5-1-2007

Two Essays on Venture Capital: What Drives the Underpricing of Venture CapitalBacked IPOs and Do Venture Capitalists Provide Anything More than Money?

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Two Essays on Venture Capital: What Drives the Underpricing of Venture Capital-Backed IPOs and Do Venture Capitalists Provide Anything More than Money?

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Date of Approval:
May 1, 2007

Key Words: Initial Public Offers, Spinning, Grandstanding, Governance, Access to Capital, Underpricing, Long-Run Performance

Table of Contents

List of Tables

List of Figures

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ABSTRACT

This dissertation includes two chapters that investigate the role venture capitalists (VCs) play in the underpricing and in the long-run performance of IPOs. The first chapter focuses on the underpricing of IPOs and attempts to determine the role that VCs play in this underpricing process. The evidence is consistent with a view that VCs agree to underpricing to ascertain benefits from both "grandstanding" and "spinning." The second chapter examines the long-run performance of IPOs and tries to determine the role that VCs play in the development of IPOs. Here, the evidence suggests that VC-backed IPOs appear to have better access to capital than non-VC-backed IPOs, but the long-run performance of VC-backed IPOs is generally mixed.

Essay 1

What Drives the Underpricing of Venture Capital-backed IPOs?

I. Introduction

Researchers of initial public offerings (IPOs), generally attribute the underpricing of IPOs to the existence of informational asymmetries between initial shareholders (of the private firm) and first-day investors. They view the abnormal initial (first-day) return or underpricing as a discount to investors who are, on average, less informed about the firm's quality than insiders (Rock, 1986). Venture Capitalists (VCs) are supposed to reduce the amount of asymmetric information between private firms and their first-day investors. Therefore, underpricing of private firms' IPOs should be reduced when VCs have equity stakes in the firms.

Early work in this area supports the intuitive notion that VCs reduce underpricing. Barry, Muscarella, Peavy, and Vetsuypens (1990) in their pioneering work, suggest that VCs monitor private firms in which they take an equity stake and reduce the asymmetric information between investors and insiders of private firms. Superior monitoring leads to a reduction in underpricing, which is significantly lower for venture backed IPOs than for non-venture backed IPOs. In a similar vein, Megginson and Weiss (1991) suggest that VCs serve to certify the value of the private firm and reduce underpricing for these private firms going public. VCs achieve this by holding high equity stakes in the private firms and remaining on the board of directors after the IPO.

In contrast, a recent paper, by Lee and Wahal (2004), has provided evidence of an opposite relationship with venture backed IPOs having higher underpricing than non-

venture backed IPOs. The sample data used in this paper supports their empirical finding, showing venture backed IPOs with an average unadjusted underpricing of 14.7 percentage points greater than non-venture backed counterparts.[1] The evidence of Lee and Wahal and this study contradicts the prevailing view of earlier studies that documented a negative relationship between VCs and underpricing. To date the only explanation provided for this seemingly counterintuitive result of the newer studies is the grandstanding theory proposed by Gompers (1996). This paper questions if grandstanding is the only reason for the underpricing difference found between VC-backed and non-VC-backed IPOs. It investigates the underpricing discrepancy between the two IPO types and attempts to reconcile the contradicting results. This paper finds empirical support for two potential incentive conflicts that exist between VCs and private firms, which are spinning and grandstanding. The results of this paper show that these two incentive conflicts appear to be the cause of greater underpricing for venture backed IPOs. After controlling for grandstanding and spinning, VC funding is found to be negatively correlated with underpricing, supporting the idea that in the absence of incentive conflicts VCs reduce underpricing.

Gompers' (1996) grandstanding theory illustrates a potential conflict that may arise between VCs and private firms. The grandstanding theory argues that VCs wanting to establish themselves quickly will bring private firms public sooner in order to entice future funding from VC investors. The idea behind this theory is that a less than well

[1] The positive differential simply looks at the average difference in underpricing of both types of IPOs. It is expected that venture backed IPOs might have a greater underpricing differential as compared to non-venture backed IPOs because of the risk characteristics of firms going public under each type. After controlling for time, industry, and risk factors venture backed IPOs still have a significant 3.2 percentage points more underpricing than their non-venture counterparts.

established VC will attempt to build its reputation through successful IPOs and secure future funding. Such VCs, eager to build their reputation, will rapidly bring private firms public to prove to prospective clients their ability to do so. However, rushing private firms public increases the amount of underpricing associated with the issues as younger firms are less established and riskier than their older counterparts. Gompers (1996) finds evidence that supports this notion by showing a lower average age and higher underpricing for private firms taken public by younger VCs as compared to older VCs. Gompers also shows that underpricing in venture backed IPOs is positively correlated with future funding from private investors. While VCs appear to benefit from it, grandstanding poses a real cost to non-VC shareholders of the private firm because of higher underpricing.

With underpricing increasing over time and simply exploding during the bubble period, a new type of incentive conflict has arisen. Loughran and Ritter (2004) point out this conflict in their "spinning" hypothesis. Specifically, the spinning hypothesis states that the decision makers of an IPO (VCs or the CEO of a private firm) will strike a deal with underwriters to deliberately underprice the offering in order to receive future allocations of "hot" IPOs. Loughran and Ritter (2004) make no distinction on which of the two decision makers will take more advantage of spinning. In this paper, we hypothesize that VC managers are more able to take advantage of spinning than CEOs of private firms.

There are two reasons why VCs take greater advantage of spinning. First, VC managers (the decision maker for venture backed IPOs) do not sell a large portion of their

ownership of shares during the IPO. Habib and Ljungqvist (2001) show that the decision makers of IPOs only care about underpricing to the extent to which they stand to lose from it. VC managers do not suffer much from high underpricing but can personally benefit from favorable future allocations of IPOs. Second, VC managers have multiple dealings with underwriters, which provide them with an enforcement mechanism for the "quid pro quo" arrangement.[2] Evidence of this spinning behavior between VCs and investment banks is reported in the *Wall Street Journal* article, "Something Ventured, Something Gained" (2002). This article alleged how some investment banks would (preferentially) allocate shares of highly underpriced IPOs to VC managers in exchange for greater underpricing in the VC's own portfolio firm.[3]

This paper examines the underpricing differential between venture-backed and non-venture-backed IPOs. In particular, it attempts to explain why venture-backed IPOs have higher underpricing than non-venture-backed IPOs after controlling for various measures of risk. In the sample period used for this paper, the difference in underpricing is shown to be a significant 3.2 percentage points more for venture-backed IPOs than non venture-backed IPOs after controlling for various measures of risk. This difference is economically important because 3.2 percentage points equals an average of about $1.5 million dollars left on the table per IPO as compared to an average offer size of about $46 million. That is, private firms that obtain venture funding suffer from additional

[2] It would seem that venture capitalists have the largest incentive to make deals with investment firms because they have repeated trips to the IPO market. Through repeated trips to the IPO market a venture capital firm could trade a high amount of rents with an investment firm and benefit greatly through a mutual beneficial relationship. Also the multiple dealings allow VCs to enforce the underwriters' end of the quid-pro-quo agreement.

[3] This article alleged that Goldman Sachs may have traded favorable allocations of IPOs in return for higher underpricing in the portfolio companies held by venture firms, namely Benchmark.

underpricing of about $1.5 million on average when their firm goes public compared to IPOs that are not backed by venture capital.

As mentioned, one explanation for this 3.2 percentage point difference in underpricing is grandstanding by less well-known VCs (Lee and Wahal, 2004). It is hard to believe that only such VCs which typically have fewer and smaller deals than well-known VCs are moving the market enough to provide a 3.2 percentage point underpricing differential over a 20-year time period. Lee and Wahal (2004) support the notion of grandstanding through capital flow regressions, but they neither directly test the underpricing effect of grandstanding, nor test another potential conflict, spinning, by VCs. This paper builds on the work of Lee and Wahal (2004) by measuring the effect of grandstanding and spinning and examining how both incentive conflicts affect the underpricing differential between venture backed and non-venture backed IPOs. The results suggest that the degree of grandstanding and spinning between private firms and VCs is positively and significantly related to underpricing. In particular, this paper finds that both spinning and grandstanding play an important role in the underpricing differential between venture backed and non-venture backed IPOs.

This paper also extends the work of Loughran and Ritter (2004) by separating the two decision makers of IPOs, showing that VCs as decision makers increase underpricing. In addition, it illustrates that venture funding is negatively related to underpricing after controlling for the two aforementioned incentive conflicts. The paper supports the idea that VCs can (in the absence of potential conflicts) reduce the amount of asymmetric information in private firms through better monitoring or certification of

value. The evidence reconciles the difference between the earlier findings on VCs and the recent study by Lee and Wahal (2004). This paper also reconciles its results with that of Habib and Ljungqvist (2001) by demonstrating that venture fund managers increase underpricing even after controlling for their ownership of the private firm.

The rest of the chapter proceeds as follows. Section 2 presents the related literature and shows how incentives can lead to higher or lower underpricing by VCs. Section 3 describes the data used in this study. Section 4 reviews and analyzes the variables used in the regressions. Section 5 discusses the results and their implications to grandstanding as well as to spinning. Section 6 revisits the spinning hypothesis and provides a robustness check to the spinning hypothesis. Section 7 concludes.

2. Related Literature

2.1 Beneficial Roles of Venture Capitalists

2.1.1 Monitoring

Venture capitalists' equity stake in a company sends a credible signal to the market that they will take an active role in monitoring the firm. They do this by sitting on the board of director and working on financial goals with the company. While banks typically monitor the financial health and particularly the downside risk of the firm, venture capitalists tend to focus on strategic goals and investment decisions. Barry, et al. (1990) examine this monitoring ability of VCs. They hypothesize that VCs' effective monitoring will decrease the amount of asymmetric information between investors and private firms, which in turn will lower underpricing.

Barry, et al. (1990) show on average that the lead venture capital firm holds a 19 percent stake in the private firm, has one third of the board seats, and typically holds a high percentage of their shares well after the IPO date. High stake in the private firm and board presence give VCs the incentive and ability to monitor their investment. The monitoring theory suggests that investors should demand lower underpricing because an independent investor will monitor the firm closely, thereby reducing information asymmetries. Barry, et al. (1990) also show that the higher the quality of the VC, the lower the underpricing. The differences in abilities among VCs send information to investors about the quality of the monitor and in turn the quality of the IPO. All else equal, investors should be willing to pay more for companies with VCs that are better at monitoring.

Lerner (1995) extends this result by showing that venture capitalists increase monitoring during times of need. Fama and Jensen (1983) and Williams (1983) hypothesize that the composition of the board should vary with the need for oversight. Lerner (1995) raises the question of whether the representation of VCs as members on their portfolio companies' boards increases when the need for oversight is larger. He finds that after a turnover in the CEO, the number of VC board members increases. CEO turnover provides a good example for the need of oversight because it typically signifies potential trouble for the firm. This evidence supports the monitoring theory that when there is an increased need for oversight, the intensity of monitoring increases.

2.1.2 Certification

Megginson and Weiss (1991) argue that VCs' repeated trips to the IPO market enable them to certify firms with credibility because of reputation concerns. In contrast, the managers of private firms typically take their own firms public only once in their lifetime. It would benefit them to conceal or delay negative information from reaching the public in order to increase the IPO offer price. VCs cannot do this because it would impede their repeated trips to the capital market. Thus, VCs are thought to provide a "certification effect" by reducing information asymmetries that arise between firms and the typical certifiers of IPOs, the investment banker and the auditors. Megginson and Weiss (1991) show in a limited time period (1984-1987) that underpricing is less for VC-backed IPOs and conclude that this is due to the certification effect.

2.2 Potential Incentive conflicts between Venture Capitalists and Private Firms' Other Shareholders

2.2.1 Grandstanding

Gompers (1996) argues that less well-known VCs may have the motivation to send a signal to the market of their ability or "grandstand" to build reputations. Such VCs with low or unknown reputations will bring firms public sooner to establish a high quality reputation to help them raise capital in the market.[4] Gompers (1996) found that the young VCs in his study consistently took firms public nearly two years faster than older VCs. Rushing these firms to the market to gain a reputation does come at a significant cost, which is measured in a higher degree of underpricing and a lower percentage equity stake for the VC. The VCs underprice offers to provide a good taste to

[4] High quality is defined as ability of a VC to pick a private firm that will eventually go public. Going public is thought of as the most profitable exit strategy for VCs.

investors by providing a quick return and securing future investment. It is much more important to these VCs to obtain future financing and extend their longevity than to maximize the price of the private firms going public. This occurs, because many VCs are set up as partnerships with a finite life span of usually about 10 years. If the VC firm, and more importantly the operators of the VC firm, are unable to show a track record of success, they may find it difficult to receive future funding to continue operations.

Lee and Wahal (2004) challenge the certification hypothesis of venture backed IPOs. In fact, they argue that the opposite is true; venture backed IPOs are underpriced more than non-venture backed IPOs. They point out a major problem that the findings of previous studies are not robust over different time periods. Lee and Wahal (2004) also address the inherently endogenous choice of VCs being able to choose the firms in which they will invest. Their results show that, after using a propensity score matching approach to control for the endogeneity issue, venture backed firms exhibit a much higher degree of underpricing compared to non-venture backed firms. The strength of their results is primarily driven by the "bubble period" in 1999 to 2000 when the underpricing difference is especially pronounced.

Lee and Wahal (2004) offer the grandstanding hypothesis by Gompers (1996) as a reason for their results, pointing out that regressions show that commitments of capital are positively correlated to first-day returns. One drawback to the matching technique used by Lee and Wahal (2004) is that it is impossible to tell which variables lead to the underpricing differential between venture backed and non-venture backed firms. This paper overcomes this problem by using a switching regression approach to study the

magnitude and significance of grandstanding. This approach uses a probit model to measure the determinants of venture funding and then uses the inverse Mills ratio as an independent variable in the OLS regression.

2.2.2 Spinning Hypothesis

Underpricing has increased over time and, with it, the door has swung open for a new type of incentive conflict. The large increase in underpricing has led to some underwriters and VCs to extract rents through deliberate underpricing. Loughran and Ritter (2002) talk about this occurrence and why private firm managers might not be upset about leaving money on the table (underpricing of IPOs). Perhaps these managers are not upset because they are taking advantage of this rent tradeoff. Specifically, the spinning hypothesis (Loughran and Ritter, 2004) postulates that the decision makers of an IPO strike a deal with underwriters to underprice the offering in order to receive future allocations of "hot" IPOs. The notion is that investment banks would (preferentially) allocate shares of other underpriced IPOs to VC managers in exchange for greater underpricing in the VC's own portfolio firm. Loughran and Ritter (2002) show examples in which VCs were given allocations in hot IPOs and flipped them over for quick profits.

