The Role of Venture Capital Backing in Initial Public Offerings: Certification, Screening, or Market Power?

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ABSTRACT

We empirically distinguish between three possible roles of venture backing in IPOs: "certification," where venture-backed IPOs are priced closer to intrinsic firm value than non-venture backed IPOs due to venture capitalists' concern for their reputation; "screening and monitoring," where VCs are able to either select better quality firms to back (screening), or help create such higher quality firms by adding value to them (monitoring) in the pre-IPO stage; and "market power," where venture capitalists attract a greater number and higher quality of market participants such as underwriters, institutional investors, and analysts to an IPO, thus obtaining a higher valuation for the IPOs of firms backed by them. We argue that IPO underpricing is *not* the most appropriate measure to evaluate the role of venture backing in IPOs. Instead, we compare the following four measures between VC backed and non-VC backed (and between high-reputation VC backed and low-reputation VC backed) IPOs: the ratio of the IPO value of the firm going public to its intrinsic value; the ratio of the secondary market value of the IPO firm to its intrinsic value at the close of the first day of trading in the secondary market, as well as one year, two years, and three years after the IPO; the extent and quality of participation by underwriters, analysts, and institutional investors in the IPO; and the post-IPO operating performance of firms going public. The evidence strongly rejects the certification hypothesis, while finding considerable support for the market power hypothesis and some support for the screening and monitoring hypothesis.

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1. Introduction

The role of venture capital backing in initial public offerings has been the subject of considerable debate in the finance literature. Two seminal papers in this literature are Megginson and Weiss (1991) and Barry, Muscarella, Peavy, and Vetsuypens (1990). Megginson and Weiss (1991) document that venture capital (VC) backed IPOs were less underpriced than non-VC backed IPOs during 1983-1987, attributing this difference to venture capital "certification." Venture capital certification (the "certification hypothesis" from now on) reflects the notion that venture capitalists, being repeat players in the IPO market, are concerned about their reputation in that market, so that they price the equity of the IPOs of firms backed by them closer to intrinsic value (and credibly convey this fact to the IPO market).[1] Similarly, Barry et al (1990) document that VC backed IPOs were less underpriced than non-VC backed IPOs between 1978 and 1987. They, however, attribute this difference in underpricing to the capital market's recognition of "IPOs with better monitors." In broader terms, the idea here is that since venture capitalists fund only a small minority of firms, these firms are of better quality than non-VC backed firms ("screening"). Further, since venture capitalists devote considerable time to monitoring firm management (in the pre-IPO stage), the quality of firms brought public with VC backing is likely to be higher than that of non-VC backed firms, even if their quality at the time the VC got involved with them was similar to that of non-VC backed firms ("monitoring").[2] Since both screening and monitoring by VCs will lead to similar results, namely, higher firm quality for VC backed firms compared to non-VC backed firms at the

[1] Under the certification hypothesis, venture capitalists' concern for their reputation in the IPO market may influence their pricing of equity in the IPOs of firms backed by them in the following manner. Venture capitalists face a dynamic trade-off: on the one hand, they obtain short-term benefits from pricing equity in the IPO above intrinsic value; on the other hand, this may cause them long-term losses by substantially damaging their reputation with IPO investors and other financial market participants. The pricing of equity in IPOs can be thought of as emerging from this dynamic tradeoff. Further, the greater the reputation of the venture capitalist, the greater his incentive to price equity in IPOs closer to intrinsic value. For a theoretical analysis of how reputation serves to mitigate the moral hazard problem faced by financial intermediaries in an environment of asymmetric information about their type, see Chemmanur and Fulghieri (1994).

[2] See, e.g., Hellman and Puri (2002), who document that venture capitalists contribute significantly to the professionalization of the top management of start-up companies.

time of IPO, we will refer to this role of venture backing as the "screening and monitoring hypothesis" or simply "screening" from now on.

More recent papers have, however, called the above early evidence into question. Lee and Wahal (2002) document that, between 1980 and 2000, IPOs of VC backed firms were, in fact, more underpriced than those of non-VC backed firms. A number of other papers have also presented similar results: see, e.g., Loughran and Ritter (2003). This, in turn, has reopened the debate about the role of venture backing in IPOs. The main objective of this paper is to attempt a resolution of the above debate by approaching it from a new perspective and using a new methodology. We propose to distinguish between the two roles of venture backing in IPOs discussed above, and a third possible role that we refer to as "market power". The market power hypothesis captures the notion that venture capitalists are able to develop long-term relationships with various participants in the IPO market (underwriters, institutional investors, and analysts) due to their role as powerful repeated players in that market.[3] These relationships enable them to attract greater participation by these market players in the IPOs of firms backed by them, thus obtaining a higher price for the equity of these firms (both in the IPO and in the secondary market). The market power and certification hypotheses have dramatically different implications for the pricing of IPOs: while the certification hypothesis implies that venture capitalists price IPOs of firms backed by them closer to intrinsic value due to their concern for preserving reputation in the IPO market, the market power hypothesis implies that venture capitalists' objective is to obtain the highest price possible for these IPOs (by taking advantage of their relationships with various market participants).

Our view is that, while the difference in underpricing between VC backed and non-VC backed IPOs is interesting to study in itself, it may *not* be the most appropriate measure to analyze if our objective is to distinguish between the various potential roles of VC backing in IPOs. This is because "underpricing" (or the initial returns to an IPO) simply reflects the price rise of a firm's equity from the IPO offer price to the

[3] The notion that venture capitalists may be able to attract higher quality investment banks and institutional investors to the IPOs of firms backed by them, and entice more analysts to follow these firms subsequent to their IPOs, has been mentioned both in the practitioner and in the academic literature (see, e.g., Brav and Gompers (1997))

first day closing price in the secondary market, so that it is affected not only by the pricing of this equity in the IPO, but also by the pricing of this equity at the close of the first trading day in the secondary market. This implies that, for underpricing to be a meaningful measure in any study of the economic role of venture backing, one has to make the crucial (and rather strong) assumption that the closing price of a firm's stock on the first day of secondary market trading is not affected by venture backing and always equals the intrinsic value of that stock. Thus, if venture backing affects not only the IPO price of a firm but also the first day secondary market close then underpricing is no longer useful in determining the economic role of venture backing in IPOs. We will discuss in more detail why underpricing is not the most appropriate measure to assess the economic role of venture backing in IPOs in Section 2.

We therefore study four sets of direct measures in our analysis of the role of venture backing in IPOs, which we feel yield more insight into the economic role of venture backing. The first measure we study is the ratio of the valuation placed on the firm in the IPO (valuation at the offer price, OP), to its intrinsic value (IV). Clearly, if the role of venture backing in IPOs is that of certification, one would expect venture backed firms to be priced closer to intrinsic value than non-venture backed companies, so that this ratio would be closer to one for venture backed firms. Similarly, one would expect equity in the IPOs of firms backed by high-reputation VCs to be priced closer to intrinsic value than equity in the IPOs of firms backed by low-reputation venture capitalists. In contrast, the market power hypothesis, which implies that the role of VCs is simply to obtain a higher valuation for firms in IPOs by attracting higher quality underwriters, more institutional investors, and more analyst coverage, would imply that the ratio of IPO firm value to intrinsic value would be *larger* for VC backed IPOs than for non-VC backed companies, and larger for the IPOs of firms backed by high-reputation VCs relative to those backed by low-reputation VCs.[4]

[4] The screening and monitoring hypothesis does not have any implications for the ratio of IPO firm value (OP) to intrinsic value (IV). While this hypothesis implies that VC backed IPOs will be of higher intrinsic value compared to non-VC backed IPOs, the OP/IV ratio will be the same under this hypothesis for the two groups of IPOs as long as the intrinsic value is correctly calculated for each group. This is because, while the intrinsic value of VC backed firms can be expected to be higher than those of non-VC backed firms under the screening and monitoring hypothesis, their valuation at IPO can be expected to be correspondingly higher as well.

The second measure we study is the ratio of the secondary market valuation placed on a firm at the close of the first trading day in the secondary market (SMP) to its intrinsic value (IV). Given that firm value is now determined by the equity market (once the firm's shares start trading in the secondary market), the certification hypothesis does not have any predictions for this ratio: under this hypothesis, this ratio should be the same across VC backed and non-VC backed IPOs (and across the IPOs of high-reputation VC backed and low-reputation VC backed firms). In contrast, the market power hypothesis predicts that this ratio will be higher for the IPOs of VC backed firms than for non-VC backed firms, since one would expect the valuation impact of participation by higher reputation underwriters, more analyst coverage, and more institutional investors attracted by venture capitalists to persist for some time after the IPO.[5] Of course, as time goes by, one would expect this valuation difference between VC backed and non-VC backed IPOs to go down (under the market power hypothesis), as the effect of venture backing dissipates over time.[6] We therefore study the ratio of secondary market valuation to intrinsic value at the end of one year, two years, and three years after the IPO.

The third set of measures we study provides a direct test of the market power hypothesis. These measures compare the quality and level of participation by three important groups of agents in the IPOs of VC backed and non-VC backed firms (and also between IPOs of firms backed by high-reputation and low-reputation VCs): underwriters, institutional investors, and analysts. The specific variables we study here are underwriter reputation, analyst coverage, and the fraction of equity sold in the IPO held by institutional investors. Under the market power hypothesis, we expect these variables to be greater for the IPOs of VC backed firms relative to those of non-VC backed firms, and higher for the IPOs of firms backed by high-reputation VCs relative to those of companies backed by low-reputation VCs. Further, we

[5] The screening and monitoring hypothesis does not have any implications for the relative magnitudes of the ratio of firm value based on first trading day closing share price (SMP) to intrinsic value (IV) for VC backed and non-VC backed IPOs. In other words, the SMP/IV ratio can be expected to be the same for the two groups of firms as long as the intrinsic firm value is correctly calculated for each group.

[6] Venture capitalists tend to exit from IPO firms backed by them within three years post-IPO. Thus, they would no longer benefit from a higher valuation for the equity of these firms after this time span.

expect that the greater the participation of these market players in the IPO, the higher the valuation placed on the firm both in the IPO and in the secondary market.

The fourth set of measures we use compares the post-IPO operating performance of VC backed and non-VC backed IPOs, allowing us to evaluate whether venture capitalists perform a screening and monitoring role. The prediction of the screening and monitoring hypothesis is that the pool of firms going public with venture backing will be of higher quality (on average) than the pool of firms going public without such backing, generating superior post-IPO operating performance. Similarly, the post-IPO operating performance of firms going public with the backing of high-reputation VCs (who have presumably a better ability to screen and monitor) will be better than the post-IPO operating performance of firms backed by low-reputation venture capitalists.

The results of our empirical tests indicate that both venture backed and non-venture backed IPOs are overvalued at the time of IPO (OP/IV>1).[7] More importantly, venture backed IPOs are significantly more overvalued than non-VC backed IPOs. Contrary to the certification hypothesis, VC backed firms show a median overvaluation of around 59% versus only a 28% median overvaluation associated with non-venture backed firms.[8, 9] Further, the difference in valuation between VC backed IPOs and non-VC backed IPOs becomes even more pronounced in the secondary market: at the close of the first secondary market trading day, the equity of VC backed companies has a median overvaluation of 132% over intrinsic value, while the equity of the median non-VC backed firm is only 52%. Thus, the above two measures clearly reject the certification hypothesis in favor of the market power hypothesis.

Our comparison of the IPOs of firms backed by high-reputation venture capitalists versus those backed by low-reputation venture capitalists also rejects the certification hypothesis and supports the

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[7] This is consistent with Purnanandam and Swaminathan (2004), who were the first to document that IPOs are overvalued on average relative to intrinsic value. However, the focus of their paper is not on the economic role of venture capital backing in IPOs, and they do not study the relative overvaluation of VC backed and non-VC backed IPOs.

[8] Unlike the underpricing studies of VC backed and non-VC backed IPOs, our results are consistent across time periods. Thus, the equity in VC backed firms were more overvalued than those of non-VC backed firms even in periods where previous studies have documented that VC backed IPOs were less underpriced than non-VC backed IPOs.

[9] Note that the differences in valuation we document between VC backed and non-VC backed IPOs cannot be explained by differences in operating performance across these two groups, since we account for any differences in operating performance when computing the intrinsic value of VC backed and non-VC backed IPO firms.

market power hypothesis: the median overvaluation of IPOs backed by high-reputation venture capitalists was 97% at the IPO, in contrast to an overvaluation of 36% for the equity of firms backed by low-reputation venture capitalists. The difference in overvaluation between two groups widens once trading begins in the secondary market: at close of the first trading day, the median overvaluation of high-reputation VC backed IPOs increases to 210%, while that of low-reputation VC backed IPOs increases to only 80%.