This paper builds on this idea by dividing the decision makers into two groups, CEOs of private firms and VCs. It is assumed that VCs are in a better position to take advantage of spinning. The idea behind this is that each one of these decision makers is very different in nature. The differences come in the form of shares sold, experience, and enforcement. VCs have a low vested interest in the amount of underpricing due to fewer shares held in general and even less sold during the IPO, which increases their incentive

to spin. VCs also understand the IPO process better and can enforce spinning agreements through their repeated trips to the IPO market. CEOs lack the enforcement capability necessary to take full advantage of the spinning agreement. With this in mind, this paper hypothesizes that VCs will take greater advantage of potential spinning and, as a result, VC-backed IPOs will have higher underpricing.

3. Data

The initial sample of IPOs comes from a database provided by Jay Ritter, which includes corrections made by him to the data extracted by a variety of sources, primarily SDC Platinum. This data set includes the offer date, offer price, closing price, SIC code, perm number, underwriter ranking, and a dummy variable representing venture funding for all IPOs during the time period 1981-2000. Underwriter ranks are based on the adjusted Carter-Manaster (1990) rankings used in Loughran and Ritter (2002). The ranking system is between 0 and 9, with 9 representing the highest possible ranking, and 0 the lowest. Any underwriter with a rank of 8 or greater is considered a prestigious underwriter. Unit offers and IPOs with an offer price under five dollars are not included. The dummy variable representing venture funding has been corrected in a few cases where venture funding existed but was not marked as a venture-backed firm. IPOs that had a venture flag but no venture capital firm were eliminated from the sample. Problems with the SDC venture backing flag have been identified by Ljungqvist and Wilhelm (2003).

Information on the founding date of the firms included in the IPO sample was obtained from Jay Ritter's Website. This variable is from the Field-Ritter dataset of company founding dates, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). The founding date is used to obtain the age of the firm at the time of its IPO. Firm age is calculated as the IPO date minus the founding date.

This dataset was supplemented with information from Securities Data Corporation (SDC), which includes state headquarters of the firm going public, net proceeds, IPO firm revenue, lead underwriter, and the names of the VCs that funded the private firm. This information was merged with previously mentioned information to form the final sample. The final sample includes 5,521 IPOs in the 20-year period between 1981 and 2000 that meet the above specifications. From the sample of 5,521 IPOs, 2,307 IPOs are backed by venture funding.

4. Variables used in regressions

Table 1 explains all variables used in the regressions of this paper. The first is a dummy variable signifying whether the IPO had venture funding. A value of 1 denotes venture funding, whereas a value of 0 equals no venture funding. The coefficient of this "VC" variable is expected to be positive as shown in previous research.[5] This paper argues that the reason behind this positive coefficient is the aforementioned incentive conflicts. This paper also argues that the VC coefficient will be negative after controlling for these incentive conflicts. This coefficient demonstrates the benefits VCs provide to private firms in terms of underpricing in the absence of these incentive conflicts.

[5] Underpricing is shown to be greater for venture capital firms even after controlling for differences between the two groups. This result is shown in Lee and Wahal (2004).

Table 1

Variables Used in Regressions

This table defines the different variables used in the regressions of this paper. The only variables not included are industry and state headquarters dummy variables. Industry dummy variables are created with 2-digit SIC codes and state headquarters dummy uses each state as a dummy variable.

Variables	Definitions
1. VC	A dummy variable signifying venture funding. A value of 1 represents venture funding and 0 does not.
2. Log Proceeds	One plus the natural log of the net proceeds (in millions) for the firm issuing the IPO.
3. Log Age	The natural log of the firm's age at the time of the IPO. Firm age is measured as IPO date – founding date.
4. Prestigious UW	Dummy variable given if the lead underwriter firm for the IPO has a rank of 8 or above.
5. Log Revenue	One plus the natural log of yearly revenue (in millions) for the IPO firm.
6. 1990s	Dummy variable given if the IPO took place in the time period between 1990-1998
7. Bubble	Dummy variable given if the IPO took place in the time period between 1999-2000
8. Young Firm*VC	Interaction term multiplying a young firm dummy (defined as any firm 4 years or younger) by a dummy for venture funding.
9. Prestigious UW*VC	Interaction term multiplying the prestigious underwriter dummy variable by the dummy for venture funding
10. Share Overhang	The ratio of shares retained in the IPO divided by the shares issued during the IPO.
11. Log VC Money	The highest amount one VC has invested in an IPO firm.
12. Insider % Sold	The percentage of insider shares sold during the IPO.

Table 1

Variables Used in Regressions (cont.)

Variables	Definitions
13. Relationship	Dummy variable that measures whether the lead VC firm has a past relationship with the lead underwriter.
14. Avg Under 3 deals	The average underpricing by an underwriter from its three most recent IPOs (average underpricing from $_{t-1}$ through $_{t-3}$).
15. Avg Under 5 deals	The average underpricing by an underwriter from its five most recent IPOs (average underpricing from $_{t-1}$ through $_{t-5}$).
16. Under last deal	The underpricing by an underwriter from its last IPOs.
17. Avg Under 3 deals*VC	Interaction term multiplying the dummy variable for venture funding times the average underpricing by an underwriter its three most recent IPOs.
18. Avg Under 5 deals*VC	Interaction term multiplying the dummy variable for venture funding times the average underpricing by an underwriter its five most recent IPOs.
19. Avg last deal*VC	Interaction term multiplying the dummy variable for venture funding times the average underpricing by an underwriter its five most recent IPOs.

Log proceeds measure the total dollar amount raised in the IPO. Log age measures the age of the private firm at the time of the IPO. This variable should capture the risk of the IPO as the younger firms will have more risk than their older counterparts. The prestigious underwriter dummy measures whether the IPO was underwritten by a

prestigious underwriter. The coefficient of this dummy variable has two potential directions. If a prestigious underwriter uses its reputation capital to certify the value of private firms, then it should have a negative coefficient.[6] On the other hand, if prestigious underwriters take advantage of their market power to increase underpricing, the coefficient should be positive.[7] Log revenue measures the IPO firm's revenue and should have a negative coefficient, as higher firm revenue would equal lower firm risk. The 1990s time period dummy and the bubble time period dummy control for the time variation in underpricing and both coefficients should be positive, with the bubble period having the greater magnitude.

The next two variables attempt to measure the underpricing related to the grandstanding and spinning hypotheses. The grandstanding variable used "Young Firm*VC" includes a dummy for private firms under the age of four years and is multiplied with the dummy variable used to mark firms with venture funding. The age of four was determined based on the 25th percentile of age for venture backed IPOs.[8] The logic behind the Young Firm*VC variable is as follows. An implication of the grandstanding hypothesis is that VC backed private companies will be taken public sooner than non-VC backed ones and will see greater underpricing. The greater underpricing is due to two reasons. First, younger IPO firms should have increased levels of uncertainty. Second, VCs will rush public such firms prematurely and increase total

[6] Beatty and Ritter (1986) and Carter and Manaster (1990) find a negative relationship between prestigious underwriters and underpricing.
[7] Beatty and Welch (1996), Cooney, Singh, Carter and Dark (2001), and Loughran and Ritter (2004) find a positive relationship between prestigious underwriters and underpricing during the 1990s.
[8] The choice coincides with Gompers (1996). He shows that the average age of private firms bought public by young venture capital firms is 55 months. The purpose of the variable is to capture this grandstanding activity by venture capital firms.

underpricing as these firms are not ready for the public market. VCs prematurely take firms public to provide their investors with a speedy return on investment and earn a reputation for the ability to take their portfolio firms public. This second way of underpricing captures the idea of grandstanding. If grandstanding is a significant cost in terms of underpricing, the coefficient for this variable will be positive.

The first variable used to capture the spinning hypothesis is "Prestigious UW*VC". This variable includes a dummy variable signifying whether the IPO had a lead underwriter with a prestigious rank and multiplies that by a dummy variable for venture funding. This variable measures whether VCs have greater underpricing when dealing with prestigious underwriters. The logic for this variable is as follows. First, this paper hypothesizes that VCs as decision makers will consent to greater underpricing. Second, spinning activity is typically thought to be centered within the confines of prestigious underwriters (Loughran and Ritter, 2004). If VCs as decision makers take more advantage of spinning, then the coefficient for this variable will be positive.

The next three variables, share overhang, log VC money, and insider percentage sold, are used to measure the incentive of pre-existing shareholders to influence underpricing. Share overhang (Bradley and Jordon, 2002) measures the ratio of shares retained in the IPO compared to the amount of shares issued during the IPO. This variable is expected to have a positive coefficient as more share overhang will lower the desire of pre-owners to lower underpricing. The next variable used is Log VC money, which measures the largest amount invested by an individual VC into the IPO firm. This variable controls for the VCs' share in the private firm when it goes public. This variable

should have a negative coefficient as VCs should care more about underpricing as their stake in the firm and potential shares sold increases. The final of the three variables, insider percentage sold, measures the percentage of insiders that sold shares at the time of the IPO. This variable should also be negative as insiders should be more concerned with underpricing when they sell a higher percentage of their shares.

A few additional variables have been constructed to test the robustness of the spinning results. The first examines VCs' unique ability to re-visit the IPO market. VCs can build relationships in the IPO market with underwriters through repeated trips to the IPO market. The "relationship" variable identifies this type of relationship between lead VCs and lead underwriters. The relationship dummy has a value of 1 if the VC and underwriter have more than one IPO together in the sample period, and a value of 0 if they do not. This variable should have a positive coefficient if a relationship between VCs and underwriters increase underpricing.

To further examine the robustness of the results, the next variables examine whether previous underpricing is correlated with future underpricing. The variable "Avg under 3 deals" measures the average underpricing for a given lead underwriter for its previous three IPOs. The variable "Avg under 5 deals" measures the same thing but looks at the previous five IPOs instead of three. The variable "last deal under" represents underpricing from the previous IPO underwritten by the lead underwriter. These variables are interacted with the VC dummy variable to form three interaction variables - Avg Under 3 deals*VC, Avg Under 5 deals*VC, and Last deal under*VC. These variables examine the relationship between venture backing and previous underpricing.

5. Results

5.1 Characteristics Non-Venture Backed and Venture Backed IPOs

Table 2 displays the descriptive statistics for the entire sample of 5,521 IPO firms. The table divides the sample by venture funding, and shows the difference between non-venture backed and venture backed IPOs.

Table 2

Descriptive Statistics for the Sample of 5,521 IPOs (1981-2000)

This table looks at the descriptive statistics for the whole sample, IPOs with no venture backing, and IPOs with venture backing. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. Underwriter grade (UW Grade) is based upon the Carter-Manaster (1990) ratings. Firm age is the number of years from founding date to IPO (IPO date – founding date). Proceeds are the amount of money received by the IPO firm in millions. Revenue is the yearly revenue for the IPO firm in millions (revenue data is only available for 3,665 IPO firms). Difference is defined as the sample of non-venture backed IPOs subtracted by venture backed IPOs. Mean significance tests were ran on the difference between the two samples to test if they were significantly different from each other (***, **, * indicate significance at the .01, .05, and .10 levels respectively).

	All	No Venture	Venture	Difference
# of IPOs	5,521	3,214	2,307	907
Underpricing	0.193	0.132	0.279	-0.147***
Offer	12.12	11.75	12.63	-0.878***
High	13.01	12.91	13.15	-0.233**
Low	11.18	11.15	11.22	-0.077
Mid	12.10	12.03	12.18	-0.155
UW Grade	7.265	6.812	7.895	-1.083***
Firm Age	13.63	16.07	10.24	5.830***
Proceeds	46.74	46.69	46.83	-0.140
Revenue	75.96	88.09	56.78	31.41***

The average underpricing for non-venture backed IPOs is 13.2 percent, whereas the average underpricing for venture backed IPOs is 27.9 percent. The difference between the two is 14.7 percentage points, which is statistically significant at the one

percent level. Average underpricing of venture backed IPOs is significantly greater than that of non-venture backed IPOs. Venture backed IPO firms are much younger than non-venture backed IPO firms, with a significant difference of almost six years. Venture Backed IPOs also have a statistically higher underwriter grade. Net proceeds for both types are statistically indifferent.

5.2 Prestigious Underwriters

Table 3 exhibits how prestigious underwriters influence venture backed and non-venture backed IPOs. The table sorts all IPOs into two groups by prestigious underwriters and then separates the data by the different time periods. Table 3 shows that IPOs with prestigious underwriters have average underpricing of 10.5 percentage points greater than IPOs with non-prestigious underwriters for the sample period 1981-2000. The breakdown of the different time periods shows that this was not always the case. During the 1980s, IPOs with prestigious underwriters had 3 percentage points lower underpricing than IPOs with non-prestigious underwriters. In the 1990s and during the bubble period, this trend was reversed with prestigious underwriters having greater underpricing. The difference between the two types of underwriters is extreme for the bubble period at 34.2 percentage points. This evidence supports the idea that the roles of prestigious underwriters have changed over time (Ritter and Welch, 2002). It appears that prestigious underwriters used their reputation to certify quality IPOs with lower underpricing in the 1980s, but over time they have used their market power to increase the underpricing of IPOs, perhaps for their own benefit.

Table 3

Prestigious Underwriters

This table shows the underpricing for a double sorted sample based upon the existence of venture backing and a lead prestigious underwriter. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The table sorts based upon prestigious underwriter while at the same time sorting the sample by different time periods. It then re-sorts the sample based on whether or not the IPO has venture backing. Prestigious underwriters are defined as underwriters with a Carter-Manaster (1990) rating of 8.0 and above. Mean significance tests were ran on the difference between the two samples to test if they were significantly different from each other (***, **, * indicate significance at the .01, .05, and .10 levels respectively).

	Prestigious UW		Non-Prestigious UW		
	Sample #	Underpricing	Sample #	Underpricing	Difference
81 – 00	3377	0.234	2144	0.129	0.105***
81 – 89	865	0.057	851	0.087	-0.030***
90 – 98	1905	0.161	1151	0.130	0.031***
99 -00	607	0.715	142	0.373	0.342***

	Prestigious UW with VC		Prestigious UW with No VC		
	Sample #	Underpricing	Sample #	Underpricing	Difference
81 – 00	1734	0.326	1643	0.137	0.189***
81 – 89	338	0.076	527	0.046	0.030***
90 – 98	937	0.190	968	0.133	0.057***
99 -00	459	0.790	148	0.482	0.308***

	Non-Prestigious UW with VC		Non-Prestigious UW with No VC		
	Sample #	Underpricing	Sample #	Underpricing	Difference
81 – 00	573	0.135	1571	0.127	0.008
81 – 89	219	0.081	632	0.089	-0.008
90 – 98	291	0.094	860	0.142	-0.049***
99 -00	63	0.510	79	0.264	0.246**

Hoberg (2003), Loughran and Ritter (2002) and (2004), and others discuss how underwriters may use their market power to increase underpricing. As pointed out by Ritter and Welch (2002) the acceptance standards of prestigious underwriters has decreased over time, which appears to be linked with the increased underpricing.