Our comparison of the extent and quality of the participation of important market players associated with venture backed and non-venture backed IPOs gives further support to the market power hypothesis. We find that VC backed firms are characterized by more reputable underwriters, a larger fraction of equity holding by institutional investors (and a larger number of them), and more extensive analyst coverage than non-VC backed IPOs. A similar pattern is revealed by a comparison of IPOs backed by high-reputation versus low-reputation venture capitalists. In an attempt to explain the valuation difference between venture backed and non-venture backed (and between high-reputation VC backed and low-reputation VC backed) firms, we use cross sectional regression analysis to examine the relationship between the extent of overvaluation (as measured by price to intrinsic value ratio) at IPO and dummies for venture backing, high-reputation VC backing, and measures of underwriter reputation, institutional investors participation, and analysts coverage. Our results again support the market power hypothesis: we find a positive and significant (both statistically and economically) relationship between the extent of overvaluation and measures of underwriter reputation, institutional investor participation, and analyst coverage.[10]

The final piece of evidence supporting the market power hypothesis is provided by the pattern of the differences in secondary market valuation between venture backed and non-venture backed IPOs, and between high-reputation VC backed and low-reputation VC backed IPOs. This difference become smaller as time elapses subsequent to the IPO, until, by the end of the third year, there is almost no difference in

[10] Regressions using the ratio of secondary market first day value to intrinsic value (SMP/IV) on the same independent variables show similar results.

valuation (as measured by the SMP/IV ratio) across these groups. This is consistent with the market valuation effect of the increased participation by various high quality market players (generated by VC backing in the IPO) dissipating over time.

We also find some evidence in favor of the screening and monitoring role of venture capitalists, which implies that the operating performance of firms going public with venture capital backing will be higher than that of firms going public without such backing (and that firms going public with high-reputation VC backing would be of a higher quality than those going public with low-reputation VC backing), and therefore exhibit better post-IPO operating performance. Consistent with this, we find that VC backed IPOs exhibit higher profit margins, ROA, and sales growth in the IPO year and two years subsequent to the IPO. A comparison between firms going public with the backing of high-reputation and low-reputation VCs exhibits a similar pattern.[11]

Overall, our results seem to indicate that venture capitalists attempt to obtain the highest price possible in the IPO market for the equity firm backed by them (rather being focused primarily on pricing this equity close to intrinsic value). Thus, the direct benefits arising from obtaining a higher IPO price, and the indirect benefits from improving their reputation with entrepreneurs may dominate considerations of building and maintaining reputation with investors.

What is the precise mechanism through which the market power of VCs influences the valuation of IPOs backed by them? A number of behavioral as well as rational arguments have been made in the literature to explain the overvaluation and long-term underperformance of IPOs. These behavioral arguments imply that IPO investors may be overly optimistic about the prospects of these firms (e.g., Loughran and Ritter (1995, 2002) and Purnanandam and Swaminathan (2004)). Models with rational investors, on the other hand, argue that this overvaluation is caused by heterogeneity in investor beliefs and short-sale constraints (e.g., Miller (1977) and Morris (1996)). Our results are consistent with both

[11] It is worth noting that the market power hypothesis and the screening and monitoring hypothesis do not contradict each other: while the former has implications only for differences in the IPO and post-IPO valuation of firms going public with or without VC backing, the latter has implications only for the intrinsic qualities of firms going public with and without VC backing (and no implications for the relative IPO and secondary market valuations of VC backed and non-VC backed IPOs).

these behavioral and rational arguments if we assume that the market power of VCs increases the optimism of some investors (and therefore the heterogeneity in investor beliefs) about the prospects of VC backed firms. In Section 7, we present some empirical evidence which indicates that the extent of the heterogeneity in investor beliefs about VC backed IPOs is indeed greater than that for non-VC backed IPOs (and greater for higher reputation VC backed IPOs than for lower reputation VC backed IPOs). Further, we show that the heterogeneity in investor beliefs about the value of a firm going public is positively affected by the extent of participation by high quality market participants in its IPO (which, as we discussed above, is positively influenced by venture backing). Finally, we show that heterogeneity in investor beliefs has a positive and significant effect on the valuation of IPOs.

The rest of the paper is organized as follows. Section 2 discusses in detail why IPO underpricing is not the appropriate measure to evaluate the economic role of venture backing in IPOs. Section 3 describes the data, while Section 4 describes how we measure venture capitalist reputation. Section 5 describes the methodologies we use to compute intrinsic firm value. Section 6 presents our empirical tests and results based on the four sets of measures discussed above. Section 7 examines the mechanism through which the market power of VCs influences the valuation of IPOs backed by them. Section 8 concludes the paper.

2. Why Underpricing is not the Most Appropriate Measure to Assess the Economic Role of Venture Backing in IPOs

Since "underpricing" measures the price rise of a firm's equity from the IPO offer price to the first day closing price in the secondary market, it is affected not only by the price of a firm's equity in the IPO, but also by the price of this equity at the close of the first trading day in the secondary market. Therefore, in any study using underpricing as a measure of the economic role of venture backing, we are making an implicit assumption that the closing price of a firm's stock on the first day of secondary market trading equals the intrinsic value of that stock. If this assumption is violated (so that the secondary market price deviates from intrinsic value), underpricing is no longer useful in determining the economic role of venture backing in IPOs. Two strands in the empirical literature indicate that one has to at least consider

the possibility that the above assumption is violated (at least during certain periods). First, recent empirical work by Purnanandam and Swaminathan (2004) document that the equity of IPO firms is overvalued (relative to intrinsic value) at the time of the IPO, and this overvaluation becomes even more pronounced on the first day of trading in the secondary market. Second, a large literature (starting with Ritter (1991)) has documented the long term underperformance of IPOs: the fact that, if investors buy IPO shares at the first day closing price and hold them for one to three years, they are likely to earn inferior returns compared to similar investments in the equity of firms which have been public for some time. Much of this literature indicates that the valuation of IPOs in the opening days of secondary market trading reflects the valuation of optimistic investors (rather than the average valuation across investors, consistent with intrinsic firm value). Theoretical work by Morris (1996) and Duffie, Garleanu, and Pedersen (2002) (who formalize the argument first made by Miller (1977)), also come to a similar conclusion: they show that, in a setting with rational investors who have heterogeneous beliefs about firm value, and where selling shares of IPO firms short is costly, the equilibrium share price of IPO firms reflects the valuation of only the most optimistic investors (and therefore sell at a premium over fundamental value).[12]

Figure 1 illustrates how a comparison of underpricing in VC backed and non-VC backed IPOs can lead us to erroneous conclusions in a setting where the assumption that the secondary market price of a firm's equity is equal to its intrinsic value is violated. Consider an econometrician using underpricing data to study whether venture capitalists indeed play a certification role in IPOs, in a situation where the secondary market opening day closing price is in fact 10% above intrinsic value for all IPOs (both VC backed and non-VC backed). In addition, let the certification hypothesis hold, so that the offer price is set

[12] Apart from the evidence provided by academic studies, it is easy to see from casual observation that the opening day secondary market price of IPO shares is significantly different from intrinsic value during some time periods. A recent example is the Internet bubble period of 1998– 2000, where a number of IPOs were priced far above their intrinsic value, only to climb much higher on the first trading day of trading in the secondary market. It seems obvious (at least in hindsight) that while these IPOs were highly underpriced (in the sense that their initial returns were very large), they were also significantly overvalued (relative to intrinsic value). The recent controversy over "laddering," where institutional investors pre-commit to buy additional IPO shares in the secondary market in exchange for larger allocations in IPOs, also highlights the possibility of the secondary market price deviating from intrinsic value (see, e.g., *WSJ*, Feb 2004, "Morgan Stanley, Goldman Fined for IPO Practices").

such that VC backed IPOs are truly priced closer to their intrinsic value (from above) than non-VC backed issuers. In this situation, the econometrician would observe that VC backed IPOs are more underpriced than non-VC backed IPOs, and thus (erroneously) reject the certification hypothesis. Here, the shares of VC backed firms will exhibit a higher price rise ("underpricing") from the offer price to the overvalued secondary market price (than the shares of non-VC backed firms), *precisely because* venture backed firms are behaving according to the certification hypothesis and pricing their IPO equity closer to intrinsic firm value (and therefore lower) than non-VC backed firms. Thus, one possible explanation of the recent evidence indicating greater underpricing of VC backed firms relative to non-VC backed firms is that it merely reflects the violation of the assumption that the secondary market first trading day closing price of equity always reflects its intrinsic value.[13]

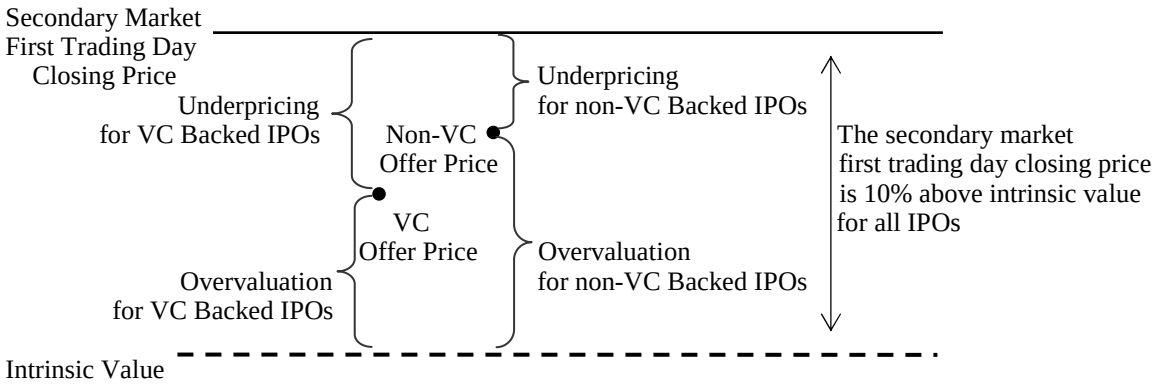

Figure 1: IPO Underpricing Example
This figure depicts the relationship between IPO underpricing and overvaluation under the assumption that all IPOs are overvalued by 10%.

A comparison of IPO underpricing in VC backed and non-VC backed IPOs would also not allow us to test whether venture backing is effective in accomplishing the second role of venture backing discussed above, namely, screening and monitoring. This is because the main implication of the screening and monitoring role of venture capitalists is that the quality (intrinsic value) of firms going public with VC backing would be higher than that of non-VC backed firms. Further, the implications arising from the

[13] This illustration assumes that the overvaluation in the secondary market is the same across VC backed and non-VC backed IPOs. If we allow for the possibility that the overvaluation of VC backed and non-VC backed IPOs in the secondary market can be different as well, it becomes clear that underpricing is even less useful in distinguishing between different possible roles of venture backing in IPOs.

theoretical IPO literature (see, e.g., Allen and Faulhaber (1989) or Chemmanur (1993)) is that higher quality firms will be *more* underpriced than lower quality firms.[14] Therefore, under the screening and monitoring hypothesis, venture backed issuers can be expected to exhibit *more* (rather than less) underpricing compared to non-venture backed IPOs. Consequently, comparing underpricing in venture backed and non-venture backed firms is also not particularly useful if we wish to investigate whether venture capitalists perform a screening and monitoring role in IPOs: comparing more direct measures of firm quality such as post IPO operating performance would be more appropriate. In summary, we feel the need to go beyond a simple comparison of underpricing in the IPOs of VC backed and non-VC backed firms to a study of more direct measures (discussed before) to distinguish between the certification, screening and monitoring, and market-power hypotheses regarding the role of VC backing in IPOs.[15]

3. Data and Sample Selection

The data used in this study come from several databases. We obtain the list of initial public offerings of equity from 1980 to 2000 from Securities Data Corporation (SDC) Platinum New Issue Database. In common with many other studies of IPOs, we eliminate equity offerings of financial institutions (SIC codes between 6000 and 6999) and regulated utilities, as well as issues with offer price below $5. The IPO should issue ordinary common shares and should not be a unit offering, closed-end fund, real estate investment trust (REIT), or an American Depositary Receipt (ADR).[16] Moreover, the issuing firm must be present on Compustat annual industrial database for the fiscal year prior to the offering, as well as on the University of Chicago Center for Research in Security Prices (CRSP) database within three months of the issue date.

[14] In Allen and Faulhaber (1989), this implication arises because, in order to signal, high intrinsic value firms price equity in the IPO lower than low intrinsic value firms, resulting in a higher price jump ("underpricing") from the IPO to the secondary market. In Chemmanur (1993), while the low and high value firms are priced similarly in the IPO, the information produced by outsiders will yield more favorable realizations for high intrinsic value firms than for low intrinsic value (on average) resulting in a higher secondary market price (and therefore higher underpricing) for higher intrinsic value firms.

[15] It is not our position, however, that underpricing is not an appropriate measure to evaluate all issues connected with venture backing in IPOs. For example, if one's objective is to study "the amount of money left on the table" in venture backed IPOs (where insiders are selling the lion's share of their equity holdings in the firm), clearly underpricing will indeed be the right measure.

[16] We do not rely on SDC classifications alone for identifying IPOs of ordinary shares. We independently verify the share type using CRSP share codes.

One of the methods we use to estimate the intrinsic value of IPO companies is using the comparable firm approach. Since this methodology requires price multiples, it can only be applied to the set of companies that have information on Sales (annual Compustat item 12) and EBITDA (earnings before interest, taxes, depreciation, and amortization; annual Compustat item 13) in the fiscal year preceding the offering, and both Sales and EBITDA have to be positive. We, therefore, impose these restrictions on the set of IPO firms in our sample.

There are 2955 IPOs from 1980 to 2000 that satisfy these criteria and form our basic sample. Panel A of Table 1 presents the summary statistics for this sample. The median offer price of the IPOs in our sample is $12, median sales are $38.1 million, median EBITDA is $4.82 million, and median net income is $1.62 million. These characteristics of the IPO sample are comparable to other research (see, e.g., Loughran and Ritter (2003)).

We further use the venture flag from the SDC database to distinguish between VC backed and non-VC backed IPOs. This results in 989 VC backed and 1966 non-VC backed IPOs in our sample. Panels B and C provide the descriptive statistics of VC backed and non-VC backed sub-samples of IPOs, respectively. Venture backed IPOs exhibit smaller sales (median of $29.38 million versus $43.32 million), smaller EBITDA (median of $3.74 million versus $5.70 million), and smaller net income (median of $1.37 million versus $1.80 million) compared to non-VC backed IPOs. At the same time, they receive a higher valuation in the primary and secondary market. For venture backed firms the median valuations at the offer price and the first trading day secondary market closing price are $85.37 million and $94.57 million, respectively. For non-venture backed companies these valuations are $72.5 million and $80.67 million, respectively.

Even though, as discussed earlier, we believe that IPO underpricing by itself is not a useful measure in distinguishing between the three possible roles of VC backing in IPOs, a comparison of IPO underpricing for VC backed and non-VC backed firms allows us to determine whether the underpricing characteristics of our sample are consistent with previous studies evaluating IPO underpricing in VC and non-VC backed IPOs. Table 2 presents a description of the underpricing characteristics of our sample and

various sub-samples. Underpricing is defined as the percentage price movement from the offer price to the closing price on the first day of trading. Panels A and B present median and mean statistics based on the full IPO sub-sample. In Panels C and D only pair-matched underpricing is presented for various IPO sub-samples. Specifically, similar to Megginson and Weiss (1991) and Barry, Muscarella, Peavy, and Vetsuypens (1990), each VC (high-reputation-VC) backed IPO is matched with a single non-VC (low-reputation-VC) backed IPO with the same three-digit SIC code, closest net proceeds, and an IPO date within one calendar year from the VC (high-reputation-VC) backed IPO date. It can be seen that our underpricing results are broadly consistent with those of previous studies (e.g., Lee and Wahal (2002) and Loughran and Ritter (2003)), indicating that our sample is broadly similar to those used in these studies, and that our results are not generated by any special features of our sample. Similar to these studies, we find that VC backed IPOs experience significantly higher underpricing compared to non-VC backed IPOs. The average underpricing for VC backed and non-VC backed IPOs is 18% and 13%, respectively, with the medians being 8.9% and 5.6%, respectively. A similar pattern is observed for different time periods.

4. Measures of Venture Capitalist Reputation

In order to separate the set of all venture capitalists backing IPOs during 1980 to 2000 into higher and lower reputation VC groups, we construct a reputation proxy variable using the fund-raising data from SDC Platinum VentureXpert. Similar to Gompers and Lerner (1998) we use the amount of money raised by VC firm over recent years to proxy venture capitalists reputation. First of all, we find the parent venture firm for each venture fund that backed an IPO. We then eliminate all parent VC firms that raised funding only once since 1965 and didn't participate in subsequent fund-raising. For each year we calculate the amount of financing raised by each parent venture firm within the prior 5 years. We further eliminate all venture firms that raised less than 10% relative to the biggest 5-year cumulative fund-raiser.

The top forty venture capital firms for each year are then considered to be high-reputation VCs.[17] This methodology generates a reputation variable that is stable across years. We obtain 140 distinct high-reputation venture capital firms, out of which 12 are present in the list for at least 19 years, 22 are present for at least 10 years, and 35 are present only once during the 21 year period.

An IPO company is considered to be backed by a highly reputable venture capitalist if it has at least one highly reputable venture firm investor that put in no less than 5% of the total amount of venture capital invested in the company. Table 1 shows that out of 989 venture backed IPOs in our sample 384 (or 39%) are backed by high-reputation VCs.[18]

Panels D and E of Table 1 provide summary statistics for high-reputation VC backed and low-reputation VC backed IPO firms. The group of IPOs backed by high-reputation venture capitalists displays lower net sales (median of $27.48 million versus $31.82 million), lower EBITDA (median of $3.41 million versus $4.11 million), but higher net income (median of $1.49 million versus $1.24 million) compared to companies backed by low-reputation VCs. High-reputation VC backed IPOs obtain higher market valuation both at the IPO stage and in the aftermarket. For this group of IPOs the median valuation at the offer price is $97.36 million and the median valuation based on the secondary market first day closing price is $109.74 million. The corresponding median valuations for IPOs backed by low-reputation venture capitalists are $78.55 million (at the offer price) and $87.19 million (at the first trading day secondary market price).

[17] Gompers and Lerner (1998) show that venture fundraising is affected by a number of macroeconomic factors such us a tax on capital gains, real interest rates, demand for venture capital, etc. The amount of financing raised over a 5-year period exhibit a significant upward pattern across all VC firms in our sample. Consequently, we discretize the underlying continuous variable to avoid the situation where all high reputation venture capitalists are concentrated in 1998-2000 period when the venture industry experienced dramatic expansion and a number of new, young VC firms raised a significant amount of capital.

[18] To study the robustness of our venture capital reputation variable we also constructed two other proxies, namely, VC firm age (as in Gompers and Lerner (1998)) and the number of IPOs a VC firm participated in since 1980. We then compute the corresponding continuous reputation variables for each IPO firm in our sample by averaging these VC firm reputation proxies across all venture capitalists that put no less than 5% of the total amount of venture capital invested in an IPO company. When adjusted for the annual average to account for the VC industry growth over the years, we find the proxies based on VC firm age and the number of IPOs it participated in to be highly correlated with the VC reputation proxy used in this study.

Table 2 shows that high-reputation VC backed IPOs experience higher underpricing relative to low-reputation-VC backed IPOs: 22% versus 15.5% in terms of means and 12.5% versus 6.5% in terms of medians. This pattern persists over time.

5. Methodologies Used to Compute Intrinsic Firm Value

Clearly, accurate estimation of intrinsic firm value is essential to distinguish between the certification and market power hypotheses regarding the economic role of venture. We therefore estimate intrinsic value using three different methodologies to ensure robustness. First, we use what we refer to as the "basic comparable firm approach" (similar to that implemented by Purnanandam and Swaminathan (2004) and Bhojraj and Lee (2002)) where we value the IPO firms using the price multiples of already public firms from the same industry with similar sales and EBITDA sales margin (EBITDA/Sales). One potential problem with this approach is that VC backed and non-VC backed firms may differ in some dimensions not captured by the matching procedure underlying the basic comparable firm approach (e.g., sales growth). The second approach we use ("the propensity score based comparable firm approach") accounts for this problem by finding a match for the IPO firm being valued along several additional dimensions (including sales growth) than is possible with the basic comparable firm approach. The third approach we use to compute intrinsic firm value is the discounted cash flow approach (the specific discounted cash flow model we use is the "residual income model" introduced by Ohlson (1990)). We describe these three valuation methodologies in the following sub-sections.[19]

5.1 The Basic Comparable Firm Approach

The first approach we use to estimate the intrinsic value of IPO companies is a matching technique based on an industry peer with comparable Sales and EBITDA profit margin (EBITDA/Sales). We first consider all firms in Compustat that were active and present on CRSP for at least three years at the end of

[19] It can be argued that some of the intrinsic value methodologies discussed here (in particular, the discounted cash flow approach) do not fully capture some components of a firm's intrinsic value (e.g., the real option component). However, this is unlikely to significantly affect our results, since it is the relative valuation of VC backed and non-VC backed IPOs (and of high-reputation and low-reputation VC backed IPOs) that is relevant for this study.

the fiscal years preceding the IPO. We then eliminate firms that are REITs, closed-end funds, ADRs, not ordinary common shares, and companies with stock prices less than $5 at the report date. We separate the remaining population of Compustat firms into 48 industry groups based on the industry classification introduced by Fama and French (1997).[20] For each year, we divide each industry portfolio into three portfolios based on sales, and then separate each sales portfolio into three portfolios based on EBITDA profit margin (EBITDA/Sales). This procedure gives us nine portfolios for each industry-year.[21] Each IPO firm is then placed into an appropriate year-industry-Sales-EBITDA margin portfolio based on an IPO firm's sales and EBITDA in year prior to IPO. Within the portfolio, we find a matching company that is closest in sales to the IPO firm being valued. We then estimate the intrinsic value of the IPO firms based on the price multiples of their matching firms.

The offer price to the intrinsic value ratio for each IPO firm (OP/IV) is calculated by dividing the offer price multiple by the comparable firm multiple. The offer price multiples are computed as follows:

$$\left(\frac{OP}{Sales}\right)_{IPO} = \frac{\text{Offer Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Sales}} \quad \textbf{(1.1)}$$

$$\left(\frac{OP}{EBITDA}\right)_{IPO} = \frac{\text{Offer Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year EBITDA}} \quad \textbf{(1.2)}$$

$$\left(\frac{OP}{E}\right)_{IPO} = \frac{\text{Offer Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Earnings}} \quad \textbf{(1.3)}$$

In the above, *CRSP shares outstanding* refers to the shares outstanding of the IPO firm at the first secondary market trading day as recorded in CRSP. The price multiples for a matching firm are computed as follows:

$$\left(\frac{P}{Sales}\right)_{Match} = \frac{\text{Market Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Sales}} \quad \textbf{(2.1)}$$

$$\left(\frac{P}{EBITDA}\right)_{Match} = \frac{\text{Market Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year EBITDA}} \quad \textbf{(2.2)}$$

[20] The industry portfolios are constructed using 4 digits SIC codes from Compustat. For robustness, we also implement this methodology using 2-digit SIC codes as industry classification criteria.

[21] We insist, however, that at least three firms should be in each portfolio. If the number of firms in the industry does not allow us to form 9 portfolios, we limit the separation to two portfolios based on Sales with further separation into two portfolios based on EBITDA profit margin, sometimes we consider only one portfolio.

$$\left(\frac{P}{E}\right)_{Match} = \frac{\text{Market Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Earnings}} \quad \textbf{(2.3)}$$

Market price is CRSP stock price and *CRSP shares outstanding* is the number of shares outstanding of the matching firm at the close of the day closest to the IPO offer date. OP/IV ratios for each IPO firm based on various multiples are then computed as follows:[22]

$$\left(\frac{OP}{IV}\right)_{Sales} = \frac{(\text{OP/Sales})_{\text{IPO}}}{(\text{P/Sales})_{\text{Match}}} \quad \textbf{(3.1)}$$

$$\left(\frac{OP}{IV}\right)_{EBITDA} = \frac{(\text{OP/EBITDA})_{\text{IPO}}}{(\text{P/EBITDA})_{\text{Match}}} \quad \textbf{(3.2)}$$

$$\left(\frac{OP}{IV}\right)_{Earnings} = \frac{(\text{OP/E})_{\text{IPO}}}{(\text{P/E})_{\text{Match}}} \quad \textbf{(3.3)}$$

5.2 The Propensity Score Based Comparable Firm Approach

One potential concern about the basic comparable firm approach is that it does not explicitly account for growth. The growth premium not being priced could generate biased estimates of intrinsic values. Consequently, the results may be considerably affected by the growth differential between VC backed and non-VC backed IPOs as well as between issuers backed by high-reputation VCs versus those backed by low-reputation VCs.[23] One possible solution to this is to include a measure of growth as one of the matching dimensions. However, as the number of matching dimensions increases, a simple matching approach like the basic comparable firm approach might not be able to find an appropriate match for the IPO firm being valued.

We, therefore, make use of the propensity score algorithm proposed by Dehejia and Wahba (1999, 2001) to solve this problem. The approach is based on Rosenbaum and Rubin's (1983) propensity score theorem. This technique allows one to accommodate a large number of matching characteristics and has proven to be successful in producing accurate estimates in a non-experimental

[22] If earnings are missing or negative for the matching firm (in the case of earnings based valuation), the closest Compustat firm with no missing data is used as the matching firm.

[23] We document a significant sales growth differential between VC backed (high-reputation VC backed) IPOs and non-VC backed (low-reputation VC backed) IPOs in Section 6.4 of this paper.

setting where the event group significantly differs from the population of potential matching subjects. The propensity score method offers another advantage: it allows us to produce accurate matches even if the group of comparable control subjects is very small. This eliminates possible source of bias due to systematic differences between treatment and control subjects (in our setting, an IPO company that we wish to value and a public firm that we select as a "comparable firm").[24]

The propensity score approach allows us to correct for differences in growth and/or other operating performance characteristics between an IPO firm being valued and a candidate matching company in a multiple factor framework. In other words, we are able to find a comparable (matching) firm for an IPO company being valued based on a larger set of factors (operating characteristics) than in the basic comparable firm approach. Here we augment the set of factors used in the basic comparable firm approach as follows. First, we use Sales (as a measure of size) and EBITDA/Sales (as a measure of operating cash flow margin). Second, we include the average sales growth over the 5-year period after the IPO as one of the matching factors. Finally, we include profit margin (Net Income/Sales) in the set of matching factors.

We use the "nearest-match" version of the propensity score matching algorithm that works as follows. Let $X_{i,j}$ be a vector of independent characteristics observed for company i (IPO firms as well as public firms) in fiscal year j prior to the issue.[25] As discussed before, the set of the factors $X_{i,j}$ for company i in year j consists of: (i) sales, (ii) operating margin, (iii) profit margin, and (iv) average five year sales growth.[26] Let $D_{i,j}$ be a dummy that is equal to 1 for the IPO firm being valued and 0 for a firm

[24] The propensity score method has already been used in the finance literature to pair-match companies based on a given set of characteristics. In particular, Villalonga (2004) uses the propensity score method in her study of diversification discount to find the appropriate benchmark companies for diversifying firms. Hillion and Vermaelen (2004) apply propensity score matching in their study of the operating performance of companies issuing death spiral convertibles.