Table 3 also shows the effect of venture funding on the underpricing of IPOs. The table partitions venture funding by prestigious and non-prestigious underwriters. The results of this partition show that when prestigious underwriters work with VC firms, the result is higher underpricing. The extreme case of underpricing is found in the bubble period for private firms that have venture funding and use prestigious underwriters. The bubble time period provided the biggest opportunity for VCs and underwriters to take advantage of quid pro quos with average underpricing of 79 percentage points. This table provides support for the spinning hypothesis, although it does not account for the differing risk level of each IPO over time.

5.3 Main Regression Results

Table 4A shows the regression results using an OLS regression with underpricing as the dependent variable. Column (1) shows the VC variable with only adjustments for industry (two-digit SIC codes) and time (year in which the IPO was offered). After controlling for industry and year differences among venture backed and non-venture backed IPOs, venture backed IPOs have 4.4 percentage points more underpricing than non-venture backed IPOs. This is much less than the 14.7 percentage point differential shown in table 2 with no adjustment for industry and time.

Table 4A

Underpricing of IPOs

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS regression framework. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. Data for revenue is only available for 3,665 IPO firms. P values are in parenthesis.

	Dependent Variable: Underpricing			
	(1)	(2)	(3)	(4)
VC	0.044	0.032	-0.067	-0.068
	(0.00)	(0.01)	(0.00)	(0.00)
Log Proceeds		0.031	0.034	0.058
		(0.00)	(0.00)	(0.00)
Log Age		-0.034	-0.021	-0.006
		(0.00)	(0.00)	(0.33)
Prestigious UW		0.010	-0.035	-0.030
		(0.77)	(0.03)	(0.05)
Log Revenues				-0.027
				(0.00)
1990s	0.063	0.041	0.040	0.040
	(0.00)	(0.00)	(0.00)	(0.00)
Bubble	0.506	0.456	0.439	0.520
	(0.00)	(0.00)	(0.00)	(0.00)
Prestigious UW*VC (Spinning)			0.108	0.082
			(0.00)	(0.00)
Young Firm*VC (Grandstanding)			0.090	0.064
			(0.00)	(0.00)
Industry Dummies	Yes	Yes	Yes	Yes
Constant	0.031	-0.017	0.002	0.021
	(0.22)	(0.54)	(0.95)	(0.66)
Observations	5,521	5,521	5,521	3,665
Adjusted R^2	0.217	0.226	0.232	0.229

This result was expected because venture backed IPOs have higher concentrations in riskier industries and in the later years with greater underpricing.[9] Column (2) adds log proceeds, log age, and a prestigious underwriter dummy variable. These control variables lower further the underpricing differential to 3.2 percentage points between venture backed and non-venture IPOs. The positive coefficient for log proceeds is as predicted. The negative coefficient for log age is also as predicted, capturing the additional underpricing of young firms. This additional underpricing is due to the increased riskiness of younger firms. The prestigious underwriter dummy is positive but insignificant, perhaps capturing both the certification effect and market power effect.

Column (3) of the regression adds the two interaction variables that measure for the potential incentive conflicts. It contains several key results of this paper. The grandstanding variable "Young Firm*VC" has a positive significant coefficient of 0.09. This shows that underpricing is increased by 9 percentage points when VCs take firm public at an age of four years or less. This additional underpricing provides evidence that is consistent with the implication of the grandstanding theory.[10] The spinning variable, "Prestigious UW*VC", has a positive and significant coefficient of 0.108. Thus, underpricing increases by 10.8 percentage points when VCs work with a prestigious underwriter. This evidence supports the spinning hypothesis. The addition of these two variables flip the underpricing differential to -6.7 percentage points between venture backed IPOs and non-venture backed IPOs. Now, venture backed IPOs have 6.7

[9] Underpricing has varied over time increasing from about 7% in the 1980s to about 16% in the 1990s to almost 60% during the bubble period (Loughran and Ritter, 2004)

[10] A cutoff point for firm age of 6 years representing the median age of firms taken public by VCs and defining a "Young Firm" was also used to test the grandstanding theory. Similar results were obtained with this change, but the magnitude was slightly smaller at .065.

percentage points *less* underpricing than their non-venture backed counterparts after controlling for the two incentive conflicts. Log proceeds and log age have the same sign as before, but the prestigious grade dummy has a significant negative sign. After separating the effect of VCs and prestigious underwriter, it is now shown that prestigious underwriters have a negative relationship on underpricing. This shows two things. First, spinning relationship appears to be primarily centered between VCs and prestigious underwriters. Second, prestigious underwriters reduce underpricing when spinning is controlled for.

Column (4) adds log revenue to the model, and the coefficient is negative and significant as expected, which means that the higher revenue equals lower underpricing. The addition of log revenue does not significantly alter any of the coefficients with the exception of log age. Log age is still negative but insignificant now. The explanation for this change is that log revenue captures some of the underpricing explained by log age, as both measure the riskiness of IPOs. Unfortunately, data restrictions reduce the sample size for this regression to 3,665 observations.

Table 4B extends the data to include IPOs issued during the post bubble period of 2001-2003. The original sample period is between 1981 and 2001, which is the same as in Lee and Wahal (2004) and is used for an easy comparison between the results here and theirs. The dataset is extended to see whether the primary results would remain constant after the burst of the bubble.

Table 4B

Underpricing of IPOs (Extended Data Set)

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS regression framework. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. Data for revenue is only available for 3,772 IPO firms. P values are in parenthesis.

Dependant Variable: Underpricing	(1)	(2)	(3)	(4)
	Dependant Variable: Underpricing			
VC Funding Dummy	0.043	0.032	-0.065	-0.064
	(0.00)	(0.00)	(0.00)	(0.00)
Log Proceeds		0.024	0.028	0.054
		(0.00)	(0.00)	(0.00)
Log Age		-0.033	-0.022	-0.006
		(0.00)	(0.00)	(0.33)
Prestigious UW Dummy		0.011	-0.034	-0.029
		(0.41)	(0.03)	(0.06)
Log Revenues				-0.026
				(0.00)
Nineties	0.065	0.047	0.047	0.041
	(0.00)	(0.00)	(0.00)	(0.00)
Bubble	0.510	0.468	0.452	0.524
	(0.00)	(0.00)	(0.00)	(0.00)
Post Bubble	0.070	0.036	0.039	-0.006
	(0.01)	(0.22)	(0.18)	(0.85)
Prestigious UW * VC			0.106	0.079
			(0.00)	(0.00)
Young Firm * VC			0.089	0.064
			(0.00)	(0.00)
Industry Dummies	Yes	Yes	Yes	Yes
Constant	0.019	0.018	0.005	-0.004
	(0.36)	(0.51)	(0.86)	(0.90)
Observations	5745	5745	5745	3772
Adj R-squared	0.209	0.216	0.223	0.215

The table illustrates that the primary results remain essentially the same after adding these additional IPOs, with no major change in terms of sign or significance. The post bubble period dummy variable is insignificant in columns two, three, and four. This shows that after controlling for various factors, the underpricing for the post bubble period is not significantly different from the underpricing in the 1980s.

5.4 Endogeneity Issue

The choice of whether to use venture funding has been described as an endogenous one. VCs have many firms from which to choose because very many apply for venture funding. VCs invest in a selected few of firms out of the many that apply (Sahlman, 1990). Furthermore, private firms may approach multiple VCs for funding and good firms may have several offers to consider. The matching process is based on many factors, with the two most important ones being geographic location and industry. Geographic location is an important consideration due to the proximity between entrepreneur and VC. The closer the proximity, the easier it is to monitor the entrepreneur. Industry is an important consideration because individual VCs have expertise in certain industries. This expertise allows for a reduction in information asymmetries between the VC and the entrepreneur. Clustering in both geographical locations and in industries suggests the likelihood that the receipt of venture funding is an endogenous choice. Lee and Wahal (2004) illustrate the endogeneity of venture-backed IPOs. To control for endogeneity, a two-stage process is used. First, probit regressions are used to measure the determinants of venture funding.

Table 5 displays the probit model measuring the determinants of venture backing.

Table 5

Determinants of Venture Backing

This looks at the determinants of venture backing. A Probit regression is estimated with the dependent variable used is a dummy variable for venture funding. All variables used are defined in table 1. P values are in parenthesis.

	Dependent Variable: VC Backing Dummy	
	(1)	(2)
Log Proceeds	0.187	0.243
	(0.00)	(0.00)
Log Age	-0.090	-0.103
	(0.00)	(0.00)
90s	0.060	
	(0.20)	
Bubble Period	0.442	
	(0.00)	
State Dummies	Yes	Yes
Industry Dummies	Yes	Yes
Constant	Yes	Yes
Pseudo R-Squared	0.188	0.182

Column (1) uses log proceeds, log age, year dummies, state headquarter dummies, and industry dummies to predict the receipt of venture funding. The pseudo R-squared for this model is 18.8%. Column (2) uses the same variables but excludes the year dummies from the model with a pseudo R-squared of 18.2%.

The second stage of the endogeneity process is an OLS regression using the inverse Mills ratio from the previous probit regression. Table 6 shows the same regressions as table 4 does, but now the endogenous choice of venture capital funding is controlled. Table 6 uses column (1) of the probit model from table 5 to create the inverse Mills ratio to control for the choice of venture funding.

Table 6

Underpricing of IPOs Controlling for the Endogenous Choice of Venture Backing

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an endogenous switching regression framework. Where the first regression is a Probit model looking at the probability of venture backing and the second is an OLS regression using the inverse mills ratio calculated as a dependent variable. The Probit model used is from table 5 column (1). Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. Data for revenue is only available for 3,665 IPO firms. P values are in parenthesis.

	Dependent Variable: Underpricing			
	(1)	(2)	(3)	(4)
VC	0.023	0.022	-0.075	-0.070
	(0.03)	(0.04)	(0.00)	(0.00)
Log Proceeds		0.020	0.023	0.054
		(0.00)	(0.00)	(0.00)
Log Age		-0.027	-0.015	-0.004
		(0.00)	(0.00)	(0.33)
Prestigious UW		0.005	-0.038	-0.031
		(0.64)	(0.01)	(0.03)
Log Revenues				-0.027
				(0.00)
1990s	0.041	0.035	0.035	0.039
	(0.00)	(0.01)	(0.00)	(0.00)
Bubble	0.421	0.418	0.403	0.512
	(0.00)	(0.00)	(0.00)	(0.00)
Prestigious UW*VC (Spinning)			0.104	0.081
			(0.00)	(0.00)
Young Firm*VC (Grandstanding)			0.090	0.064
			(0.00)	(0.01)
Industry Dummies	Yes	Yes	Yes	Yes
Constant	-0.021	-0.002	-0.013	0.018
	(0.14)	(0.94)	(0.53)	(0.44)
Observations	5,521	5,521	5,521	3,665
Adjusted R^2	0.217	0.235	0.241	0.227

The results in table 6 are similar to those shown in table 4, with no major differences in the coefficients' signs or magnitudes. This table shows that the results are robust after controlling for endogenous choice of venture funding. Both the spinning and grandstanding variables withstand this endogeneity test.

6. Robustness Checks

6.1 Share Retention and Underpricing

Three major parties are involved with the underpricing decision of a venture-backed IPO. These parties are the CEO of the private firm, the underwriter, and the VC.[11] Both the CEO and the VC own shares and often sell a portion of those shares during the IPO. The sale of these shares could influence the overall underpricing of the IPO. A few studies have examined how pre-IPO ownership affects underpricing of IPOs. Bradley and Jordan (2002) suggest that owners who sell fewer shares suffer only marginally from underpricing. They show that IPOs with high first–day returns typically have only a small fraction of shares sold at the time of the IPO as measured by the ratio of retained shares to issued shares, which they term share overhang. This demonstrates a positive relation between share overhang and underpricing. Habib and Ljungqvist (2001) also find a positive relation between share overhang and underpricing. They hypothesize that higher share retention lowers the incentive to control underpricing. Retained ownership and its effects on the prior results are examined in table 7.

[11] If the IPO is not backed with venture funding then the VC is eliminated from this group.

Table 7

Incentives to Control Underpricing

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS framework. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. Column (1) and (2) add share overhang to the regressions from table 4, which reduces the total sample size due to data requirements. Column (3) includes only the VC-backed sample (2,307 total IPOs) with a small loss in observations due to data requirements (loss of 400 IPOs). Column (4) adds the full sample of non-VC-backed IPOs to column (3). Column (5) uses the full sample but has reduced observations due to data requirements of insider shares sold (total sample 2,586). P values are in parenthesis.

	Dependant Variable: Underpricing				
	(1)	(2)	(3)	(4)	(5)
VC Funding Dummy	0.033	-0.077			-0.045
	(0.02)	(0.01)			(0.08)
Log Proceeds	0.033	0.036	0.131	0.041	0.049
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Age	-0.038	-0.023	-0.057	-0.021	-0.024
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Prestigious UW Dummy	0.005	-0.043	0.007	-0.041	-0.019
	0.764	(0.02)	(0.81)	(0.01)	(0.40)
90's	(0.46)	0.044	0.023	0.036	0.052
	(0.00)	(0.00)	(0.45)	(0.01)	(0.65)
Bubble	0.462	0.446	0.518	0.456	0.321
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Prestigious UW * VC (Spinning)		0.116		0.112	0.090
		(0.00)		(0.00)	(0.00)
Young Firm * VC (Grandstanding)		0.102		0.085	0.017
		(0.00)		(0.00)	(0.49)
Overhang	0.008	0.008			
	(0.00)	(0.00)			
VC Max Money			-0.012	-0.005	
			(0.24)	(0.04)	
Insider % Sold					-0.185
					(0.00)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.236	0.244	0.296	0.244	0.158
Observations	4439	4439	1907	5121	2586

Table 7 examines share overhang, maximum amount of VC money invested by any one VC, and percentage of insider shares sold to control for share retention.[12] The first two columns of table 7 add share overhang as an independent variable to the regressions (columns 2 and 3) from tables 4 and 6 to measure retained ownership.[13] The coefficient of the added overhang variable is positive and significant as expected, whereas a higher percentage of shares sold at the time of the IPO decreases underpricing. This result is consistent with the work of Bradley and Jordan (2002) and Habib and Ljungqvist (2001). The results from the first two columns show that the inclusion of the overhang variable does not affect the results shown in tables 4 and 6. The coefficients for the variables of interest in this paper, spinning and grandstanding, remain positive and significant. In fact, the magnitudes of the two variables are increased as shown in column (2) of table 7.