[25] We consider the same restriction on the set of IPO companies as in "basic comparable firm approach", and limit the population of potential matching public companies to consist only of firms that have been public for at least three years at the end of the fiscal year prior to IPO.

[26] In using ex-post sales growth as one of the variables in our propensity score based comparable firm approach, we implicitly assume that investors have rational expectations: i.e., the ex-ante sales growth assessed by investors in valuing firms is equal, on average, to the ex-post growth. This is consistent with the approach adopted by discounted cash flow valuation models (see, e.g., Ohlson (1990)) which implicitly assume that realized earnings are equal, on average, to the expected earnings of the firms being valued.

that is already public. We estimate the propensity score logit function as $P_{i,j} = P(D_{i,j} = 1 | X_{i,j})$, $i = 1,...,N_j$, for each fiscal year (j takes values from 1979 to 1999). As VC backed and non-VC backed IPOs can be affected by the same factors in a different fashion, we estimate the propensity score logit function separately for the set of VC backed and non-VC backed IPOs. With the estimated propensity score values $P_{i,j}$, we match each IPO firm to a single public company with the closest $P_{i,j}$ value, within the same industry. We impose the industry restriction to avoid differences in operating risk characteristics between an IPO and its matching firm and to thus obtain more economically meaningful matches. Once the matching company is obtained, we use sales, EBITDA, and earnings price multiples approaches similar to those discussed under the basic comparable firm approach (formulas (1) to (3)) to estimate the OP/IV ratios for each IPO firm.

5.3 Discounted Cash Flow Valuation

Finally, as a robustness test of our valuation results based on the two comparable firm methodologies discussed above, we also compute the intrinsic value of IPO firms using the discounted cash flow method. The specific discounted cash flow model we use is the residual income model introduced by Ohlson (1990). In contrast to above two comparable firm methodologies, here we *do not* require IPO firms to have positive sales and EBITDA in the year preceding the IPO. Thus, the discounted cash flow approach we implement only requires the book value of equity and earnings (whether positive or negative) to be available for three years post IPO. It also requires the calculated intrinsic value to be positive. Following Ohlson (1990), the fair value of a firm's shares is calculated as follows:

$$IV = B_0 + \frac{EPS_1 - r * B_0}{1 + r} + \frac{EPS_2 - r * B_1}{(1 + r)^2} + TV \,. \qquad \textbf{(5)}$$

Here B_0 is the book value of issuer at the end of IPO year (annual Compustat item 60) divided by CRSP end of year number of shares outstanding; EPS is income before extraordinary items available to common shareholders (annual Compustat item 237) divided by CRSP number of shares outstanding; r is

the required rate of return on firm's equity. We assume a constant required rate of return r of 13%. TV, the terminal value is calculated as follows:

$$TV = \frac{(EPS_2 - r * B_1) + (EPS_3 - r * B_2)}{2} * \frac{1}{(1+r)^2 * (r-g)} \quad \textbf{(6)}$$

The terminal value is calculated as an average to avoid the effect of unusual performance in year 3. Constant earnings growth g (5% and 0% are considered) is assumed after year 3 and the terminal value of the stock is calculated as a perpetuity. If the terminal value is negative, we set it equal to zero, since managers are unlikely to continue negative NPV projects forever.

6. Empirical Tests and Results

6.1 IPO Valuation of VC Backed and Non-VC Backed Firms

In this section we present our comparison of the intrinsic values of IPO firms to their valuation at the offer price. We compute the intrinsic values using three different methodologies: the basic comparable firm approach, the propensity score based comparable firm approach, and the discounted cash flow approach.

6.1.1 The Basic Comparable Firm Approach

Table 3 reports medians of the cross-sectional distribution of the offer price to the estimated intrinsic value ratio (OP/IV) based on Price/Sales, Price/EBITDA, and Price/Earnings price multiples.[27] The size of the sample changes for the valuations using different price multiples due to unavailability of the data on one or another accounting parameter for the IPO companies. Out of the sample of 2955 firms we were able to find a match for 2946 firms.

Our results show that OP/IV ratios are significantly higher for VC backed companies than for non-VC backed companies. The OP/IV ratios are above 1 indicating that IPOs are significantly overvalued

[27] While we present year by year OP/IV ratios only for intrinsic values based on the EBITDA multiple, our year by year results based on other multiples are quantitatively similar.

relative to their estimated intrinsic firm value.[28] The overvaluation of VC backed IPOs ranges from 92% to 138% depending on the price multiple used. On the other hand, the overvaluation of non-VC backed companies varies from 40.8% to 42.7%. These differences are statistically significant at the 1% level. The same relationship holds on a year to year basis. The OP/IV ratio for VC backed IPOs exceeds the OP/IV ratio for non-VC backed companies in 19 years out of 21. The difference in overvaluation between VC backed and non-VC backed firms is around 52%.

A similar relationship is exhibited by the high-reputation VC and low-reputation VC backed IPO sub-samples. The former exhibit higher OP/IV ratios relative to the latter, and the results are robust regardless of the valuation multiple applied. The high-reputation VC backed IPOs show offer prices ranging from 144% to 181% higher than the intrinsic value. In comparison, low-reputation VC backed IPOs are 67% to 119% overvalued relative to intrinsic value. Hence, the group of high-reputation VC backed IPOs obtain an offer price that is significantly higher than the one obtained by low-reputation VC backed IPOs. The difference in overvaluation for high-reputation and low-reputation VC backed IPOs ranges from 51% to 114%. Thus, our results contradict the certification hypothesis and support the market power hypothesis. [29]

6.1.2 Propensity Score Based Comparable Firm Approach

Table 3 reports the medians of the cross-sectional distribution of estimated intrinsic value to offer price ratios with the intrinsic value generated by the propensity score based comparable firm approach making use of the Price/Sales, Price/EBITDA, and Price/Earnings multiples. The results exhibit the same pattern as the basic comparable firm approach estimates. According to the propensity score based comparable firm approach, VC backed companies are overvalued by 59.6% to 95% relative to their intrinsic value based on different price multiples. In comparison, for non-VC backed firms the

[28] We estimated the pooled panel data correlations among the intrinsic values calculated using different multiples. These correlations are positive, statistically significant, and vary from 0.56 to 0.95, indicating that these valuations are not too far apart.
[29] Our results are robust to industry classifications based on 2-digit Compustat or CRSP SIC codes. A classification based on 3-digit SIC code does not generate a sufficient number of companies in each industry portfolio, which, in turn, may affect the quality of the intrinsic value estimates. Furthermore, our results do not seem to be generated by the clustering of VC backed IPOs in certain industries and/or geographical areas.

overvaluation ranges from 28.8% to 41.5%. Relative to the basic comparable firm approach estimates, the magnitude of OP/IV ratio for VC backed and non-VC backed companies significantly decreases. This might reflect the growth premium being incorporated into the valuation. The relationship between OP/IV ratios continues to hold on a year by year basis as well.

The group of high-reputation VC backed IPOs exhibits higher OP/IV ratios relative to the group of low-reputation VC backed IPOs. High-reputation VC backed companies are overvalued by about 97% to 154.3% relative to their intrinsic value. The corresponding overvaluation for low-reputation VC backed firms is 36% to 80%. The difference in overvaluation between the two groups is statistically significant at the 1% level. The IPOs backed by high-reputation venture capitalists obtain higher offer prices relative to their intrinsic value compared to issuers backed by low-reputation VCs.[30] Consistent with our earlier results obtained with the basic comparable firm approach, these results contradict the certification hypothesis and support the market power hypothesis.

We also implemented alternative specifications of the propensity score matching procedure. First, we allowed for 2-digit CRSP or Compustat SIC code industry definition. Second, we experimented with the set of factors $X_{i,j}$ by (i) including the industry medians of the operating performance measures to adjust for industry performance; (ii) including accruals to adjust for the possibility of differences in earnings management across VC backed and non-VC backed IPOs, (iii) incorporating additional profitability measures (and their industry medians) such us return on assets, EBITDA/book value of assets, and share of capital expenditures and R&D in assets. We found our results to be robust toward these changes in the set of the propensity score matching dimensions we imposed. These changes do not significantly affect the magnitude of the overvaluation as well as quality of the match (as measured by the ability of the matching firm to track the operating performance of an IPO company in post-IPO years).

[30] We also checked for robustness by eliminating the restriction on the match to be from the same industry. We found that even after eliminating this restriction, our results are generally the same. However, in this case 92% of the companies received a match from a different (as defined by Fama and French (1997)) industry. We, therefore, continue to impose the industry restriction, since it allows for an economically more appropriate match.

Furthermore, to evaluate the quality of the match that we use in our valuation under the basic comparable firm approach and the propensity score based comparable firm approach, we evaluate the operating performance differential between an IPO and its matching company.[31] We find that while both matching approaches give a reasonably good match, the propensity score based comparable firm approach generates a better match not only in terms of current (year -1 and year 0), but also in terms of future performance (years 1 through 4) matching. Furthermore, the differences in the match-adjusted operating performance across different sub-samples (namely, VC backed versus non-VC backed IPOs, as well as high-reputation VC backed versus low-reputation VC backed IPOs) is neither statistically nor economically significant over the years (year -1 through 4). This allows us to conclude that the difference in overvaluation we document can not be attributed to differences in the quality of the IPO firms measured by operating performance.

6.1.3 Discounted Cash Flow Valuation

Table 5 reports our results with intrinsic value estimated using the discounted cash flow method (residual income model). We assume a constant required rate of return of 13% and constant growth rates of 5% and 0% after year 3. The relationship between the medians of different IPO sub-samples holds here as well: VC backed IPOs are more overvalued than non-VC backed IPOs, and high-reputation VC backed firms are more overvalued than low-reputation VC backed firms. Under the assumption of 5% growth, the VC backed IPOs have OP/IV ratio of 10.23, non-VC backed 5.85, high-reputation-VC backed 13.27, and low-reputation-VC backed issuers 8.73. Clearly, OP/IV ratios are much higher than those obtained though basic comparable firm approach and propensity score based comparable firm approach, which is not surprising due to potential growth option component that we may not be able to capture fully in our discounted cash flow valuation. However, our primary interest is the valuation differential between venture backed IPOs and non-venture backed IPOs, as well as high-reputation VC backed firms and low-

[31] The analyzed operating performance characteristics are profit margin, EBITDA over book value of assets, EBITDA sales margin, return on assets, share of capital expenditures and R&D in total assets, and growth in sales.

reputation VC backed firms. In this respect, the discounted cash flow valuation results provide an additional validation of our earlier results generated by the basic comparable firm approach and the propensity score based comparable firm approach. Our results once again contradict the certification hypothesis and support the market power hypothesis. As discussed before, the discounted cash flow approach imposes fewer restrictions on the IPO sample relative to the two comparable firm approaches. In particular, it does not require availability of COMPUSTAT data prior to an IPO. Neither does it require positive sales, EBITDA, or earnings. This indicates that our overvaluation results are robust and not generated by any sample restrictions.

6.1.4 Summary of Results Based on IPO Valuation of VC backed and Non-VC Backed IPOs

The evidence presented in Sections 6.1 suggests that (1) the offer price of VC backed IPOs (high-reputation VC backed IPOs) deviates from their intrinsic value more than the offer price of non-VC backed IPOs (low-reputation VC backed IPOs); and (2) IPOs supported by venture capitalists are significantly overvalued relative to their intrinsic value, and this overvaluation increases with venture capitalist reputation. The magnitude of the difference in valuation between VC backed and non-VC backed firms as well as between high-reputation VC backed and low-reputation VC backed IPOs is large enough that it is clearly not only statistically but also economically significant. These results are consistent across the three valuation methodologies used: the basic comparable firm approach, the propensity score based comparable firm approach, and the discounted cash flow approach, and contradict the certification hypothesis, while supporting the market power hypothesis.

6.2 Secondary Market Valuation of VC Backed and Non-VC Backed IPOs Over Time

We now present a comparison of equity valuation of VC backed and non-VC backed IPOs in the secondary market. Here we estimate secondary market price to intrinsic value (SMP/IV) ratios for IPO

companies using the basic comparable firm approach.[32, 33] To compute the secondary market price multiples for an IPO firm, we substitute the IPO offer price (OP) and CRSP number of shares outstanding in formula (1) by the secondary market price (SMP) and the CRSP number of shares outstanding observed at the specific date. We then use formulas (2) and (3) to compute SMP/IV ratio for each IPO company.

Table 6 reports the medians of the cross-sectional distribution of secondary market price to the intrinsic value ratio (SMP/IV) at the first trading day as well as one, two, and three years later. Intrinsic values are generated by the basic comparable firm approach and Price/Sales, Price/EBITDA, and Price/Earnings multiples. We find that after the first trading day, the secondary market price of an IPO company moves further away from intrinsic value. In the secondary market the VC backed IPOs become (on average) overvalued by around 131%. The non-venture backed IPOs, on the other hand, exhibit around 52% overvaluation. The difference in overvaluation between these two IPO sub-samples increases from approximately 60% at the offer price to around 80% at the secondary market price. On the first day of secondary market trading the overvaluation of high-reputation VC backed IPOs increases to around 230%, whereas low-reputation VC-backed companies exhibit 80% overvaluation. Thus, the difference in Price/IV ratios between these two sets of companies almost doubles from the offer price to closing price on the first trading day. It goes from around 75% at the IPO stage to about 120% in the secondary market. This evidence clearly supports the market power hypothesis. The certification hypothesis does not predict any valuation difference between VC backed and non-VC backed firms, and between high-reputation and low-reputation VC backed IPOs in secondary market trading.