Column (3) of table 7 only looks at the VC-backed sample to examine if underpricing is affected by the amount of money invested by the VC with the highest stake in an IPO.[14] Megginson and Weiss (1991) report VCs own 36 percent of the firm before the IPO and 26 percent after the IPO. With this in mind, VCs should be concerned with underpricing as they sell shares during the IPO. This should mitigate VCs' incentive to spin unless the benefit of spinning is greater than the loss of money from the increased underpricing. The coefficient for the VC money variable is negative but not

[12] The results shown are in an OLS framework, but the results do not change if the two-stage approach from Table 6 is implemented.
[13] The numbers of observations are reduced by about 1,000 due to the information on overhang, leaving a sample of 4,439.
[14] This regression includes only the VC-backed sample, which consists of 2,307 total IPOs. Four hundred IPOs are lost due to the data requirements of the VC money invested variable.

significant for the VC sample. This provides evidence that VCs might have a different incentive structure than other investors as shown with share overhang.

Column (4) of table 7 includes the entire sample, adding in the non-VC-backed sample.[15] The VC money variable is used as the variable to control for venture backing as it measures the amount of money that is invested by the highest invested venture firm. Non-venture firms by definition have zero invested by VCs. The results from column (4) support the results in tables 4 and 6, both the spinning and grandstanding variables are significant. The coefficient for the amount of money invested by the VC with the highest stake in the private firm is negative and significant. This agrees with the VC dummy variable from tables 4 and 6, showing that VCs indeed reduce underpricing as they invest more money in the private firm. Columns (3) and (4) from table 7 were also run with total VC money invested in the private firm instead of maximum amount by a single VC with the same results.

Column (5) from table 7 uses another proxy for pre-IPO owners' effect on the underpricing of IPOs by looking at the percentage of insiders that sold shares during the IPO.[16] It is expected that the coefficient for insider percentage sold would be negative and significant as insiders would be concerned with the offer price of the IPO. The result is as expected with the coefficient of the insider percentage sold variable being negative and significant. The spinning variable remains positive and significant. Interestingly, the grandstanding variable loses its significance with the inclusion of this variable. Perhaps,

[15] Adding the non-VC-backed sample increases total observations to 5,121.
[16] Due to data restrictions on insider sales, the total sample size on this regression is 2,586.

this is due to the fact that insiders mitigate the problem associated with grandstanding or perhaps the sample size reduction eliminates the firms most likely to grandstand.

6.2 VC Spinning Variable: Relationship between VCs and Underwriters

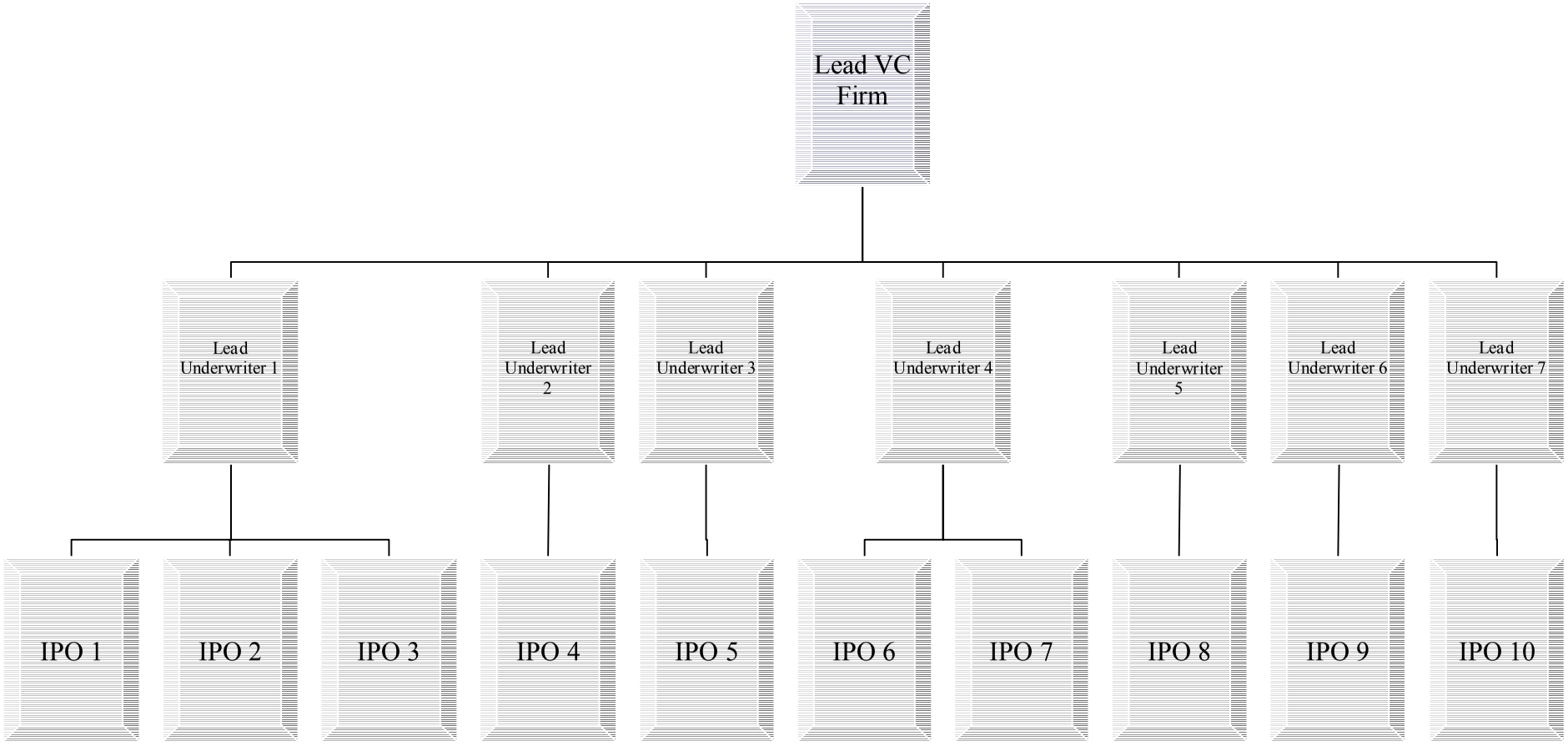
This section and the next further examine the spinning variable by using different proxies for spinning. The previous tables demonstrate that underpricing is positively correlated with the interaction variable "Prestigious UW*VC", which shows that spinning is positively related with underpricing. The focus of this section is to further examine this relationship between VCs and underwriters. The spinning theory postulates that the decision makers of IPOs will agree to underprice their IPO to trade rents with underwriters (Loughran and Ritter, 2004). The assertion made by this paper is that VCs as decision makers will have a greater incentive to take advantage of this potential quid pro quo agreement. The first part of this section attempts to further capture the relationship between VCs and underwriters. A relationship variable is created that attempts to capture whether there is a working relationship between VCs and underwriters. VCs and underwriters are considered to have a relationship if they have more than one deal together within the sample period. An example of this relationship between VCs and underwriters is shown in Figure 1. For this particular example, the VC would have a relationship with underwriters 1 and 4 in the diagram because they have more than one IPO with that underwriter.[17]

[17] The relationship is measured only by using the lead underwriter and the lead VC. The lead underwriter is defined by SDC Platinum. The lead VC is defined as the first VC firm to fund the private firm. If two VCs fund the firm at the same time, the one with a larger amount of funding is used as the lead.

Figure 1

Relationship between VCs and Underwriters

This figure demonstrates an example of the potential relationship between a lead VC firm and different lead underwriters. The VC firm has brought ten IPOs public and used seven different underwriters. The VC firm is considered to have a relationship with an underwriter if the VC conducts more than one IPO with the underwriter. For this example the VC firm would have a relationship with Underwriter 1 and 4.



As mentioned earlier in this paper, VCs can enforce the underwriters' end of the quid-pro-quo argument through their future business with underwriters. VCs would enforce this by only bringing future IPOs to underwriters that fulfilled their end of the bargain. Repeated business between VCs and underwriters should represent the highest underpricing to support this version of the spinning theory. The idea behind the relationship variable is to find out how underpricing is affected when VCs and underwriters work together repeatedly.

This relationship between VCs and underwriters is tested in a multiple regression analysis in table 8. The first three columns of table 8 look at only IPOs with venture funding. Column (1) illustrates the full sample of IPOs with venture funding and the relationship variable has a positive and significant coefficient of 0.089. This shows that when VCs and underwriters work together regularly, underpricing increases by 8.9 percentage points. Given that an IPO has venture funding, a relationship between VC and underwriters significantly increases underpricing, supporting the spinning theory. Column (2) eliminates the bubble period from the sample of venture backed IPOs. The relationship variable is positive and significant even after the exclusion of the bubble period. This result shows that the relationship variable measuring spinning is significant both inside and outside the bubble period. Column (3) exhibits only venture backed IPOs that use prestigious underwriters. The relationship variable coefficient is positive and significant, 0.09. This shows the importance of the relationship between VCs and underwriters, even when only looking at prestigious underwriters.

Table 8

Relationship between VCs and Underwriters

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS regression framework. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. The first 3 columns of the regression look at only venture backed IPOs with column (1), (2), and (3) looking at the whole sample, the sample without the bubble period IPOs, and the sample with only IPOs that have prestigious underwriters respectively. Columns (4) and (5) look at venture and non venture backed IPOs with column (4) and (5) looking at the whole sample and the sample without bubble period IPOs. Bubble period IPOs include IPOs issued in 1999 and 2000. P values are in parenthesis.

Dependent Variable: Underpricing

	VC Backed IPOs – Only			VC & Non VC IPOs	
	Full Sample	No Bubble	Prestigious	Full Sample	No Bubble
	(1)	(2)	(3)	(4)	(5)
VC				0.020	-0.005
				(0.09)	(0.49)
Log Proceeds	0.085	0.043	0.109	0.031	0.012
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Age	-0.060	-0.029	-0.071	-0.033	-0.020
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Prestigious UW	0.013	0.013		0.006	0.000
	(0.60)	(0.29)		(0.64)	(0.95)
1990s	0.031	0.056	0.050	0.040	0.061
	(0.03)	(0.00)	(0.17)	(0.00)	(0.00)
Bubble	0.503		0.530	0.461	
	(0.00)		(0.00)	(0.00)	
Relationship	0.089	0.048	0.090	0.099	0.060
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Constant	-0.070	-0.010	-0.148	0.019	0.063
	(0.39)	(0.79)	(0.18)	(0.54)	(0.00)
Observations	2307	1785	1734	5521	4772
Adjusted R^2	0.273	0.141	0.273	0.228	0.082

Columns (4) and (5) show the full sample, including both venture backed and non-venture backed IPOs. Column (4) provides a similar result to that of column (1) but now the relationship variable has a coefficient of 0.099. Column (5) illustrates the entire sample minus the IPOs issued during the bubble period. The results of column (5) demonstrate that even outside of the bubble period, the relationship variable coefficient is positive and significant 0.06. The results from table 8 show the relationship between VCs and underwriters as paramount in explaining underpricing both inside and outside of the bubble period.

6.3 VC Spinning Variable: Previous Underpricing

The previous results show that repeated business between VCs and underwriters increase underpricing, which lends more support to the spinning hypothesis. Another important implication of the spinning hypothesis shown in Loughran and Ritter (2004) is that the decision makers of IPOs, VCs or the CEO of the private firms, enlist the services of underwriters that have large amounts of underpricing in the past. They make a decision to partner with an underwriter with the knowledge that underpricing was high in the past and will be high for their IPO as well. Because underpricing is easily observed by market participants, each successive deal by an underwriter updates the previous knowledge of underpricing by that particular underwriter.

Do underwriters that had high underpricing in the past continue to underprice IPOs more than those that had lower underpricing? This section addresses this question. In fact, it addresses the bigger issue of this paper: Do venture backed IPOs have a larger magnitude of underpricing than IPOs without VC-backing? To test the hypothesis that

when VCs deal with underwriters that have underpriced IPOs to a large extent in the past, the current underpricing is also larger, a variable was created to capture the past deal underpricing by the lead underwriter. The "Avg Under 3 deals" variable looks at the average underpricing of the previous three IPOs by an underwriter. For example, if the last three IPOs by an underwriter had underpricing of 10%, 20%, and 30%, the average would be 20%.

The results of this analysis are shown in table 9. The regression in column (1) shows that current underpricing is positively correlated to the past IPO underpricing by the lead underwriter. Underwriters that underprice more in the past continue to underprice IPOs more greatly than underwriters with less average underpricing in the past. Column (2) illustrates the same result as column (1) but changes the number of previous underwriter deals to five instead of three. The results are the same with underpricing positively correlated to previous underpricing by the same underwriter.

Who chooses underwriters with a reputation for high underpricing, and what is the result when different decision makers pick different underwriters? This paper has made the assertion that VCs will select underwriters with a reputation for high underpricing and work with them in a spinning relationship to secure rents. The evidence provided in column (3) of the regression supports this claim. To measure it, an interaction variable between VC-funding and average underpricing is added to the regression from column (1). Current underpricing is still correlated with previous underpricing, but now the interaction variable is also positive and significant.

Table 9

Previous Underpricing by Underwriters

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS regression framework. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. The variables used in this regression are defined in table 1. P values are in parenthesis.

	Dependent Variable: Underpricing				
	(1)	(2)	(3)	(4)	(5)
VC	0.027	0.027	-0.027	-0.043	0.009
	(0.03)	(0.04)	(0.06)	(0.01)	(0.48)
Log Proceeds	0.037	0.040	0.037	0.040	0.038
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Age	-0.031	-0.030	-0.030	-0.030	-0.030
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Prestigious UW	0.008	0.001	0.009	0.003	0.001
	(0.59)	(0.95)	(0.53)	(0.86)	(0.94)
1990s	0.017	0.013	0.024	0.022	0.027
	(0.22)	(0.39)	(0.08)	(0.14)	(0.04)
Bubble	0.291	0.246	0.286	0.247	0.374
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Avg under 3 deals	0.313		0.099		
	(0.00)		(0.01)		
Avg under 5 deals		0.417		0.122	
		(0.00)		(0.01)	
Last Deal Under					0.095
					(0.00)
VC*Avg under 3 deals			0.293		
			(0.00)		
VC*Avg under 5 deals				0.389	
				(0.00)	
VC*Last deal under					0.116
					(0.00)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Constant	-0.026	-0.046	-0.004	-0.016	-0.011
	(0.47)	(0.23)	(0.91)	(0.68)	(0.73)
Observations	4373	4004	4373	4004	4929
Adjusted R^2	0.282	0.299	0.291	0.311	0.266

VCs appear to seek out underwriters with reputations for high levels of underpricing and then strike deals for greater levels of underpricing. Column (4) shows that the results found in column (3) are robust to the use of the previous five deals of underwriters. The only difference in the results of these two is the magnitudes of the variables. Column (5) makes the assumption that only the previous IPO's underpricing by an underwriter matters. The results are similar to the earlier results using the previous three and five IPOs.