The overvaluation of IPO companies in the secondary market exhibits another interesting pattern. Table 6 shows that the difference in overvaluation between VC backed and non-VC backed IPOs (and between high-reputation and low-reputation VC backed firms) decreases over time until, by the end of the

[32] For each firm being valued, we find a new matching company each year, with the restriction that the matching company should be traded at least three years prior to the IPO year of a firm being valued.
[33] We obtain similar results with the propensity score based comparable firm approach.

third year, there is almost no difference in overvaluation (as measured by the SMP/IV ratio) across these groups. Figure 2 depicts this valuation pattern graphically. This pattern might be attributed to dissipation of the influence of venture capital backing on market value over time. Thus, at the end of year 3, the market value of IPO companies is close to their intrinsic value (as measured by the secondary market price).

6.3 Participation of Reputable Underwriters, Institutional Investors, and Analysts in VC Backed and Non-VC Backed IPOs

In this section we empirically investigate the implications of the market power of venture capitalists hypothesis, which states that VCs can attract a higher quality and a larger number of financial market participants to the IPOs backed by them, leading to a higher valuation of equity in these IPOs. First, we will analyze the quantity and quality of market participants involved in IPO companies such as underwriters, institutional investors, and analysts in VC backed and non-VC backed IPOs. We will then study whether the extent of participation by these market players in fact affects the valuation difference between VC backed and non-VC backed IPOs and between high-reputation and low-reputation VC backed IPOs.

6.3.1 Participation by Reputable Underwriters

In this sub-section we study the reputation of underwriters associated with venture and non-venture backed IPOs. Panel A of Table 7 reports the summary statistics of average underwriter reputation associated with different IPO sub-samples. We use two measures of underwriter reputation. First, we analyze the measure of underwriter reputation used by Loughran and Ritter (2003).[34] Second, similar to Loughran and Ritter (2003), we use a dummy for the underwriter. The dummy takes a value of 1 if the reputation measure is 8 or higher.

[34] Loughran and Ritter (2003) augmented the Carter-Manaster measure of underwriter reputation to include underwriters up to year 2000.

Our results show that the average underwriter reputation for VC backed firms is higher than that for non-VC backed firms (7.53 versus 6.72). Similarly, the average underwriter reputation for high-reputation VC backed IPOs is higher than that for low-reputation VC backed IPOs (7.83 versus 7.33). The percentages of the companies with a high-reputation underwriter according to this measure are 69% for VC backed issuers versus 55% for non-VC backed issuers, and 76% for high-reputation VC backed IPOs versus 65% for low-reputation VC backed IPOs. The evidence clearly suggests that VC backed IPOs are associated with higher quality underwriters compared to non-VC backed IPOs, and high-reputation VC backed companies are associated with higher quality underwriters compared to low-reputation VC backed IPOs.[35] The differences are statistically significant at the 1% level. These results support the market power hypothesis.

6.3.2 Participation by Institutional Investors

In this sub-section we analyze the influence of venture capitalists on institutional investors' participation in IPOs backed by them. We study three different measures of institutional investors' involvement in IPOs. First, we consider the percentage of IPOs with positive (non-zero) institutional investor holdings. Second, we use the number of institutional investors investing in the IPO. Finally, we analyze first quarter post-IPO institutional investor holdings as a percentage of the number of shares sold in the IPO. We obtain the institutional investors holdings data for IPOs in years 1983 to 1997 from Spectrum Institutional (13f) Holdings Database of Thomson Financial.

Panel B of Table 7 reports the results of our analysis of the institutional investors' participation measures. All three measures are remarkably unanimous. Relative to non-VC backed IPOs, VC backed IPOs have a 4% higher institutional investor participation, around 18% higher percentage of shares sold in the IPO held by institutional investors, and 3 to 6 more institutional investors involved.[36] These differences are not only statistically but also economically significant. The differential between high and

[35] These results are consistent with earlier studies. See Megginson and Weiss (1991) and Barry et al (1990).
[36] The evidence is consistent with that documented by Megginson and Weiss (1991).

low-reputation VC backed companies is less pronounced but still significant in terms of holdings (3.5% in terms of means and 7% in terms of medians) and the number of institutional investors (0.7 in terms of means and 2 in terms of medians).

Since the degree of institutional investors' participation may also be affected by better quality underwriters (in addition to venture capital backing), we control for the effect of underwriter reputation through a regression analysis of institutional investor participation in IPOs. We consider two dependent variables: number of institutional investors participating in an IPO, and institutional investor holdings as a percentage of shares sold in the IPO. The independent variables we consider are the VC backing dummy, the VC reputation dummy, and the measure of underwriter reputation. As we anticipate the venture capitalists and underwriters to be capable of attracting more institutional investors to participate in new issues and this ability to increase with their reputation, the coefficients of these three variables are expected to be positive. We use the following control variables: log(total assets), industry dummies, and year dummies.

Table 8 reports the results of this regression. We find that even after we control for the underwriter reputation, the presence of venture backing brings one additional investor and around 13% higher new issue allocation to the institutional investors. The findings are statistically significant at the 1% level. High-reputation venture capitalists attract 1.6 additional investors and 4% additional share allocation, though the latter effect is weaker.[37] The positive sign of the size coefficient suggests that institutional investors are indeed more likely to invest in bigger IPOs. The above evidence once again emphasizes the significance of the venture backing in attracting institutional investors and thus supports the market power hypothesis.

[37] The results are generally the same if we include measures of pre-IPO operating performance (ROA, profit margin, leverage, etc.) as control variables. Thus, our results cannot be explained by institutional investors investing in better IPOs disregarding the presence of venture capitalists and/or high quality underwriters.

6.3.3 Analyst Coverage after the IPO

In this sub-section we will investigate the analyst coverage of IPO companies. The data about analyst coverage is taken from I/B/E/S database. We consider the analyst forecasts closest to the first post-IPO financial year end.[38] The number of analysts is assigned to be zero if there is no information about the company in I/B/E/S. Panel C of Table 7 presents the median and mean statistics for the percentage of IPOs with analyst coverage and the number of analysts, respectively. The statistics are estimated for the IPO year (year 0) as well as for the three years following an IPO (years 1 through 3).

We can see that a significantly larger percentage of VC backed (high-reputation VC backed) companies receive analyst coverage and that these firms are followed by a larger number of analysts compared to non-VC backed (low-reputation VC backed) IPOs. This relationship holds not only in year 0 but also in the post-IPO years. The percentage of the companies with analyst coverage as well as the number of analysts is lowest for the IPO year and increases in later years. One can also note that the difference in percentage of the IPO companies with analyst coverage between VC backed and non-VC backed issuers does not significantly change over time. It seems that venture capitalists (high-reputation venture capitalists) are able to attract more analyst coverage in the IPO year, but that their ability to attract more analysts in post-IPO years decreases over time. The evidence is consistent with the market power hypothesis.

Since analyst coverage may also be affected by the IPO underwriter and interest from institutional investors, we control for these effects through a regression analysis presented in Table 9. The dependent variable is the number of analysts following the issuer in the IPO year (year 0). The independent variables are the VC backing dummy, the VC reputation dummy, the underwriter reputation, and number or holdings of institutional investors. We expect the coefficients of all these variables to be positive. Since analysts tend to cover larger companies we use size as one of the control variables. We also control for industry and year.

[38] We also conduct the analyst coverage analysis based on quarterly earning forecasts in I/B/E/S. The results are generally the same.

The evidence shows that, as expected, analyst coverage is positively affected by venture capital backing, their reputation, quality of the underwriter, and institutional investor participation. The effects are not only statistically significant at the 1% level, but also economically significant. The venture backing generates 0.22 more analysts following the company, which translates into a 7.6% increase relative to the average number of analysts of 2.9. In addition, high-reputation venture capitalists add 0.49 analysts (16.8% increase). High quality underwriter generates 0.46 more analysts (16% increase).[39]

6.3.4 Relationship Between the Participation of Various Market Players and the Valuation of VC Backed and Non-VC Backed IPOs

So far we have shown that venture capital backing (high-reputation VC backing) attracts more extensive participation by various market players. In this sub-section, we will use regression analysis to investigate the combined influence of different market participants as well as venture backing on the valuation of IPOs. The dependent variable we use is the log of the OP/IV ratio. The set of independent variables includes the VC backing dummy and the VC reputation dummy, as well as measures of participation by various market players. Under the market power hypothesis, we expect the backing of venture capitalists to yield a higher valuation. We also anticipate this ability to be greater for high-reputation venture capitalists than for low-reputation venture capitalists. Consequently, we expect the coefficients of both independent variables to be positive. According to the market power hypothesis, a larger number and better quality of market participants involved in IPO increases the relative overvaluation. Consequently, we also expect the coefficients of the following independent variables to be positive: underwriter reputation, number of institutional investors with IPO holdings, and/or the percentage of shares sold in IPO held by institutional investors (these two measures proxy for the extent of the institutional investor participation), and, finally, the number of analysts covering the company. Since we hypothesize that better market participants is one of the channels through which venture backing

[39] The results are generally the same if we include measures of pre-IPO operating performance (ROA, profit margin, leverage, etc.) as control variables. Thus, our results cannot be explained by analysts following better IPOs disregarding the presence of venture capitalists and other market players.

yields higher valuation, we also expect the coefficient of the VC backing dummy to decrease in magnitude and lose significance as we include various market participant proxies. As control variables we employ size (log of total assets), share of firm equity sold in the IPO, industry dummies, and year dummies. We are agnostic about the sign of the size coefficient.

Table 10 reports the results of our regression analysis. We find that VC backing dummy, VC reputation dummy, and all of the market participant variables have positive and significant coefficients in all the specifications. As specification (10) indicates, venture capital backing by itself increases the valuation by around 11.1% relative to the intrinsic value. Backing by high-reputation venture capitalists generates an additional 36.2% increase in valuation. The influence of high quality underwriters (with reputation score above 8) amounts to a 28% increase in valuation. A 1% increase in institutional investor holdings (as a percentage of total shares sold in IPO) causes a 0.19% increase in valuation. An additional analyst following a firm causes a 0.10% increase in valuation. Furthermore, while the VC backing dummy and the high-reputation VC dummy are highly significant in the absence of the measures of participation of various financial market players, both dummies become less significant when these measures are added to the regression equation, indicating that attracting a higher level and quality of participation by various market players is one of the mechanisms through which VC backing achieves a higher valuation for the IPOs of firms backed by them. As the share of an IPO firm sold in an IPO decreases overvaluation increases.[40] The negative coefficient of the size control variable suggests that smaller companies tend to be more overvalued.[41] In results not presented, we also ran the same regressions as those presented in Table 10 with the overvaluation of the IPO firms in the secondary market (log(SMP/IV)) as the dependent variable. Our results are generally similar to those presented in

[40] This is consistent with the heterogeneous beliefs hypothesis, which argues that the valuation of equity in an IPO reflects only the valuation by the most optimistic investors (see Section 7 for discussion). As the fraction of equity sold in an IPO is smaller, the IPO price reflects the valuation of only a smaller group of (more optimistic) investors, increasing the degree of overvaluation.
[41] We will discuss our results in specifications (11) and (12) of Table 10 in Section 7.

Table 10. As before, the various measures of participation by important market players are highly significant in explaining the degree of overvaluation.[42]

Our results are consistent with the market power hypothesis. The ability of venture backing in IPOs to attract a higher quality underwriter, more institutional investors with deeper pockets (as measured by the share of the IPO firm held by institutional investors), and more analyst coverage documented in sections 6.3.1 through 6.3.3 indeed leads to higher valuation of these IPO firms.

6.4 Post-IPO Operating Performance of VC Backed and Non-VC Backed IPOs

In this section we investigate whether venture capital backing also has a screening and monitoring role in IPOs through a comparison of the operating performance of different IPO sub-samples. It is important to note that, in our setting, it is inappropriate to use the matching firm approach suggested by Barber and Lyon (1996), which advocates choosing a matching (benchmark) firm based on prior profitability and size. Matching on prior profitability would be appropriate only if we wished to determine whether there is a change in operating performance of firms subsequent to the IPO (and if this change is different for VC backed and non-VC backed IPOs). Instead, our objective here is to determine whether the pool of firms going public with VC backing is of higher quality (thereby generating superior operating performance) compared to the pool of firms going public without VC backing.[43] We also want to conduct a similar comparison between high-reputation VC backed IPOs and low-reputation VC backed IPOs.

We compare the operating performance of various IPO sub-samples using two approaches. First, we compare the full samples (VC backed versus non-VC backed, and high-reputation versus low-reputation VC backed) unadjusted operating performance measures. Second, we use a matching approach where each VC backed (high-reputation VC backed) company is matched to a non-VC backed (low-reputation

[42] As we showed before, our intrinsic value calculations also reflect the differences in operating performance between VC backed and non-VC backed IPOs (as well as between high-reputation VC backed and low-reputation VC-backed IPOs). However, we also run our overvaluation regression including as control variables the operating performance characteristics (e.g., pre-IPO ROA, leverage, accruals, etc.). We find our results to be qualitatively unaffected in these regressions.