6.4 Dummy Variable Issues

Table 10 examines potential problems with using dummy variables in the primary regressions. Perhaps, some of the results reported in tables 4 and 6 are due to the use of multiple dummy variables. Table 10 attempts to examine this issue by creating interaction with continuous variables and the VC dummy to measure grandstanding and spinning as well as using each year as a dummy variable instead of grouping these variables as to check for any potential mismeasurement in the earlier results. The results show that this is not the case, as there is no change to the primary variables of interest.

Column (1) of table 10 switches the spinning variable and the grandstanding variable from an interaction between two dummy variables to an interaction between the VC funding dummy and log age and underwriter grade. The prestigious underwriter dummy is also changed to underwriter grade. The results for this regression are consistent with the story from the previous regressions. The spinning variable is positive and significant, showing that as grade increases for VC-backed IPOs, underpricing increases as predicted by the spinning hypothesis. Yet, underwriter grade outside of VC

funding is negative and significant. The grandstanding variable is also significant as VCs have significantly lower underpricing as the age of the IPO firm at the time of the IPO is higher. This result is consistent with the grandstanding hypothesis. Column (2) further examines this by eliminating the grouped time variables and replaces it with year dummy variables. The results of this test are consistent with the idea that spinning and grandstanding increase underpricing for venture-backed IPOs.

Columns (3) and (4) break up the sample by prestigious underwriter. Column (3) eliminates all IPOs issued by prestigious underwriters, whereas column (4) includes only IPOs issued by prestigious underwriters.[18] If prestigious underwriters lead to higher underpricing when dealing with VCs, then the expectation is that the VC dummy variable would have a higher coefficient in column (4) than in column (3). The results of these two regressions support this expectation and the earlier result of the interaction dummy variable used to measure spinning. Also of interest is the coefficient for underwriter grade in columns (3) and (4). When looking at column (3) the coefficient for grade is negative and significant at the 10% level. This result supports the idea that better underwriters reduce underpricing. This is not the case when looking at column (4), which only includes IPOs underwritten by prestigious underwriters, where the coefficient for grade is positive and significant. This shows a move upward in level of prestige leads to higher underpricing. This supports the idea that better underwriters may increase underpricing. This evidence also supports the argument that spinning between VCs and prestigious underwriters appears to be a major incentive conflict.

[18] The cut-off for prestigious underwriters is a grade of 8 as measured by the revised Carter and Manaster (1990) grades.

Table 10

Reexamination of Dummy Variables

This table measures the underpricing of IPOs for both venture backed and non-venture backed IPOs in an OLS framework and eliminates the use of multiple dummy variables as in table 4. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading. Columns (3) and (4) separate the sample into two groups. Column (3) has all IPOs that were underwritten by non-prestigious underwriters, while column (4) includes those underwritten by only prestigious underwrites. The variables used in this regression are defined in table 1. P values are in parenthesis.

	Dependant Variable: Underpricing			
	(1)	(2)	(3)	(4)
VC Funding Dummy	-0.148	-0.152	-0.027	0.053
	(0.00)	(0.00)	(0.04)	(0.00)
Log Proceeds	0.038	0.037	0.029	0.038
	(0.00)	(0.00)	(0.00)	(0.00)
Log Age	-0.019	-0.017	-0.014	-0.037
	(0.00)	(0.01)	(0.01)	(0.00)
Underwriter Grade	-0.011	-0.011	-0.006	0.0403
	(0.00)	(0.00)	(0.07)	(0.02)
90's	0.036			
	(0.01)			
Bubble	0.432			
	(0.00)			
Grade * VC	0.037	0.037		
	(0.00)	(0.00)		
Age * VC	-0.045	-0.045		
	(0.00)	(0.00)		
Year Dummies	No	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Adj R-squared	0.232	0.236	0.126	0.266
Observations	5521	5521	2144	3377

7. Conclusion

This essay identifies two incentive conflicts between VCs and the private firms they take public to explain the difference in underpricing between venture backed and non-venture backed IPOs. These two incentive conflicts are grandstanding describe by Gompers (1996) and spinning of IPOs described by Loughran and Ritter (2004). Both incentive conflicts appear to lead to greater underpricing for IPOs with venture capital backing. The grandstanding theory has been examined and its robustness has been shown in previous work of Gompers (1996) and Lee and Wahal (2004). This paper provides similar robustness for the spinning theory. After controlling for the two incentive conflicts, venture capital funding is shown to be negatively correlated with underpricing, supporting the results of prior researchers that demonstrate the abilities of VCs to monitor and certify IPOs. This paper, therefore, reconciles the conflicting results between the earlier and more recent literature.

An interesting extension to this study is to investigate the time period after the adoption of anti-spinning laws in 2003. The behavior of VCs and underwriters may change after the anti-spinning laws are passed. It would be interesting to see if the significance of the spinning variables disappears. It will also test the effectiveness of the laws in eliminating spinning of IPOs.

Essay 2

Do VCs Provide Anything More Than Money?

I. Introduction

The role of venture capitalists (VCs) remains a heavily contested issue. Many researchers argue that VCs provide valuable services to the companies in which they invest, but current research comes up short in providing strong empirical evidence to support this contention. The role of VCs has often been examined at the time of the IPO. If VCs provide benefits to the IPO firm through increased monitoring (Barry, Muscarella, Peavy, and Vetsuypens, 1990) and/or certification (Megginson and Weiss, 1991), then underpricing should be reduced for VC-backed IPOs because investors recognize the added benefit of a VC-backed IPO. Evidence illustrating a beneficial role provided by VCs in terms of lowering the underpricing of IPOs has been mixed at best. In fact, new evidence indicates that VC-backed IPOs have higher risk-adjusted underpricing than non-VC-backed IPOs.[19]

Rather than focusing on underpricing of VC-backed IPOs, this chapter examines the role VCs may play in the performance of newly public firms after the IPO. That is, do VCs provide any long-term identifiable benefits to the firms in which they take an equity stake, or do VCs simply provide capital? To date, long-run performance studies on VCs have yielded vastly different results.[20] The purpose of this study is to examine

[19] Early work including Barry, Muscarella, Peavy, and Vetsuypens (1990), Megginson and Weiss (1991), etc. has shown that VC-backing was negatively related to underpricing. In contrast, recent work including Lee and Wahal (2004) and Flagg (2006) have shown a much different result with VC-backing positively related to underpricing, perhaps due to grandstanding (Lee and Wahal, 2004) and spinning (Flagg, 2006).

[20] Brav and Gompers (1997) document VC-backed IPOs as having performed marginally better than non-VC backed IPOs. Chan, et al. (2005) examine the long-run performance of IPOs and find that for large

different long-run characteristics and identify if VCs provide long-run benefits after the IPO. In order to identify these differences, this paper will examine the inherent advantages that VCs may bring to firms beyond providing capital.

Brav and Gompers (1997) are one of the first to identify any difference in the long-run performance of VC-backed versus non-VC-backed IPO. Brav and Gompers find that VC-backed IPOs perform moderately better than their non-VC-backed counterparts. They illustrate three major reasons why VC-backed IPOs may perform differently from non-VC-backed IPOs. First, VCs implement management structures that help the firm perform better in the long-run and VCs use their industry expertise to improve the firm's operations. With these two factors in mind, firms with venture backing may have better long-run performance than firms without venture backing. This paper attempts to find this performance gap by looking at long-run returns and accounting performance. Second, VCs may affect who holds the firm's shares after an IPO. Perhaps, more large investors will hold shares of VC-backed IPOs because VCs have contacts with large investment banks. Contacts with large investment banks can also increase the firm's ability to raise capital. This paper measures the benefit of increased access to capital by measuring firms' level of financial constraint. Third, VCs obtain positions on the board of directors of the start-up firms and retain these positions long after the IPO. VCs may be able to improve the governance of start-up firms by

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sized IPOs that VC-backing is positively related to long-run stock performance. Campbell and Fry (2004) show no major difference in stock performance between VC-backed and non-VC-backed IPOs. Dolvin and Pyles (2005) find that VC-backing does not lead to better long-run performance.

retaining positions on the board of directors. This paper evaluates improved governance by examining different measures of governance.

Hellman and Puri (2002) discuss how VCs play a role beyond that of a traditional financial intermediary. They document that obtaining VC funding is associated with the formulation of human resource policies, the adoption of stock plans, and the hiring of a VP of sales and marketing. They argue that VCs increase the long-run performance of VC-backed IPOs. Brav and Gompers (1997) and Hellman and Puri (2002) make clear distinctions that VCs provide support to private firms beyond capital.

This paper contributes to the literature in two ways. First, it will examine the long-run differences between VC-backed and non-VC-backed IPOs in a previously unexplored way by looking at three different measures. The extant research mainly focuses on return-based measures with mixed results. Besides examining returns, this paper will focus on measures that drive long-run returns, such as accounting performance, access to capital, and governance, so as to provide a clear distinction between the two IPO types. Second, this paper will attempt to explain why the current literature has such differing results when it comes to the long-term performance of VC-backed IPOs.

This paper finds significant differences between the long-run characteristics of venture and non-venture backed IPOs. Similar to prior studies, long-run stock performance is mixed at best. Different measures for long-run stock performance leads to different conclusions about the benefit to venture funding in terms of long-run returns. Contrary to prevailing wisdom, VC-backed IPOs perform much worse than non-VC

backed IPOs in terms of accounting measures, such as ROA, Cash flow per assets, and sales per assets. These accounting results are economically important as VC-backed IPOs have a ROA 3.4 percentage points lower than non-VC-backed IPOs after controlling for time, different industries, and various risk measures. The results for cash flow and sales mirror this same story. This evidence provides a result that differs from what is expected. The results are in direct opposition to the work done by Jain and Kini (1995) and the ideas discussed in Brav and Gompers (1997) and Hellman and Puri (2002).

The results on access to capital show VCs significantly improve the IPO firms' access to capital. VC-backed IPOs are less financially constrained than non-VC-backed IPOs. VC-backed IPO firms are found to have significantly lower KZ scores (measure for financial constraint), to lower debt ratios, and to have a much greater probability of being financial unconstrained three years after the IPO. This result is consistent with the ideas discussed in Brav and Gompers (1997) that VCs lead to better access to capital. The results on governance are mixed but provide some evidence that VCs may lead to better firm governance.

Finally, this paper argues that the differences in accounting performance and access to capital provide an explanation for the differences in long-run returns found in the current literature. This is found in the cross sectional explanation of long-run returns. ROA is positively correlated to long-run returns while financial constraint is negatively correlated with long-run returns. Given the differences of the two, these contradicting effects may lead to the different results found in long-run returns.

This chapter proceeds as follows. Section 2 presents the related literature and implications to the firm with venture backing. Section 3 describes the data that will be used in this paper. Section 4 reviews and analyzes the variables that will be used in this study. Section 5 discusses the results. Section 6 concludes this essay.

2. Related Literature and Implications

2.1 Long-Run IPO Performance

Long-run stock performance of IPOs has been an area of intense debate for some time. One issue with long-run performance of IPOs is that a newly formed public firm should be accurately priced in the market. The current market price should reflect all future cash flows from the firm, or simply stated, the long-run performance should not be predictable by any characteristics of the IPO. A common inference from results of long-term abnormal performance studies is that average buy-and-hold abnormal returns (BHARs) following major corporate events are very far from zero. This idea suggests that the market is not efficient and all future cash flows are not accurately priced during IPOs or other corporate events. Many behavioral reasons have been poised to explain the long-run underperformance of IPOs.

Ritter (1991) and Loughran and Ritter (1995) first show that IPOs exhibit significant underperformance in the three to five years following the IPOs, with the returns of IPOs being much less than the portfolios of comparable seasoned stocks. Ritter (1991) proposes a behavioral argument that the difference is due to investor overreaction. The idea is that investors may be systematically over-optimistic about the future performance of IPO firms. This optimism leads to over-brought IPOs and

subsequent poor performance. This underperformance has been documented and heavily debated but very few papers have been able to explain the cross section of these long-run returns (Ritter and Welch, 2002). The exceptions have been found in Mikkelson, Partch, and Shah's (1997) accounting measures, Teoh, Welch, and Wong's (1998) "optimistic" accounting, and Purnanandam and Swaminathan's (2003) overvalued offer prices relative to comparables.

2.1.2 Long-Run IPO Performance and VCs

Many papers discuss potential benefits that VCs provide to the firms they finance, but only a handful test whether VCs actually improve the long-run performance of the firm. These long-run VC studies attempt to measure VC performance through long-run returns and have mixed results. Brav and Gompers (1997) document VC-backed IPOs as having performed marginally better than non-VC backed IPOs. Chan, et al. (2005) examine the long-run performance of IPOs and attempt to figure out what characteristics of IPOs increase long-run performance. They find that for large sized IPOs, VC backing is positively related to long-run stock performance. Campbell and Fry (2004) show no major difference in stock performance between VC-backed and non-VC-backed IPOs. They do show that higher VC board membership leads to better long-term stock performance for the firm. Dolvin and Pyles (2005) find that VC backing does not lead to better long-run performance. They find that VC backing actually decreases long-run stock performance, although the significance of the performance is marginal. As shown in these differing results, the long-run stock performance of VC-backed IPOs is generally

inconclusive. Based on the evidence from this paper using stock returns, it is also unclear if VCs provide any long-run benefit to IPO firms.

2.1.3 Issues/Controversy with Long-Run Performance

Long-run studies on IPO underperformance provide an interesting and controversial topic. Ritter and Welch (2002) summarize the topic and point out two problems in the long-run studies. The two problems are the methodology and time period used in measuring long-run stock returns. They point out that varied methodology or time period can change the results dramatically. This section discusses some of the common problems associated with long-run returns.

Barber and Lyon (1997) propose calculating BHARs. This technique matches what an investor might try and accomplish, purchasing and holding stocks in a portfolio. The biases that arise in using this method come from new listings, rebalancing of benchmark portfolios, and skewness of multiyear abnormal returns. Some corrections discussed are careful construction of benchmark portfolios, large samples, and bootstrapping techniques. Lyon, Barber and Tsai (1999) document that two general approaches yield well-specified test statistics in random samples. The first approach uses a traditional event study framework calculating BHARs using carefully constructed reference portfolios, such that the population mean abnormal return is identically zero. The second approach is based on the calculation of mean monthly abnormal returns using calendar-time portfolios and a time-series t-statistic.

Fama (1998) argues against BHAR methodologies because the systematic errors are compounded with long-horizon returns. He also states, that any methodology

ignoring cross-sectional dependence of event-firm abnormal returns that are overlapping in calendar time is likely to produce overstated t-statistics. Fama strongly advocates monthly calendar-time portfolio approach for measuring long-term abnormal returns. He illustrates that skewness bias can cause BHARs to overstate long-run performance, even when there is no abnormal return after the first month. Mitchell and Stafford (2000) provides more evidence in the same direction of Fama (1998). Mitchell and Stafford (2000) reconcile the two views by investigating the impact on inferences of several potential, but often overlooked, problems with common methodologies using three well-studied samples of major managerial decisions. Major corporate events cluster through time by industry leading to cross-correlation of abnormal returns, making test statistics that assume independence severely overstated. Mitchell and Stafford (2000) find that a 3-year average BHAR of 15% is not statistically different from zero. Hence, after accounting for positive cross-correlations of individual-firm BHARs, they find no reliable evidence of long-term abnormal performance for any of the three event samples when using BHAR approach.

Loughran and Ritter (2000) point out that there is a basis in the Fama and French (1993) factors that force the intercepts to zero in time series calendar time regressions. It is due to the factors themselves being contaminated with IPO data. Due to the high number of documented problems with returns, perhaps long-run returns are not the most effective way to measure the long-run benefits provided by VCs. To avoid the issues with stock returns, accounting measures will be used to gauge the financial performance

of IPOs. As mentioned earlier, accounting measures have been shown to be important in IPO long-run performance.

2.2 Access to Capital

Firm access to capital is of extreme importance. The lack of ability to raise funds or reasonably priced funds negatively affects firm value. The recent literature on financial constraints points out that financially constrained firms find it difficult or extremely expensive for them to raise capital to finance valuable growth opportunities. Fazzari, et al. (1988), Kaplan and Zingales (1997), and Cleary (1999) among others examine the financing needs of firms. The financial constraint literature has implied that information costs and the internal resources of a firm influence the cost of external funds. The challenge is to identify "constrained" and "unconstrained" firms at a particular point in time. Lamont, et al (2001) use the results from Kaplan and Zingales's (1997) logit regressions to build a measure that evaluates the firm level of financial constraint called the KZ index. Each firm has a KZ index score based on factors that make it harder or more expensive to raise capital. Higher KZ index scores mean a higher level of financial constraint. Debt ratio is also shown as a measure of firm level financial constraint by Whited (1992) and Whited and Wu (2006). Higher debt ratios especially as compared to other firms in the same industry leads to firms that are more constrained. If VCs improve firms' access to capital, then VC-backed IPOs should have lower KZ index scores and lower debt-to-asset ratio.

2.3 Venture Capitalists and Governance

Agency theory alleges that managers do not always act in the best interest of shareholders. Shareholders as primary owners attempt to mitigate managerial agency, so that the goals of managers are better aligned with shareholders. This is a difficult and costly proposition for small shareholders. In contrast, VCs own economically significant equity positions after the IPO (Barry, et al., 1990). As large shareholders of the firm, VCs have the unique ability and desire to monitor managers closely. Sahlman (1990) argues that VCs are involved in the day-to-day operations and often become members of the board. Being involved in the day-to-day operations and sitting on the board of directors enables VCs to be informed and make critical decisions concerning the firm. Lerner (1995) discusses VCs' monitoring ability while on the board of directors and how they increase their involvement as the need for involvement increases. He illustrates an example of this behavior, with the number of VCs board members increasing when the CEO of a firm is replaced.

Baker and Gompers (2002) show that board structure is influenced by VCs, as they shift the board structure away from insiders towards independent outside directors. Baker and Gompers (2002) also point out that VCs are a counter weight to CEO control, where higher VC involvement means lower CEO control. Heaton (2002) shows that managers of IPO firms are overly optimistic and might over-invest in poor projects if the firm has excess funds. Firm governance has been documented as a critical component in firm success. Gompers, Ishii, and Metrick (2003) develop a governance index that measures the power of shareholder rights, which proxies for the governance of firms. They illustrate a positive link between good governance of firms and higher firm stock

returns. Bebchuck, Cohen, and Ferell (2005) take the G-index of Gompers, Ishii, and Metrick (2003) and develop an entrenchment index (E-Index) that measures how entrenched firm managers are. This measure offers another proxy for firm governance and finds a link between less entrenched managers and stock performance.

Larker, Richardson, and Tuna (2006) argue that the G-Index does not do a great job in capturing how good and bad governance firms should act in the market place. They show that the G-index does not have very much explanatory power for the cross-sectional difference in key variables that indicate "good" or "bad" governance of the firm. One of the variables they use to examine the quality of governance is abnormal accruals. Abnormal accruals gauge the quality of firm earnings, and one would think that firms with poor governance would have a higher amount of abnormal accruals. If the earnings management is directional, the appropriate measure is the raw value of abnormal accruals and not the absolute value. For example, poorly governed firms will manage their earnings more than well governed firms. If VCs improve the governance measures of a start-up firm for the long-run, the governance of VC-backed IPOs should be better than that of non-VC backed IPOs.

3. Data

The data collection process for this paper includes the following stages: First, all IPOs for the time period 1990–2000 are identified through Securities Data Exchange (SDC). Information taken from SDC include IPO characteristics such as offer date, offer price, closing price, underwriter ranking, net proceeds, net revenues, and a dummy

variable illustrating venture backing. The dummy variable representing venture funding has been corrected in a few areas where venture funding existed but was not marked as a venture-backed firm. IPOs that had a venture flag but no venture capital firm are detected and eliminated from the sample. Problems with the SDC venture backing flag have been identified by Ljungqvist and Wilhelm (2003). Information on the founding date of the firms included in the IPO sample was obtained from Jay Ritter's website. This variable is from the Field-Ritter dataset of company founding dates, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). The founding date is used to obtain the age of the firm at the time of its IPO. Firm age is calculated as the IPO date minus the founding date.

In the next stage, firm returns for the three years after the IPO are identified for all of the IPOs found in the CRSP database. The three-year return will be calculated one month after the IPO offer date which includes the first day return or underpricing. This month is eliminated to provide a more clear measure of stock performance for the IPO firm, eliminating the month following the IPO offer date. The return data will be used to estimate the buy-and-hold three year stock returns for all IPOs as well as the 180-day return measuring the lock-up period. The return data from the CRSP database are also combined with the Fama and French (1993) three-factor model to calculate a calendar time adjusted alpha measuring abnormal performance, for both the venture backed and non-venture backed IPOs. The Fama and French (1993) factors were obtained from Kenneth French's web page.

After finding the stock returns, the next stage is finding accounting variables from the Compustat database for the first three years of firm operations. For IPOs issued before June 30th, the offer year is used as the first year, and for those IPOs offered after this cut-off date the following year is used as the first year. The variables obtained include net income, revenues, assets, cash flow, dividend payout, accruals, and the variables needed to calculate both the KZ Index and the Laker, Richardson, and Tuna (2006) version of abnormal accruals. After finding all accounting data and eliminating any IPO with missing information, the final stage is to collect the Gompers, Ishy, and Metric (2003) governance index and the Bebchuk, Cohen, and Ferrell (2005) entrenchment index.

4. Variables Used in Regressions

This section will define the different variables used in this paper. A brief definition of the variables is found in table 11. This section will define the variables in detail and provide the motivation for the choice of each.

4.1 Stock Performance

It is hypothesized that VC-backed IPOs will perform better than non-VC-backed IPOs. To measure this, stock returns will be measured for three years after the IPO. The first measure used is a three-year compounded return. This measure, used by Ritter (1991), mimics the investor's overall return for holding the IPO for three-years. This holding period begins one month after the IPO offer date to eliminate any bias in the first month's performance.

Table 11

Variables Used in Regressions

Variables	Definitions
STOCK PERFORMANCE	
1. Compounded Return	Ritter (1991) approach: Buy and hold returns are calculated by compounding the raw monthly returns for a three year time period and for the lock-up period (typically 180 days).
2. BHARs	Barber and Lyon (1995) approach: Buy and hold returns are calculated by taking the monthly return of each IPO and subtracting the benchmark return yielding the abnormal monthly return. This monthly abnormal return is compounded for a three year time period and 180 days.
3. Abnormal Return Alpha	Fama and French (1998) approach: Calendar time adjusted abnormal returns using the market model and Fama and French (1993) three factor model.
ACCOUTING PERFORMANCE	
1. ROA	The firm's net income divided by the total assets of the firm.
2. Cash Flow/Assets	The firm's cash flow standardized by total assets.
3. Sales/Assets	The three year sales of the firm divided by assets.
ACCESS TO AND COST OF CAPITAL	
1. KZ Index	Index that measures the financial constraint level of firms. Based on the work of Kaplan and Zanglas (1997) and Lamont, Polk and Saa-Requejo (2001).
2. Financial Constraint	A dummy variable representing the lowest third or the most constraint firms in the sample based upon the KZ Index.
3. Debt-to-Asset Ratio	The ratio of a firms debt to assets.

Table 11 (continued)

Variables Used in Regressions

Variables	Definitions
GOVERNANCE	
1. G-Index	The Gompers, Ishii and Metrick (2003) Governance Index, which measures the strength of shareholder rights.
2. E-Index	The Bebchuk, Cohen, and Ferrell (2005) Entrenchment Index that measures the entrenchment level of management (scale of 1 – 6).
3. Abnormal Accruals	The deviation from the standard or expected accrual of the firm. This is measured in a regression with total accruals shown in Larker, Richardson, and Tuna (2004).
IPO CHARACTERISTICS	
1. VC	A dummy variable signifying venture funding. A value of 1 represents venture funding and 0 does not.
2. Offer Price	The offer price of the IPO.
3. Log Age	The natural log of the firm's age at the time of the IPO. Firm age is measured as IPO date – founding date.
4. Log Assets	The natural log of total assets for the IPO firm.
5. Prestigious UW	Dummy variable given if the lead underwriter firm for the IPO has a rank of 8 or above.
6. Underpricing	The initial (first-day) return for the IPO. Underpricing is calculated as the percentage change in price from the offer price to the closing price of the stock on the first day of trading.

The second return calculation is BHAR, as discussed by Barber and Lyon (1997). This approach examines the difference in monthly returns between the IPO and the market (CRSP equally weighted index) return and compounds that difference over a three-year time period, measuring the three-year compounded abnormal return. These two stock return measures are calculated both before and after the lock-up period. The final stock return calculation is a calendar time approach, which regresses the excess monthly returns (monthly return minus risk free rate) for a time-based portfolio of IPO firms on the Fama and French (1993) three factors. The constant (alpha) of the regression measures the abnormal performance for the sample.

4.2 Accounting Performance

Due to the documented troubles with long-term stock returns, other variables will be used to measure long-run performance by VCs. To capture the financial performance of VCs, accounting variables will be implemented. The different accounting variables used will be ROA (net income divided by assets), cash flow per assets, and sales per assets. These variables will estimate the efficiency of the two types of IPO firms. The accounting performance should be higher for VC-backed IPOs if VCs improve the financial performance over that of non-VC-backed IPOs.

4.3 Access to Capital

It is hypothesized in this paper that VCs will increase firms' access to capital markets. The first variable that estimates the firms' ability to raise capital is the KZ Index. The KZ Index measures the financial constraint level of firms. Higher KZ scores

equal higher levels of financial constraint and visa versa.[21] The KZ index has been winzorized at the top and bottom 1% level due to extremely large KZ scores at the top and bottom of the data, which lowers the total sample to 1,438 total IPOs. The second variable that measures access to capital is a financial constraint dummy variable. This variable classifies a firm as financially constrained based on having KZ scores in the highest one-third of the sample. Using a dummy variable eliminates the need to winzorize the data and increases the sample back to 1,466 as the KZ scores simply take a value of either zero (not financially constrained) or one (financially constrained). Debt ratio is also shown as a measure of firm level financial constraint by Whited (1992). Debt ratio is measured as the total amount of debt divided by total assets.

4.4 Governance

It is hypothesized in this paper that VCs will help improve the long-run governance of the firm through board involvement. The variables used to measure the governance of these firms are the Gompers, Ishy, and Metric (2003) G-Index, the Bebchuk, Cohen, and Ferrell (2005) E-Index, and abnormal accruals. The G-index measures the level of shareholder rights for a firm. As the G-number for the firm increases, governance for that firm decreases. VC-backed IPOs should have significantly lower G-scores as compared to non-VC backed IPOs if this hypothesis is correct. The E-index measures the level of managerial entrenchment, and follows the same pattern. Abnormal accruals are used to measure the earnings quality if the firm. Firms with better

[21] The KZ Index measures constraints based on Kaplan and Zingales (1997) and classify firms according to this measure (known as the KZ Index). Specifically, following Lamont et al. (2001), construct an index of the likelihood that a firm faces financial constraints by applying the following columnarization to the data: KZ Index = *-1.002*CashFlow + 0.283*Q + 3.130*Leverage – 39.368*Dividends – 1.315*CashHoldings*

governance should also have higher quality earnings, and thus less abnormal accruals. Abnormal accruals are calculated based on the method used by Larker, Richardson, and Tuna (2006) in which total accruals are regressed against several factors to control for the normal portion and the residual is the abnormal portion of accruals.[22]

4.5 Individual IPO characteristics

This section discusses the variables used to identify the characteristics of the different firms at the time of their IPO. VC (the primary variable of interest) will be a dummy variable that measures whether or not the IPO firm had venture funding at the time of the IPO. The next variable used is offer price. Fernando, Krishnamurthy, and Spindt (2002) find a positive relationship between offer prices and long-run returns. Log age is the natural log of the age of the firm at the time of the IPO, controlling for the stability and risk of the firm. Log assets are the natural log of the firm's assets at the time of the IPO, controlling for the size of the IPO.

Prestigious underwriter variable is a dummy variable that measures whether or not the firm used a prestigious underwriter for the IPO. Chemmanur and Fulghieri (1994) argue that investors use the investment banks' past performance, as measured by the quality of firms in which they previously sold equity, to enhance their creditability. Underwriters who sell equity in firms with better long-run performance will build their reputation. Carter, Dark, and Singh (1998) examine this theory and find that the long-run performance of IPOs is positively affected by the reputation of the underwriter. Houge, et al. (2001) argue that flipping affects long-run performance. To control for this issue,

[22] The regression used in Larker, Richardson, and Tuna (2006) is as follows: $TA = \acute{\alpha} + B_1(\Delta Sales - \Delta REC) + B_2PPE + B_3BM + B_4CFO + e$

underpricing will be used. Underpricing is measured as the change in price on the first-day of trading (offer date) for the IPO. This variable will identify if underpricing affects long-run performance. The IPO characteristics will be used to control for the differences in the firms at the time of the IPO.