[43] Since our objective here is to detect differences in the quality (performance) of the pool of firms going public with VC backing and those going public without such backing, matching on pre-IPO operating performance would be inappropriate, since this is equivalent to minimizing the quality difference we are attempting to detect (since both pre- and post-IPO performance are correlated with intrinsic firm quality and, therefore, with each other).

VC backed) firm based on year, Fama and French (1997) industry classification, and size measured by total assets. In doing so, we ensure that each VC backed (high-reputation VC backed) company receives a unique match. The operating performance of the two samples of matched firms is then compared.

To measure operating performance, we use the following characteristics: (1) profit margin (net income including extraordinary items (Compustat item 172) divided by sales), (2) EBITDA over book value of assets (Compustat item 6), (3) EBITDA sales margin, (4) Return on assets (net income including extraordinary items over book value of assets), (5) share of capital expenditures (Compustat item 128) and R&D (Compustat item 46) in assets, and (6) growth in sales.

Tables 11 presents the analysis of operating performance for different IPO sub-samples. We report the operating performance ratio for the IPO year (year 0) and four years post-IPO (1 through 4). We also evaluate the average performance ratios over 5 years for each IPO.[44] Panel A provides median non-adjusted operating performance characteristics calculated using full IPO sub-samples. Panel B on the other hand gives statistics for the matched paired sub-samples.

The empirical evidence suggests that VC backed (high-reputation VC backed) IPOs show significantly higher profitability and margins in the IPO year than do non-VC backed (low-reputation VC backed) companies.[45] This difference in operating performance declines in later years for all IPO sub-samples.[46, 47] On the other hand, VC backed (high-reputation VC backed) firms have consistently higher R&D and capital expenditures as well as sales growth in post-IPO years compared to non-VC backed (low-reputation VC backed) firms. In summary, there is some evidence supporting the screening and monitoring role of venture capital backing in IPOs.

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[44] The average ratios are calculated as a ratio of average accounting values for years 0 through 4. For example the average profit margin is calculated as average net income over years 0 through 4 divided by average total assets.

[45] It should be noted however, that we account for this difference in operating performance between VC backed and non-VC backed firms and between firms backed by high-reputation and low-reputation VCs in our valuation analysis using the propensity score backed comparable firm approach, as discussed earlier.

[46] These results are consistent with Jain and Kini (1994) and Loughran and Ritter (1997).

[47] The fact that operating performance dominance of VC backed (high-reputation VC backed) companies is eliminated in later post-IPO years might be due to venture capitalists exiting post-IPO or to the decreasing influence of the venture capitalists on a company's management decisions.

7. How does the Market Power of Venture Capitalists Affect IPO Valuation?

What do our results imply about the precise mechanism through which venture capitalists influence the valuation of IPOs backed by them? Our results are consistent with both behavioral and rational models of IPO valuation. Thus, they are generally consistent with the "mispricing" argument about long-term underperformance made by Ritter (1991) and Loughran and Ritter (1995). They are also consistent with a number of other behavioral theories. For example, Daniel, Hirshleifer, and Subrahmanyam (1998) develop a model where the driving factor is investors' overconfidence about their valuation of the firm. Assuming that investor overconfidence about their valuation of a firm's IPO is increased by the fact that it is venture backed, our results can be explained by the implications of their model. Further, Barber and Odean (2003) find that retail investors are more likely to purchase "attention-grabbing" stocks. In a similar vein, we conjecture that VC backing and the presence of high-reputation underwriters and other market participants in an IPO may increase the attractiveness of these shares for retail investors, thus increasing demand and therefore valuation.

Among rational investor models, our results seem to be best explained by the arguments made by Miller (1977) that investors who tend to buy IPOs initially tend to be those who are the most optimistic about the prospects of these firms. In a formal model capturing this intuition, Morris (1996) has shown that, in a setting where rational investors have heterogeneous prior beliefs and with constraints on short-selling, the shares of IPO firms will reflect the valuation of the most optimistic investors (and will sell at a premium over their fundamental value). Then, as the IPO firm's prospects become clearer over time, learning occurs across investors, so that the beliefs of various investors converge toward each other, leading the market value of equity to go towards the intrinsic value.[48] In the context of our results, it seems to be the case that investors are more optimistic about the future cash flows of IPO firms backed by venture capitalists, which, as we have shown, are associated with more reputable underwriters and which are likely to receive more extensive coverage from analysts and larger shareholding from institutional

[48] Morris (1996) builds on earlier work by Harrison and Kreps (1978). See also Duffie, Garleanu, and Pedersen (2002), and Chen, Hong, and Stein (2002).

investors. This may be because higher reputation underwriters (with more extensive marketing networks) are able to conduct more extensive road shows, and investments by some important and influential institutional investors may trigger investments by other investors (both institutional and retail), thus increasing the general level of optimism about the IPOs of venture backed firms.[49] Our evidence that IPOs backed by high-reputation venture capitalists are more overvalued than those backed by low-reputation venture capitalists is also consistent with this theory, since high reputation VCs are able to attract higher reputation underwriters, more analyst coverage, and greater institutional investment, thus leading to greater heterogeneity in investor beliefs.

In the rest of this section we empirically examine whether heterogeneity in investor beliefs is one of the mechanisms through which the market power of venture capitalists generates valuation differences between VC backed and non-VC backed IPOs (and between high-reputation and low-reputation VC backed IPOs). In developing proxies for the heterogeneity in investor beliefs about the intrinsic value of firms going public, we rely on the model of trading activity developed by Harris and Raviv (1993), who show that greater diversity in investor beliefs about a firm's true value leads to greater trading volume and turnover. We therefore use average trading volume (in dollars) and share turnover for the first day, first week, and first month of post-IPO trading in the secondary market as our proxies for the heterogeneity in investor beliefs.[50] Table 12 presents a univariate analysis of these proxies across different groups of IPOs. We find that these proxies for the heterogeneity in investor beliefs are significantly greater for VC-backed than for non-VC backed IPOs, and greater for high-reputation VC backed IPOs than for low-reputation VC backed IPOs.

We first use regression analysis to study how VC backing and the resulting presence of a larger number of higher quality market participants in an IPO affects the degree of the heterogeneity in investor beliefs about the intrinsic values of these firms. The dependent variables are the two proxies for the

[49] Such investor behavior is also consistent with the cascade theory of Welch (1992), where investors pay attention not only to their own information, but also to whether other investors are interested in the IPO.

[50] A number of empirical papers in the accounting literature have also used trading volume and turnover as proxies for heterogeneous beliefs among investors: see, e.g. Bamber (1987) and Bamber, Barron, and Stober (1997, 1999).

heterogeneity in investor beliefs discussed above: first trading day volume and turnover. The independent variables are the VC backing dummy, the VC reputation dummy, and the market participant variables: underwriter reputation, degree of institutional investor participation, and analyst coverage. We expect the coefficients of all market participant variables to be positive, since we hypothesize that the presence of venture capitalists, venture capitalist reputation, underwriter reputation, analyst coverage, and the degree of participation by institutional investors positively affect the heterogeneity in investor beliefs. Table 13 presents the results of this regression analysis. We find that the coefficients of all market participant variables are positive and economically as well as statistically significant in most specifications. For example, in specification (7), venture capital backing results in an increase in turnover of 14.73%; backing by high-reputation venture capitalists generates an additional 12.63% increase in turnover. Further, the influence of high quality underwriters increases turnover by about 12.93%. Finally, an additional analyst following an IPO firm increases turnover by 9.5%, while a 1% increase in institutional investor holdings (as a percentage of total shares sold in the IPO) leads to a 0.31% increase in turnover.[51] This suggests that venture capital backing and the resulting participation by a larger number and higher quality of various market players in an IPO significantly increases the heterogeneity in investor beliefs about the true value of the firm going public.[52]

We now analyze how the heterogeneity in investor beliefs affects firm valuation. In order to study this, we include the above two proxies for heterogeneity in beliefs as explanatory variables in our regression analysis of the extent of overvaluation of VC backed and non-VC backed IPOs (discussed earlier in Section 6.3.4, and presented in Table 10). We expect that the greater the heterogeneity in investor beliefs (as proxied by volume and turnover), the higher is the extent of overvaluation: i.e., we expect the coefficients of these proxies to be positive. Specifications (5), (6), (11) and (12) of Table 10

[51] While we present our multivariate results using first day volume and turnover as the dependent variable, the results are similar when we use average daily volume and turnover measured over the first week or first month of trading after the IPO.

[52] We have also implemented a similar analysis based on another proxy for the heterogeneity in investor beliefs, namely, time of first trade in the IPO stock (used by Houge, Loughran, Suchanek, and Yan (2001)). Our findings using this proxy produce results similar to those presented above: the heterogeneity in investor beliefs is greater for VC backed versus non-VC backed IPOs and for high-reputation versus low-reputation VC backed IPOs.

present these regression results. Consistent with our hypothesis, we find that volume and turnover have a significantly positive effect on overvaluation as measured by the OP/IV ratio. Moreover, when these proxies for the heterogeneity in investor beliefs are included in the set of independent variables, the market participant variables become less significant, as expected.[53]

In summary, there seems to be some empirical support for the notion that one of the mechanisms through which venture backing (especially backing by high-reputation venture capitalists) affects IPO equity valuation is by attracting high quality market players to the IPO, which, in turn, increases the heterogeneity in investor beliefs about the IPO firm's future prospects. Consequently, while both VC backed and non-VC backed firms are overvalued at the time of IPO, the extent of overvaluation is greater for VC backed firms (especially for those firms backed by higher reputation venture capitalists).

8. Conclusion

In this paper we have attempted to empirically distinguish between three possible roles of venture backing in IPOs: certification, market power, and screening and monitoring. We argued that IPO underpricing is not the most appropriate measure to evaluate the role of venture backing in IPOs. Instead, we compared four measures between VC backed and non-VC backed (and between high-reputation VC backed and low-reputation VC backed) IPOs: the ratio of the IPO value of the firm going public to its intrinsic value; the ratio of the secondary market value of the IPO firm to its intrinsic value at the close of the first day of trading in the secondary market, as well as one year, two years, and three years after the IPO; the extent and quality of participation by underwriters, analysts, and institutional investors in the IPO; and the post-IPO operating performance of firms going public.

Our results can be summarized as follows. First, while both venture backed and non-venture backed IPOs are overvalued at the offer price relative to intrinsic value, venture backed IPOs are much more

[53] Trading volume and turnover differences across stocks may, however, proxy for liquidity effects unrelated to opinion divergence. Therefore, as a robustness check, we also perform our analysis using a measure of turnover adjusted for liquidity effects. Our adjustment consists of subtracting the average daily turnover of each stock at the end of year three (calculated over one month at the end of that year) from the turnover on the first trading day after the IPO. This adjustment captures any liquidity differences across stocks, so that the adjusted turnover measures trading activity unrelated to liquidity. Our results using this adjusted measure are similar to those obtained using unadjusted volume and turnover.

overvalued than non-venture backed IPOs (and that high-reputation VC backed firms are more overvalued than low-reputation VC backed IPOs). Second, the difference in valuation between venture backed and non-venture backed IPOs (and between high-reputation and low-reputation VC backed IPOs) becomes even larger at the start of trading in the secondary market. Third, a significant portion of this valuation premium of venture backed IPOs over non-venture backed IPOs is explained by the fact that venture backed IPOs are associated with high-reputation underwriters, greater equity holdings by institutional investors, and more extensive analyst coverage. Fourth, the valuation differences between venture and non-venture backed IPOs dissipate over time, almost disappearing at the end of third year after the IPO. Thus, our valuation results and our comparison of participation by underwriters, institutional investors, and analysts across venture backed and non-venture backed IPOs reject the certification hypothesis, and provide considerable support for the market power hypothesis. Fifth, our study of post-IPO operating performance indicates that firms going public with VC backing are indeed of higher quality than those going public without such backing (and that high-reputation VC backed IPO firms are of higher quality than low-reputation VC backed firms), providing some support also for the screening and monitoring hypothesis. Finally, our results indicate that one of the mechanisms through which venture backing (especially backing by high-reputation venture capitalists) affects IPO equity valuation is by attracting high quality market players to the IPO, which, in turn, increases the heterogeneity in investor beliefs about the IPO firm's future prospects.

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Table 1
Number of IPOs, Size, and Market Valuation

This table reports the descriptive statistics for the sample of IPOs from 1980 to 2000. IPOs with an offer price below $5.00 per share, unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within three months of SDC IPO date have been excluded. We further excluded all IPOs that do not have data (or have negative values) on Sales and EBITDA for the year prior to going public available in Compustat. Offer Price Valuation and Market Price Valuation are the valuations of the companies based on offer price and first trading day closing market price, respectively. Valuations are computed using the post-issue shares outstanding as reported in CRSP. Sales, EBITDA, and Net Income are as reported in Compustat for the year prior to going public. Panel A reports descriptive statistics for the full IPO sample; Panel B: for VC backed IPOs, Panel C: for non-VC backed IPOs; Panel D: for high-reputation VC backed IPOs; and Panel E: for low-reputation VC-backed IPOs. Data are from SDC Platinum, CRSP, and Compustat.

Variable	Mean	25%	Median	75%
Panel A: Complete IPO sample (Number of Issues = 2955)				
Offer Price in $	12.37	9.00	12.00	15.00
Offer Price Valuation, $ Millions	187.35	37.41	77.85	164.40
Market Price Valuation, $ Millions	231.40	40.69	86.25	192.57
Net Sales, $ Millions	171.75	16.16	38.10	102.41
EBITDA, $ Millions	24.27	1.94	4.82	12.76
Net Income, $ Millions	5.05	0.47	1.62	4.18
Panel B: VC-backed IPOs (Number of Issues = 989)				
Offer Price in $	12.62	9.75	12.00	15.00
Offer Price Valuation, $ Millions	141.73	50.09	85.38	154.81
Market Price Valuation, $ Millions	201.83	53.69	94.57	189.98
Net Sales, $ Millions	86.99	15.88	29.38	64.96
EBITDA, $ Millions	9.92	1.76	3.74	8.77
Net Income, $ Millions	1.95	0.31	1.37	2.77
Panel C: Non-VC-backed IPOs (Number of Issues = 1966)				
Offer Price in $	12.25	8.50	12.00	15.00
Offer Price Valuation, $ Millions	210.33	31.64	72.50	169.19
Market Price Valuation, $ Millions	246.30	34.32	80.67	194.35
Net Sales, $ Millions	214.45	16.30	43.32	126.14
EBITDA, $ Millions	31.47	2.07	5.70	16.08
Net Income, $ Millions	6.62	0.53	1.80	5.17
Panel D: High-Reputation VC-backed IPOs (Number of Issues = 384)				
Offer Price in $	12.82	10.00	12.00	15.00
Offer Price Valuation, $ Millions	147.13	59.89	97.36	174.55
Market Price Valuation, $ Millions	217.53	66.35	109.74	211.03
Net Sales, $ Millions	47.10	16.29	27.48	52.51
EBITDA, $ Millions	5.66	1.60	3.41	6.53
Net Income, $ Millions	1.90	0.42	1.49	2.77
Panel E: Low-Reputation VC-backed IPOs (Number of Issues = 605)				
Offer Price in $	12.49	9.50	12.00	15.00
Offer Price Valuation, $ Millions	138.30	42.98	78.55	140.86
Market Price Valuation, $ Millions	191.85	44.72	87.19	168.78
Net Sales, $ Millions	112.35	15.29	31.82	80.08
EBITDA, $ Millions	12.63	1.85	4.11	10.28
Net Income, $ Millions	1.98	0.27	1.24	2.77

Table 2
Underpricing of VC Backed and Non-VC Backed IPOs

This table reports the statistics of the first day returns for various IPO sub-samples from 1980 to 2000. The offer price is taken from SDC and first trading day secondary market price is as recorded in CRSP. IPOs with an offer price below $5.00 per share, unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within three months of issue have been excluded. We further exclude all IPOs that do not have data (or have negative values) on Sales and EBITDA for the year prior to going public available in Compustat. Panel A (B) presents the medians (means) of unadjusted first day returns. Panels C and D contain the first day returns for the pair-matched sub-samples. Following Megginson and Weiss (1991) and Barry et al (1990) each VC backed (high-reputation-VC backed) IPO is matched with a single non-VC backed (low-reputation-VC backed) IPO in the same 3-digit SIC code and closest net proceeds. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for the difference in median (Wilcoxon-Mann-Whitney rank sum test) or means (t-statistic) between two sub-samples.

Years	*All IPOs*	*VC Backed IPOs*	*Non-VC Backed IPOs*	*Difference*	*High Rep. VC Backed IPOs*	*Low Rep. VC Backed IPOs*	*Difference*
Panel A: Median of the First Day Returns (%)							
1980-1990	3.13	4.69	2.68	2.01***	5.88	2.72	3.16***
1991-1998	8.13	10.00	7.50	2.50***	17.19	7.07	10.12***
1999-2000	20.23	33.33	14.38	18.96**	37.82	31.25	6.57**
1980-2000	6.65	8.93	5.56	3.37***	12.50	6.52	5.98***
Panel B: Means of the First Day Returns (%)							
1980-1990	9.16	10.10	8.64	1.46	10.94	9.42	1.52
1991-1998	14.14	16.28	13.08	3.20***	21.78	13.40	8.38***
1999-2000	45.45	84.00	30.41	53.59***	76.89	92.54	-15.65
1980-2000	14.68	18.03	13.00	5.03***	21.99	15.51	6.48***
Panel C: Medians of the First Day Returns for Matched Samples (%)							
1980-1990	–	5.16	3.13	2.03***	7.81	1.25	6.56***
1991-1998	–	11.36	10.24	1.12***	16.76	13.75	3.01***
1999-2000	–	33.33	20.14	13.19**	48.08	48.53	-0.45*
1980-2000	–	9.82	7.66	2.17***	14.34	13.04	1.30***
Panel D: Means of the First Day Returns for Matched Samples (%)							
1980-1990	–	10.34	8.53	1.81*	12.40	9.89	2.51
1991-1998	–	17.45	15.44	2.01*	21.87	21.51	0.36*
1999-2000	–	84.85	34.37	50.48***	79.35	53.85	25.50**
1980-2000	–	19.08	14.31	4.76***	22.53	19.92	2.61**

Table 3
The Valuation of VC Backed and Non-VC Backed IPOs Using the Basic Comparable Firm Approach

This table reports the cross-sectional distribution of the ratio of offer price to intrinsic value (OP/IV) for IPOs from 1980 to 2000. The intrinsic value is the fair value of the IPO firm computed based on market price-to-sales, market price-to-EBITDA, or market price-to-earnings ratios of an industry peer. The industry peer is a comparable publicly traded firm in the same Fama and French (1997) industry as the IPO firm and has the closest sales and EBITDA profit margin (EBITDA/Sales) in the pre-IPO fiscal year. OP/IV is the ratio of the offer price to the estimated intrinsic value of an IPO stock. Wilcoxon p-value corresponds to the Wilcoxon rank sum test for median OP/IV equal to 1. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians of two sub-samples. "*Overall*" represents the aggregate sample of IPOs across years. The IPOs are from SDC Platinum and all other data are from CRSP and Compustat.

Year	Full Sample of IPOs			VC Backed IPOs			Non-VC Backed IPOs			Difference in medians	High-Reputation VC Backed IPOs			Low-Reputation VC Backed IPOs			Difference in medians
	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1		No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV =1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	
Panel A: OP/IV Ratio Based on P/EBITDA Multiple																	
1980	27	1.463	0.0171	15	1.506	0.0074	12	1.094	0.3877	0.412*	7	1.441	0.0156	8	1.676	0.0703	-0.236
1981	82	1.880	0.0001	35	1.857	0.0020	47	1.900	0.0066	-0.044	6	4.118	0.5000	29	1.824	0.0205	2.294**
1982	27	2.255	0.0019	9	4.240	0.0391	18	2.143	0.0075	2.097*	5	3.361	0.0625	4	6.826	0.1250	-3.465
1983	165	2.024	0.0001	56	2.441	0.0001	109	1.754	0.0001	0.687	21	4.020	0.0015	35	1.743	0.0002	2.277**
1984	87	1.533	0.0019	31	1.931	0.1043	56	1.377	0.0038	0.554	13	1.931	0.2668	18	2.113	0.2379	-0.182
1985	62	1.409	0.0055	17	2.102	0.0023	45	1.244	0.0899	0.858**	9	2.102	0.0039	8	2.263	0.0703	-0.161
1986	163	1.426	0.0011	43	1.827	0.0007	120	1.260	0.0502	0.567**	20	3.028	0.0026	23	1.592	0.0347	1.436**
1987	137	1.631	0.0105	44	2.176	0.0013	93	1.152	0.2340	1.024***	23	2.2336	0.0026	21	2.073	0.0784	0.160*
1988	50	1.591	0.0055	22	2.565	0.0043	28	1.205	0.1284	1.359**	13	2.961	0.0002	9	1.085	0.5078	1.876**
1989	49	1.211	0.0580	19	1.174	0.6476	30	1.259	0.0339	-0.085	12	1.889	0.3877	7	0.962	0.4531	0.926*
1990	61	1.843	0.0001	32	1.904	0.0067	29	1.733	0.0027	0.170	16	3.324	0.0001	16	1.024	0.8036	2.300**
1991	143	1.152	0.0560	71	1.370	0.0218	72	1.037	0.4068	0.332*	28	1.788	0.0117	43	1.124	0.2229	0.665**
1992	208	1.358	0.0003	95	1.377	0.0052	113	1.206	0.0093	0.171	30	2.333	0.0053	65	1.266	0.0862	1.067**
1993	268	1.424	0.0001	118	1.815	0.0001	150	1.268	0.0072	0.547**	28	1.821	0.0012	90	1.794	0.0002	0.027
1994	230	1.501	0.0001	67	2.582	0.0002	163	1.285	0.0007	1.297***	17	4.271	0.0001	50	1.604	0.0239	2.667***
1995	250	1.934	0.0001	92	2.648	0.0001	158	1.696	0.0001	0.952**	39	3.441	0.0001	53	1.865	0.0008	1.576***
1996	351	1.489	0.0001	97	2.135	0.0001	254	1.328	0.0164	0.807***	40	2.217	0.0008	57	2.075	0.0005	0.143
1997	260	1.548	0.0001	47	2.252	0.0001	213	1.395	0.0002	0.857***	18	3.106	0.0001	29	2.164	0.0027	0.942
1998	130	1.417	0.0004	22	1.932	0.0043	108	1.283	0.0062	0.649***	9	3.036	0.0039	13	1.775	0.0923	1.261
1999	109	4.211	0.0001	28	8.081	0.0001	81	2.883	0.0001	5.198***	17	6.737	0.0003	11	14.779	0.0001	-8.042
2000	87	1.901	0.0009	27	2.112	0.0062	60	1.865	0.0194	0.246	13	5.931	0.0034	14	1.970	0.1796	3.961
Overall	2946	1.586	0.0001	987	2.003	0.0001	1959	1.422	0.0001	0.580***	384	2.815	0.0001	603	1.675	0.0001	1.139***
Panel B: OP/IV Ratio Based on P/Sales Multiple																	
Overall	2946	1.590	0.0001	987	1.926	0.0001	1959	1.408	0.0001	0.518***	384	2.444	0.0001	603	1.692	0.0001	0.753***
Panel C: OP/IV Ratio Based on P/Earnings Multiple																	
Overall	2276	1.653	0.0001	725	2.384	0.0001	1551	1.427	0.0001	0.957***	287	2.704	0.0001	437	2.196	0.0001	0.509***

Table 4

The Valuation of VC Backed and Non-VC Backed IPOs Using the Propensity Score Based Comparable Firm Approach

This table reports the cross-sectional distribution of the ratio of offer price to intrinsic value (OP/IV) for IPOs from 1980 to 2000. The intrinsic value is the fair value of the IPO firm computed based on market price-to-sales, market price-to-EBITDA, or market price-to-earnings ratio of an industry peer. The industry peer is a comparable publicly traded firm in the same Fama and French (1997) industry as the IPO firm and which has the closest propensity score value $P_{i,j}$ based on sales, operating margin (EBITDA/Sales), profit margin (Net Income/Sales), and sales growth. The propensity score logit functions are estimated separately for groups of VC backed and non-VC backed IPOs in each year. Wilcoxon p-value corresponds to the Wilcoxon rank sum test for median OP/IV equal to 1. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians of two sub-samples. "*Overall*" represents the aggregate sample of IPOs across years. The IPOs are from SDC Platinum and all other data are from CRSP and Compustat.