5. Results

5.1 Descriptive Statistics

This section describes the difference in means between venture and non-venture backed IPOs. Table 12 displays the mean and number of observation for the entire sample as well as the subsample of both venture backed and non-venture backed IPOs. Also shown are the differences between the two groups of IPOs and the significance of those differences. Panel A examines the means and differences in means between the venture backed and non-venture back samples at the time of the IPO. For the sample of 1,466 IPO firms, 46.5% of the IPO firms have venture capital funding. The average characteristics for the entire sample of IPO firms are 109 million in total assets, underpricing of 23.7%, firm age of about 14 years, offer price of $12.21, and underwriter grade of 7.38. As mentioned, panel A also looks at the difference between the two types of IPOs. The difference between the two groups shows that total assets and firm age are significantly greater for non-venture backed IPOs, while underpricing, offer price, and underwriter grade are significantly greater for venture backed IPOs. The amount of proceeds is insignificantly larger for the venture sample. The significant differences between the IPO characteristics illustrate the major differences between the two types of IPOs.

Table 12

Descriptive Statistics for the Sample of 1,466 IPOs (1990-2000)

This table looks at the descriptive statistics for the whole sample, IPOs with no venture backing, and IPOs with venture backing. Table 1 defines all of the variables shown in the descriptive statistics. Difference is defined as the sample of non-venture backed IPOs subtracted by venture backed IPOs. Mean significance tests were ran on the difference between the two samples to test if they were significantly different from zero. P-values from these tests are shown in the last column.

Panel A: Time of the IPO

Variable	Full Sample	No Venture	Venture	Difference	P-value
Number of IPOs	1466	769	697	72	
Total Assets	109.01	116.33	100.93	15.40	0.02
Underpricing	0.237	0.160	0.321	-0.161	0.00
Proceeds	42.27	40.90	43.78	-2.88	0.20
Age	14.20	17.43	10.64	6.79	0.00
Offer Price	12.21	11.75	12.71	-0.952	0.00
Underwriter Grade	7.38	6.86	7.95	-1.09	0.00

Panel B: Three Years After the IPO

Variable	Full Sample	No Venture	Venture	Difference	P-value
Three-year returns (180-Days)	0.123	0.118	0.128	-0.010	0.76
Three-year returns	0.288	0.247	0.333	-0.086	0.41
Total Assets	160.82	178.55	141.25	37.31	0.00
Sales	150.80	179.48	119.16	60.32	0.00
ROA	-0.078	-0.025	-0.136	0.111	0.00
Cash Flow / Assets	-0.023	0.027	-0.078	0.105	0.00
Sales / Assets	1.08	1.24	0.893	0.352	0.00
KZ Index	-5.49	-3.47	-7.71	4.24	0.00
Financial Constraint	0.323	0.404	0.232	0.172	0.00
Debt / Asset	0.173	0.225	0.114	0.111	0.00
Total Accruals	8.47	6.86	10.26	-3.40	0.01
Abnormal Accruals	-0.0001	0.0000	-0.0002	0.0002	0.14
G-Index	7.37	7.49	7.27	0.225	0.32
E-Index	1.91	1.92	1.90	0.021	0.87

Panel B of table 12 shows the means for the entire sample and the breakdown of venture backed and non-venture backed IPOs for different measures three years after the IPO. First shown is the compounded return for a period of six months and a period of three years after the IPO date. Although the compounded return for venture backed IPOs is larger for both the six-month period and the three-year period, neither difference is significantly different from zero. The next items shown are size measures of the firm. Total assets and sales are significantly larger for the non-venture backed sample, showing that the average size is larger for non-VC-backed IPOs. The next three variables examine the accounting performance for both IPO groups. The non-venture backed group has accounting performance ratios of 2.5%, 2.7%, and 124%, respectively, for ROA, cash flow per assets, and sales per assets, while the venture backed group has comparable performance ratios of -13.6%, -7.8%, and 89.3%. The difference between all three accounting measures of financial performance point out that the sample of non-venture backed IPOs greatly outperforms that of venture backed sample in terms of these accounting measures. This evidence is intriguing as the result appears to contradict that of Jain and Kini (1995), and also counters the implications of Brav and Gompers (1997) and Hellman and Puri (2002). This result might capture the fact that IPOs backed by VCs during this sample period focuses more on growth than financial performance.

The next three variables measure access to capital. The first is the KZ index. The sample is slightly smaller with a total sample of 1,438 IPOs as it has been winzorized at the top and bottom 1% level. The comparison of the KZ index shows that venture backed IPOs have significantly lower KZ scores than non-venture backed IPOs. This leads to a

lower level of financial constraint and thus better access to capital for VC-backed IPO firms. The second variable that measures access to capital is the financial constraint dummy, which classifies a firm as financially constrained based on having KZ scores in the highest third (higher KZ scores equal more constrained firms). Using a dummy variable eliminates the need to winzorize the data and increases the sample back to 1,466. Venture backed IPOs have a 17.2% less firms that are considered financially constrained by this measure as compared to non-venture backed firms. The third measure examined is the firm's debt-to-asset ratio. Venture backed IPOs have a significantly lower debt ratio. All three measures share the same result that venture backed IPOs are significantly less financially constrained than non-venture backed IPOs. This result is consistent with the common belief that VCs increase the firm's ability to access capital markets.

The final three variables examine VCs' effect on firm governance. First, G-index and E-index are measured. As mentioned above the problems with the first two variables are the reduced number of observations. Both of these variables show venture backed IPOs with a better governance (lower G and E index values indicating better governance), but the difference between the two are insignificant. Another measure used to examine governance is abnormal accruals. This variable eliminates the concern of a smaller sample with the other two variables. By construction, both numbers for abnormal accruals are extremely low. The abnormal accruals are marginally smaller for venture backed IPOs than non-venture backed IPOs, suggesting that the VCs may improve governance.

5.2 Regression Results

Table 13

Calendar-Time Returns

This table looks at the calendar time returns and regress the returns against both the market-model (RMRF) and the Fama and French (1993) 3-factor model (RMRF, SMB, HML). The P-values are shown in parentheses.

Panel A: Full Sample	**Market Model**	**FF 3-Factor Model**
	(1)	**(2)**
Intercept (alpha)	-0.0018	-0.0022
	(0.24)	(0.14)
RMRF	1.5902	1.4327
	(0.00)	(0.00)
SMB		0.7157
		(0.00)
HML		-0.2438
		(0.00)

Panel B: No Venture Sample	**Market Model**	**FF 3-Factor Model**
	(1)	**(2)**
Intercept (alpha)	-0.0028	-0.0020
	(0.12)	(0.10)
RMRF	1.2839	1.2067
	(0.00)	(0.00)
SMB		0.7724
		(0.00)
HML		-0.1829
		(0.00)

Panel C: Venture Sample	**Market Model**	**FF 3-Factor Model**
	(1)	**(2)**
Intercept (alpha)	0.0010	-0.0007
	(0.62)	(0.86)
RMRF	1.8795	1.5640
	(0.00)	(0.00)
SMB		0.6863
		(0.00)
HML		-0.4821
		(0.00)

This section will explain the various regression results of the paper. Table 13 shows the results from a time series regression using the calendar time approach (Fama and French, 1998) and regresses the time-based portfolio of returns against a market factor and the Fama-French three-factor model. Panel A examines the entire sample of 1,466 firms. The results for both models show that the abnormal performance by IPOs appears to be non-existent for the full sample using the Fama and French (1993) three-factor model. Panel B examines the abnormal returns for the non-venture backed sample with 769 IPOs. The results from the time series regressions show that the non-venture sample has marginal underperformance for the time period. These results agree with the results from Brav and Gompers (1997) who find underperformance in the non-venture IPO sample. Panel C examines the 697 IPO venture backed sample. The results show that venture sample's alpha is insignificant, meaning no significant under- or over-performance based on the market model or the Fama-French three-factor model. This result is slightly different from Brav and Gompers (1997) who show a marginally significant positive alpha for the venture sample.

Table 14 examines the BHARs for the venture and non-venture samples. The table measures whether VC-backed IPOs have higher BHARs than non-venture backed IPOs. Both the BHAR for 180 days after the IPO and three years after the IPO are insignificant. For the three-year BHAR, only log size is significant, meaning larger size IPOs have larger BHAR. Log age and log proceeds are marginally significant and have the expected sign. All the other variables are insignificant.

Table 14

Three-Year Buy and Hold Abnormal Returns

This table examines the buy-and-hold returns for the sample of 1,466 IPOs. Buy-and-hold returns are calculated as the monthly returns minus the reference portfolio (CRSP equal-weighted index) and then compounded for the thirty-six period after the IPO. The period begins one month after the IPO as to not confound the performance with the initial return from the IPO. The buy-hold-return for 180-days is based upon the 180-days not counting the first-day return. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses.

Dependant Variable	**Buy-and-hold return**	**Buy-and-hold return 180**
	(1)	**(2)**
VC Funding Dummy	0.034	-0.025
	(0.58)	(0.43)
Log Age	-0.052	-0.042
	(0.09)	(0.01)
Offer Price	0.003	-0.009
	(0.79)	(0.10)
Prestigious UW Dummy	0.095	0.089
	(0.17)	(0.01)
Log Proceeds	-0.130	-0.142
	(0.08)	(0.00)
Underpricing	-0.026	-0.100
	(0.73)	(0.01)
Log Size	0.101	0.147
	(0.02)	(0.00)
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	-0.610	-0.960
	(0.02)	(0.00)
Adj. R-squared	0.018	0.054
Observations	1466	1466

The regression examining the time period of only 180-days has similar results but now the prestigious underwriters dummy and underpricing are significant. The adjusted R-squared on the regression is low at only 1.8%.

Table 15

Compounded Returns

This table examines the buy-and-hold returns for the sample of 1,466 IPOs. Three-year returns are calculated as the monthly compounded returns for the thirty-six period after the IPO. The period begins one month after the IPO as to not confound the performance with the initial return from the IPO. The buy-hold-return for 180-days is based upon the 180-days not counting the first-day return. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses.

Dependant Variable	**3-Year Return**	**180-Day Return**
	(1)	**(2)**
VC Funding Dummy	0.064	-0.014
	(0.59)	(0.71)
Log Age	-0.106	-0.050
	(0.04)	(0.01)
Offer Price	0.015	-0.012
	(0.45)	(0.07)
Prestigious UW Dummy	0.188	0.090
	(0.17)	(0.03)
Log Proceeds	-0.299	-0.174
	(0.03)	(0.00)
Underpricing	-0.077	-0.099
	(0.58)	0.024
Industry Return (Equal)	0.772	0.180
	(0.00)	(0.00)
Log Size	0.230	0.288
	(0.01)	(0.00)
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	-1.645	-0.742
	(0.02)	(0.00)
Adj. R-squared	0.043	0.109
Observations	1466	1466

Table 15 measures how VCs affect the long-run performance in terms of compounded three-year returns. The results show that VCs appear to increase the three-

year return, but it is an insignificant amount. Also shown on this table are the buy-and-hold returns for the first six-month period measuring the "lock-up" period. The results from table 15 are similar to those from table 14 for the independent variables. Log age, log proceeds, and log size are significant again. For the shorter time period, both prestigious underwriter and underpricing once again matter. Different from table 14, an industry return control variable (CRSP equal-weighted return) is added to the regression. Tables 13, 14, and 15 illustrate the difficult and confusion of using returns to ascertain the difference in long-run performance.

To further explore the issue of long-run performance, accounting measures will be examined for both IPO types. The three measures used to examine financial performance are return on assets, cash flow per assets, and sales per assets. Table 16 examines these measures using a multivariate regression analysis. Columns (1) and (2) use ROA as the dependent variable in the regression. The result from column (1) demonstrates that VCs reduce financial performance as the coefficient for the VC dummy is significant with -5%, meaning that venture backed IPOs have 5 percentage points lower ROA than non-VC-backed IPOs after controlling for various measures. This result contradicts the idea that VCs should improve the financial performance of IPOs, and is opposite to the results of Jain and Kini (1995). Perhaps, this result is due to a differing role that VCs have taken over time, which coincides with the underpricing results from Lee and Wahal (2004) and Flagg (2007). The coefficient for log age is positive and significant, demonstrating that older firms appear to have better financial success in term of ROA than younger firms.

Table 16

Accounting Performance

This table examines the accounting performance for the sample of 1,466 IPOs. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses.

Dependant Variable	ROA		CF/TA		Sales/TA	
	(1)	(2)	(3)	(4)	(5)	(6)
VC Dummy	-0.050	-0.034	-0.048	-0.032	-0.132	-0.054
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.10)
Log Age	0.032	0.020	0.030	0.017	0.093	0.016
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.35)
Offer Price	0.009	0.006	0.007	0.003	0.002	-0.002
	(0.00)	(0.02)	(0.00)	(0.11)	(0.76)	(0.66)
Prestigious UW	-0.025	-0.006	-0.019	-0.001	-0.066	-0.044
	(0.14)	(0.68)	(0.22)	(0.95)	(0.13)	(0.23)
Log Proceeds	-0.028	0.001	-0.027	0.002	-0.032	0.009
	(0.10)	(0.97)	(0.09)	(0.87)	(0.47)	(0.82)
Underpricing	-0.067	-0.057	-0.045	-0.035	-0.098	-0.029
	(0.00)	(0.00)	(0.00)	(0.02)	(0.03)	(0.45)
Log Size	0.047	0.014	0.048	0.014	-0.027	-0.073
	(0.00)	(0.17)	(0.00)	(0.11)	(0.32)	(0.00)
ROA (beginning)		0.421				
		(0.00)				
CF/TA (beginning)				0.429		
				(0.00)		
Sales/TA (beginning)						1.182
						(0.00)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.236	-0.181	-0.177	-0.132	1.477	0.462
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
Adj. R-squared	0.208	0.299	0.221	0.329	0.350	0.518
Observations	1466	1466	1466	1466	1466	1466

The coefficient for offer price is positive and significant as a higher offer price (initial value of an IPO) is positively related to future ROA. This is consistent with results in Fernando, Krishnamurthy, and Spindt (2002). The coefficient for the prestigious underwriter dummy variable is insignificant. The coefficient for log proceeds is negative and marginally significant as higher proceeds at the time of the IPO leads to lower ROA. Underpricing is negative and significant as the first-day return for the IPO, which is typically driven by asymmetric information and risk leads to lower ROA. The coefficient for log size is positive and significant, demonstrating that a larger firm size at the time of the IPO leads to a higher future ROA. This agrees with the logic that underpricing measures higher risk, asymmetric information, and potential flipping (Houge, et al., 2001) and will lead to a lower ROA on average. The adjusted R-squared of the regression is 20.8%, much higher than that in the return regressions.

One issue with measuring ROA three years after the IPO is that perhaps the results are driven by the ROA of the firm at the time of the IPO. In other words, good performing firms continue to do well while poor performing firms continue to do poorly. Column (2) of table 16 adds the ROA of the IPO firm at the time of the IPO. The addition of this variable provides a way to gauge whether the significant difference in ROA between venture backed IPOs and non-venture backed IPOs is simply a function of prior firm characteristics. This variable as expected is positive and significant as a high prior ROA leads to a high future ROA and visa versa. Even after controlling for the initial ROA, the VC dummy variable coefficient still remains negative and significant. This evidence strongly indicates that VCs appear to lower financial performance of the

firm. Is it possible that the above phenomenon is due to the reduced interest of VCs after the IPO and lock-up period? There are no major changes in the magnitude and significance of any other variable in the regression with the exception of log size, which becomes insignificant, possibly because size at the time of IPO partially controlled for the ROA at the time of the IPO.

In order to test the robustness of using ROA to capture financial performance, two additional dependent variables are used. Columns (3) and (4) use cash flow divided by total assets as the dependent variable. The results are basically the same. ROA with venture funding is negatively related to the firm's percentage of cash flow per assets. All control variables have similar magnitudes and significance as shown before. Again, cash flow per assets at the time of the IPO is controlled for and there is no loss to the primary result. The final dependent variable used is sales per assets, shown in columns (4) and (5). The VC variable is negative and significant once again using this measure for financial performance, demonstrating the reduced accounting performance by VC-backed IPOs. There are no major changes to any of the control variables in terms of magnitude and significance using this measure.

The next area examined in this paper is access to capital. The first dependent variable used to measure firms' access to capital is the KZ-index, which measures the constraint level of a firm. Table 17 illustrates VCs' influence on the access to capital for IPO firms. The smaller sample size of this first regression is due to the fact that the KZ-index variable was winzorized at the 1% and 99% level, eliminating the lowest and highest 1% because of extreme values on these sides.

Table 17

Access to Capital

This table examines the access to capital for the sample of 1,466 IPOs. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses. Columns (2) and (3) are probit regressions since the dependant variable is a dummy variable.

Dependant Variable	KZ Index	Financially Constrained	Financially Unconstrained	Debt Ratio
	(1)	(2)	(3)	(4)
VC Dummy	-1.665	-0.173	0.516	-0.035
	(0.02)	(0.04)	(0.00)	(0.00)
Log Age	0.475	-0.016	-0.130	-0.008
	(0.19)	(0.70)	(0.01)	(0.18)
Offer Price	-0.129	-0.030	0.029	-0.009
	(0.30)	(0.06)	(0.04)	(0.00)
Prestigious UW	-1.590	-0.021	0.199	-0.053
	(0.05)	(0.83)	(0.03)	(0.00)
Log Proceeds	1.424	0.089	-0.221	-0.010
	(0.05)	(0.31)	(0.01)	(0.46)
Underpricing	-1.143	-0.231	0.134	-0.026
	(0.18)	(0.10)	(0.15)	(0.05)
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Constant	-2.697	-0.256	-0.376	0.117
	(0.36)	(0.72)	(0.20)	(0.01)
Adj. R-squared	0.104	0.148	0.152	0.282
Observations	1438	1466	1466	1466

The results for the KZ index are shown in column (1) of table 17. The coefficient for the VC dummy variable is negative and significant, showing that the presence of a VCs reduces the constraint level of a firm and thus providing a better future access to capital for VC-backed IPOs. The coefficient for the prestigious underwriter dummy variable is also negatively significant to the KZ-index. Having a prestigious underwriter

reduces the financial constraint level of firms. Log proceeds are also significant, but have a positive coefficient as firms that raise more proceeds at the time of the IPO are more financially constrained based on the KZ index. Firm age, offer price, and underpricing are insignificant to the KZ-index. The adjusted R-squared for the regression is 10.4%.

To avoid the loss of observations with extreme upper and lower values of the KZ index, a dummy variable was created for financial constraint. The dependent variable in column (2) is a dummy variable measuring financial constraint firms (based on the KZ index). Since a dummy variable is used as the dependent variable a probit model is used for column (2). The coefficient for the VC dummy variable is negative and significant, showing that venture funding at the time of the IPO reduces the probability that a firm will be financially constraint. This result agrees with those from column (1) using the raw KZ index. One major difference from the results in column (1) concerns prestigious underwriters. Now, the coefficient for prestigious underwriters is insignificant. Column (3) looks at the other side of the picture by constructing a dummy variable for the firms that are the least financially constrained. Once again a probit model is used for this regression. The coefficient for the VC dummy variable has a positive and significant coefficient, showing that venture funding increases the probability that the firm will be financially unconstrained or the firm will have less fictions accessing the capital markets. This confirms the results from column (1) using the KZ index and shows that IPOs with prestigious underwriters are more likely to be financially unconstrained.

Column (4) uses a different variable to measure IPO firms' access to capital, the ratio of debt to assets. As with the other measures for access to capital, the VC dummy

variable has a negative and significant coefficient. This variable shows that VC-backed IPOs have significantly lower debt to asset ratios as compared to non-VC-backed IPOs after controlling for risk and industry. This result supports those from the KZ measure. Offer price, prestigious underwriters, and underpricing reduce the debt to asset ratio of IPO firms. The other variables used in the regression are insignificant.

The final issue examined is the governance of IPOs firms. The results for governance are shown in table 18. The first measure used is the Gompers, Ishy, and Metric (2002) G-index. The total sample size of this is reduced as G-index scores are limited for newly public firms. The total sample size of this regression is only 387 observations. VCs' influence in the governance of an IPO using the G-index as a measure is inconclusive as the VC dummy variable for this regression is positive but insignificant. Interesting in this regression is the fact that the coefficient for prestigious underwriter dummy variable is negative and significant. Prestigious underwriters seem to improve the governance of IPO firms according to the G-index. The other IPO characteristics have insignificant results. It is difficult to infer much out of this regression due to the small sample size. Column (2) uses the E-Index as a measure for governance, and suffers from the same lack of data as the G-index. The sample size for this is only 366 total observations. The result with the E-index is similar to that of the G-index as the coefficient for the VC dummy variable is insignificant. Once again, the coefficient for prestigious underwriter dummy variable is negative and significant. For the small sample, it appears that a prestigious underwriter has some influence on future governance of the firm.

Table 18

Governance

This table examines governance for the sample of 1,466 IPOs. G-Index and E-Index do not have a full sample due to limited data for these two indexes for newly formed public firms. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses.

Dependant Variable	G-Index	E-index	Abnormal Accruals
	(1)	(2)	(3)
VC Dummy	0.097	0.136	-0.00037
	(0.70)	(0.37)	(0.03)
Log Age	-0.054	0.056	0.00000
	(0.70)	(0.50)	(0.99)
Offer Price	-0.002	0.022	-0.00004
	(0.95)	(0.29)	(0.12)
Prestigious UW	-0.771	-0.455	-0.00001
	(0.03)	(0.03)	(0.96)
Log Proceeds	0.412	0.068	0.00007
	(0.14)	(0.68)	(0.71)
Underpricing	-0.143	-0.116	0.00016
	(0.57)	(0.43)	(0.41)
Log Size	-0.053	-0.068	0.00022
	(0.78)	(0.55)	(0.05)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Constant	4.461	1.350	-0.00185
	(0.00)	(0.04)	(0.01)
Adj. R-squared	0.094	0.070	0.040
Observations	387	366	1466

The final variable used is abnormal accruals. As mentioned earlier, Larker, Richardson, and Tuna (2006) argue that the G-index does not fully capture the variables that reflect poor governance. With this in mind, abnormal accruals are used to measure poor governance. The coefficient for the VC dummy variable has a negative and

significant coefficient. It appears that VCs reduce the amount of abnormal accruals made by IPO firms, showing less earnings management by VC-backed IPOs and perhaps better governance. In general, however, the governance results are mixed as G-index and E-index produce non-significant results.

Table 19 examines the ability of the accounting and access to capital variables to explain the cross-sectional differences in the three-year returns for different types of IPOs. The ability of a governance variable to affect the long-run returns is eliminated from this analysis due to the reduced number of observations of governance variables and the mixed results. To see how the accounting and access to capital variables will affect the three-year compounded return, ex ante variables are used for these measures. Column (1) uses ROA for the firm at the time of IPO to predict future returns. As shown in table 16, previous ROA, known at the time of the IPO, is positively related to future ROA. The coefficient for the beginning ROA variable is positive and significantly related to the three-year return. This illustrates that a higher (lower) ROA at the time of the IPO leads to a higher (lower) three-year return on average. Column (2) does the same thing for financial constraint. Since it is difficult to measure if a firm is financially constraint at the time of the IPO, the estimated probability that a firm will be financially constraint in the future is used based on the probit model from table 17's column (2). The coefficient for this variable is negative and significant. This illustrates that these firms are more likely to be financially constraint will have lower three-year compounded returns on average.

Table 19

Three-Year Returns

This table examines the buy-and-hold returns for the sample of 1,466 IPOs. Three-year returns are calculated as the monthly compounded returns for the thirty-six period after the IPO. The period begins one month after the IPO as to not confound the performance with the initial return from the IPO. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses. ROA (beginning) is the ROA for the firm at the time of the IPO. Prob. of Fin Constraint is the probability that the firm will be considered financially constrained three years in the future.

Dependant Variable: Three Year Returns			
	(1)	(2)	(3)
VC Funding Dummy	0.085	-0.256	-0.215
	(0.47)	(0.17)	(0.26)
Log Age	-0.123	-0.112	-0.127
	(0.04)	(0.06)	(0.03)
Offer Price	0.010	-0.047	-0.047
	(0.61)	(0.18)	(0.18)
Prestigious UW Dummy	0.212	0.146	0.171
	(0.12)	(0.28)	(0.21)
Log Proceeds	-0.258	-0.096	-0.073
	(0.07)	(0.57)	(0.68)
Underpricing	-0.065	0.020	0.025
	(0.65)	(0.89)	(0.87)
Industry Return (Equal)	0.755	0.745	0.730
	(0.00)	(0.00)	(0.00)
Log Size	0.186	0.227	0.186
	(0.03)	(0.01)	(0.03)
ROA (beginning)	0.565		0.524
	(0.04)		(0.05)
Prob. of Fin Constraint		-5.808	-5.418
		(0.03)	(0.04)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Constant	-1.520	0.934	0.876
	(0.04)	(0.50)	(0.52)
Adj. R-squared	0.045	0.046	0.048
Observations	1466	1466	1466

Column (3) includes both ex ante variables, ROA at the time of IPO for the firm and the estimated probability of the IPO firm to be financially constraint. Both of the variables have approximately the same size and magnitude as displayed in columns (1) and (2) of table 19. The result from this table shows two different things. First, it suggests a potential explanation for the varied results found in the long-term studies on VCs, as VC-backed IPOs appear to have worse accounting-based financial performance but do seem to improve the newly public firm's ability to raise capital. Since both factors affect the long-run return of IPOs but in opposite directions, it is therefore not surprising that the overall effect is ambiguous in general and depends on different time periods, methodologies, and sub samples used. Also shown here is the ability of ex ante variables to predict the future three-year compounded return of IPO firms.

Table 20 is a robustness check that eliminates the bubble period from the sample. Perhaps, the bubble period causes varying IPO long-run performance. Extreme underpricing and quality of firms going public during the bubble period might influence the results. The burst of the bubble could also lead to extreme poor performance for especially IPOs backed by VCs which have a higher concentration of IPOs during the bubble period. With those factors in mind, IPOs with offer dates inside the bubble period have been eliminated. The results from tables 14, 15, 16, and 17 have been recalculated with the sample of 1,220 IPOs that have offer dates outside of the bubble period. The primary variable of interest—the coefficient of the VC dummy variable—does not change when using the smaller non-bubble sample.

Table 20

Elimination of the Bubble Period

This table examines the results from previous tables using a sub sample of 1,220 IPOs that do not include the bubble period. Table 1 defines all of the variables used in the regressions. The P-values are shown in parentheses.

Dependant Variable	ROA	3-Year Return	3-Year BHAR	KZ
	(1)	(2)	(3)	(4)
VC Dummy	-0.037	0.136	0.080	-2.190
	(0.00)	(0.33)	-0.270	(0.00)
Log Age	0.028	-0.126	-0.061	0.454
	(0.00)	(0.07)	(0.09)	(0.19)
Offer Price	0.009	0.012	0.001	-0.012
	(0.00)	(0.65)	(0.94)	(0.93)
Prestigious UW Dummy	-0.024	0.183	0.089	-1.376
	(0.14)	(0.25)	(0.27)	(0.08)
Log Proceeds	-0.037	-0.359	-0.163	-1.127
	(0.03)	(0.04)	(0.06)	(0.19)
Underpricing	-0.026	0.785	0.533	-5.099
	(0.42)	(0.01)	(0.00)	(0.00)
Log Size	0.052	0.278	0.127	1.782
	(0.00)	(0.01)	(0.01)	(0.00)
Industry Return (Equal)		0.748		
		(0.00)		
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Constant	-0.245	-1.702	-0.685	-2.566
	(0.00)	(0.05)	(0.02)	(0.35)
Adj. R-squared	0.205	0.022	0.023	0.135
Observations	1220	1220	1220	1200

Interesting is that underpricing, which was insignificant for returns and access to capital, is now significant outside the bubble period. That is, beyond the bubble, higher

underpricing (first-day return) appears to lead to higher returns and less financially constrained firms.

6. Conclusion

It is widely believed that VCs should help improve the long-run performance of IPOs that they take an equity stake in. Unfortunately, extant empirical results supporting this belief are generally inconclusive and have left much to be desired. In an attempt to bridge this gap, this chapter examines the role of VCs in the long-run performance of IPOs, and hopes to provide evidence that helps shed light on the role of VCs. The paper finds that the long-run benefits are indeed mixed with respect to the long-run return for VC-backed IPO firms. VCs appear to improve IPO firms' access to capital, but they also impede the firms' financial performance as calculated by accounting measures. Together, these results help explain why long-run return studies on VCs are generally inconclusive. Finally, this paper shows that accounting and access to capital variables have explanatory power in the cross section of IPO returns.

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