Year	Full Sample of IPOs			VC Backed IPOs			Non-VC Backed IPOs			Difference in medians	High-Reputation VC Backed IPOs			Low-Reputation VC Backed IPOs			Difference in medians
	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1		No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	
Panel A: OP/IV Ratio Based on P/EBITDA Multiple																	
1980	26	1.3178	0.2164	14	1.3251	0.1796	12	1.0988	0.7744	0.226	6	2.8212	0.0313	8	0.9874	0.7266	1.834**
1981	83	1.9006	0.0001	36	1.9362	0.0013	47	1.9006	0.0004	0.036	7	3.3968	0.0156	29	1.8570	0.0079	1.540**
1982	27	2.1758	0.0005	9	9.5122	0.0039	18	1.3844	0.0075	8.128***	5	9.5122	0.5000	4	3.6166	0.1250	5.896
1983	164	1.7643	0.0001	56	2.0224	0.0001	108	1.5344	0.0001	0.488*	21	2.7767	0.0072	35	1.8593	0.0007	0.917
1984	88	1.3558	0.0003	31	1.5691	0.0098	57	1.2743	0.0059	0.295	13	1.1361	0.2668	18	2.2386	0.0075	-1.102
1985	62	1.3081	0.1548	17	1.2459	0.3323	45	1.3768	0.2280	-0.131	9	0.7199	0.5078	8	1.4873	0.0703	-0.767
1986	167	1.2876	0.0183	44	1.5943	0.0658	123	1.1765	0.0627	0.418	21	2.0774	0.1892	23	1.3509	0.2100	0.726
1987	136	1.1469	0.3658	45	1.7408	0.0263	91	0.8174	0.1727	0.923**	23	1.9553	0.0106	22	1.3618	0.5235	0.593
1988	51	1.4367	0.0617	22	2.9446	0.0525	29	1.2753	0.2887	1.669*	13	2.4065	0.0923	9	3.6306	0.1797	-1.224
1989	48	1.1063	0.0745	19	1.0901	0.1671	29	1.2928	0.1766	-0.203	12	1.0799	0.1460	7	1.1647	0.4531	-0.085
1990	60	1.3981	0.0049	31	2.9685	0.0003	29	1.0627	0.4263	1.906***	16	5.7753	0.5000	15	1.2153	0.3018	4.560***
1991	144	1.4036	0.0001	72	1.6168	0.0005	72	1.2906	0.0048	0.326	28	1.6329	0.0041	44	1.4090	0.0174	0.224
1992	209	1.0440	0.4178	96	1.1440	0.1537	113	0.9335	0.2551	0.211*	30	1.4930	0.0142	66	0.8878	0.4028	0.605*
1993	268	1.3298	0.0005	118	1.3226	0.0050	150	1.3323	0.0169	-0.010	28	1.5968	0.0294	90	1.2427	0.0289	0.354
1994	232	1.1651	0.0128	67	1.3225	0.0561	165	1.1462	0.0510	0.176	17	2.6593	0.0490	50	1.1819	0.1981	1.477**
1995	250	1.5409	0.0001	92	1.8529	0.0001	158	1.4520	0.0001	0.401*	39	2.0731	0.0001	53	1.5305	0.0371	0.543
1996	349	1.2485	0.0011	98	1.3975	0.0003	251	1.1871	0.0733	0.210*	41	1.7553	0.0040	57	1.2485	0.0122	0.507
1997	263	1.4389	0.0003	48	1.9760	0.0019	215	1.3130	0.0085	0.663**	18	2.2407	0.0013	30	1.5577	0.0721	0.683
1998	128	1.3541	0.0259	21	1.8384	0.0266	107	1.3175	0.1044	0.521	8	2.3659	0.0078	13	1.2647	0.2668	1.101
1999	110	2.9907	0.0001	29	5.3136	0.0002	81	2.1359	0.0001	3.178**	16	4.6159	0.0213	13	6.6153	0.0002	-1.999
2000	83	1.5013	0.0310	26	1.8246	0.0583	57	1.4377	0.1166	0.387	13	3.7242	0.0034	13	0.8706	0.5811	2.854**
Overall	2949	1.3778	0.0001	991	1.5963	0.0001	1958	1.2883	0.0001	0.308***	384	1.9727	0.0001	607	1.3604	0.0001	0.612***
Panel B: OP/IV Ratio Based on P/Sales Multiple																	
Overall	2949	1.5764	0.0001	991	1.9025	0.0001	1958	1.4152	0.0001	0.487***	384	2.2237	0.0001	607	1.8012	0.0001	0.422***
Panel C: OP/IV Ratio Based on P/Earnings Multiple																	
Overall	2287	1.4985	0.0001	714	1.9506	0.0001	1573	1.3503	0.0001	0.600***	280	2.5436	0.0001	434	1.6453	0.0001	0.898***

Table 5
The Valuation of VC Backed and Non-VC Backed IPOs Using the Discounted Cash Flow Approach

This table reports the cross-sectional distribution of the ratio of offer price to intrinsic value (OP/IV) for IPOs from 1980 to 2000. The intrinsic value is the fair value of the IPO firm estimated using the residual income model of Ohlson (1990) with constant discount rate of 13% and growth rate of 5% after three years. "5% growth" represents the aggregate sample of IPOs across years where IVs are calculated under the assumption of 5% indefinite earnings growth after year 3, "0% growth" represents the aggregate sample of IPOs across years where IVs are calculated under the assumption of no earnings growth after year 3. The statistics corresponding to "5% growth" and "0% growth" are based on pooled time-series, cross-sectional data. Wilcoxon p-value corresponds to the Wilcoxon rank sum test for median OP/IV equal to 1. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians of two sub-samples. The IPOs are from SDC Platinum and all other data are from CRSP and Compustat.

	Full Sample of IPOs			VC Backed IPOs			Non-VC Backed IPOs			Difference	High-Reputation VC Backed IPOs			Low-Reputation VC Backed IPOs			Difference
Year	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	in medians	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	No. of Issues	Median OP/IV	Wilcoxon p-value H_0:OP/IV=1	in medians
1980	28	9.5589	0.0001	14	33.987	0.0001	14	4.215	0.0001	29.772***	5	29.931	0.0001	9	49.643	0.0001	-19.713
1981	82	10.0902	0.0001	37	10.040	0.0001	45	10.141	0.0001	-0.101	8	13.833	0.0001	29	10.040	0.0001	3.793
1982	23	13.6818	0.0001	13	20.724	0.0001	10	10.003	0.0001	10.722	6	31.716	0.0001	7	12.345	0.0001	19.371*
1983	154	9.0449	0.0001	47	13.285	0.0001	107	6.565	0.0001	6.720**	18	24.475	0.0001	29	9.062	0.0001	15.414**
1984	77	6.5587	0.0001	26	14.487	0.0001	51	4.874	0.0001	9.613**	12	19.617	0.0001	14	11.184	0.0001	8.433
1985	56	5.9244	0.0001	14	8.824	0.0001	42	5.018	0.0001	3.806*	7	8.531	0.0001	7	9.118	0.0156	-0.587
1986	153	8.3661	0.0001	46	17.719	0.0001	107	7.105	0.0001	10.614***	23	27.849	0.0001	23	9.087	0.0001	18.762***
1987	122	9.5365	0.0001	42	11.218	0.0001	80	8.087	0.0001	3.131*	22	14.213	0.0001	20	6.562	0.0001	7.652*
1988	45	4.9141	0.0001	18	6.942	0.0001	27	4.664	0.0001	2.278	12	5.727	0.0005	6	11.105	0.0001	-5.379*
1989	47	6.1158	0.0001	17	6.367	0.0001	30	5.916	0.0001	0.450	11	8.596	0.0001	6	4.306	0.0001	4.289
1990	56	8.4795	0.0001	31	15.181	0.0001	25	7.439	0.0001	7.742**	13	14.926	0.0001	18	16.895	0.0001	-1.969
1991	137	5.6812	0.0001	71	9.853	0.0001	66	4.688	0.0001	5.165**	29	15.256	0.0001	42	7.143	0.0001	8.113**
1992	182	7.0402	0.0001	85	8.730	0.0001	97	6.517	0.0001	2.214**	26	12.893	0.0001	59	7.807	0.0001	5.086
1993	209	6.7902	0.0001	89	7.863	0.0001	120	5.706	0.0001	2.158	22	9.682	0.0001	67	7.535	0.0001	2.147
1994	192	6.3823	0.0001	51	7.240	0.0001	141	5.660	0.0001	1.580*	14	7.136	0.0001	37	7.240	0.0001	-0.104
1995	169	6.1905	0.0001	49	10.276	0.0001	120	5.319	0.0001	4.957***	22	13.066	0.0001	27	7.667	0.0001	5.399
1996	240	6.3083	0.0001	56	14.383	0.0001	184	5.213	0.0001	9.170***	23	13.495	0.0001	33	21.326	0.0001	-7.831
1997	192	5.6593	0.0001	36	12.058	0.0001	156	5.170	0.0001	6.887***	16	10.182	0.0001	20	20.005	0.0001	-9.823
1998	85	7.3468	0.0001	11	11.092	0.0001	74	6.002	0.0001	5.091	5	29.471	0.0001	6	9.891	0.0001	19.580
1999	62	8.8350	0.0001	16	22.709	0.0001	46	6.547	0.0001	16.162***	12	28.926	0.0001	4	8.487	0.0001	20.439
5% growth	2311	6.9027	0.0001	769	10.238	0.0001	1542	5.852	0.0001	4.387***	306	13.275	0.0001	463	8.730	0.0001	4.545***
0% growth	2234	8.3098	0.0001	754	12.665	0.0001	1480	6.677	0.0001	5.987***	303	16.128	0.0001	451	11.060	0.0001	5.068***

Table 6
Secondary Market Valuation of VC Backed and Non-VC Backed IPOs Over Time

This table presents the ratio of secondary market price to intrinsic value (SMP/IV) for IPOs over time. The dataset contains IPOs from 1980 to 2000. The intrinsic value is the fair value of the IPO firm computed based on market price-to-sales, market price-to-EBITDA, or market price-to-earnings ratio of an industry peer. The industry peer is a comparable publicly traded firm generated by the basic comparable firm approach. SMP/IV is the ratio of the estimated intrinsic value of the IPO stock to the closing price on the first day of trading in the secondary market (year 0) as well as exactly one, two, and three years after the first secondary market trading day. Wilcoxon p-value corresponds to the Wilcoxon rank sum test for median equal to 1. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians of two sub-samples. The IPOs are from SDC Platinum and all other data are from CRSP and Compustat.

Year with respect to IPO date	VC Backed IPOs			Non-VC Backed IPOs			Difference in medians	High-Reputation VC Backed IPOs			Low-Reputation VC Backed IPOs			Difference in medians
	No. of Issues	Median SMP/IV	Wilcoxon p-value (H_0:SMP/IV=1)	No. of Issues	Median SMP/IV	Wilcoxon p-value (H_0:SMP/IV=1)		No. of Issues	Median SMP/IV	Wilcoxon p-value (H_0:SMP/IV=1)	No. of Issues	Median SMP/IV	Wilcoxon p-value (H_0:SMP/IV=1)	
Panel A: SMP/IV Ratio Based on P/EBITDA Multiple														
0	973	2.320	0.0001	1934	1.521	0.0001	0.800***	377	3.124	0.0001	596	1.806	0.0001	1.318***
1	859	1.324	0.0001	1730	1.105	0.0002	0.219***	341	1.631	0.0001	518	1.134	0.0069	0.497***
2	733	0.933	0.0298	1468	0.877	0.0001	0.056**	284	1.208	0.0218	449	0.796	0.0001	0.412***
3	622	0.832	0.0012	1253	0.768	0.0001	0.065	244	1.047	0.2610	378	0.714	0.0001	0.333***
Panel B: SMP/IV Ratio Based on P/Sales Multiple														
0	973	2.312	0.0001	1934	1.566	0.0001	0.746***	377	3.057	0.0001	596	1.852	0.0001	1.205***
1	859	1.326	0.0001	1730	1.129	0.0001	0.196***	341	1.546	0.0001	518	1.147	0.0054	0.399***
2	733	0.939	0.2190	1468	0.840	0.0001	0.099**	284	1.204	0.0163	449	0.787	0.0036	0.417***
3	622	0.864	0.0065	1253	0.765	0.0001	0.099**	244	1.106	0.1851	378	0.726	0.0001	0.380***
Panel C: SMP/IV Ratio Based on P/Earnings Multiple														
0	707	2.718	0.0001	1526	1.523	0.0001	1.194***	280	3.300	0.0001	427	2.363	0.0001	0.936***
1	730	1.288	0.0001	1463	1.102	0.0007	0.186***	299	1.289	0.0001	431	1.287	0.0001	0.002
2	598	0.905	0.0204	1173	0.808	0.0001	0.097**	236	1.089	0.3013	362	0.857	0.0012	0.231***
3	469	0.746	0.0001	919	0.734	0.0001	0.012	177	0.801	0.0572	292	0.699	0.0001	0.101**

Table 7
Market Participants in VC Backed and Non-VC Backed IPOs: Univariate Tests

This table reports the cross-sectional distribution of underwriter reputation, institutional investor participation, and analyst coverage for IPOs from 1980 to 2000. Panel A presents the analysis of underwriter reputation according to the Carter-Manaster reputation measure updated by Loughran and Ritter (2002). It reports the percentage of IPOs with high-reputation underwriter (ranking of 8 or higher) and average underwriter reputation for each IPO sub-sample. Panel B presents institutional investor participation statistics. It reports the percentage of IPOs with the institutional investors' holdings, number of the institutional investors with IPO allocations, and the institutional investor holdings in IPO as a percentage of shares sold in an IPO. Panel C reports the degree of analyst coverage for various IPO sub-samples for IPO year (year 0) as well as one to three years after an IPO (year 1 through year 3). The t-statistics for means and Z-statistics for medians are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians or t-statistics for the equality of means of two sub-samples. The IPO and underwriter data are from SDC. The institutional investor holdings data are from Spectrum Institutional (13f) Holdings Database of Thomson Financial and available only for 1983-1997 IPO sub-sample. The analyst forecast data are from the I/B/E/S database.

Measure		*VC Backed IPOs*	*Non-VC Backed IPOs*	*Difference*	*High Rep. VC Backed IPOs*	*Low Rep. VC Backed IPOs*	*Difference*
Panel A: Underwriter Reputation in VC Backed and Non-VC Backed IPOs							
% of IPOs with Highly Reputable Underwriter		0.69	0.55	0.15***	0.76	0.65	0.11***
				(8.080)			(3.775)
Average Underwriter Reputation		7.53	6.72	0.81***	7.83	7.33	0.504***
				(9.314)			(4.023)
Panel B: Institutional Investor Participation in VC Backed and Non-VC Backed IPOs							
% of IPOs with Institutional Holdings		94.91	90.37	4.54***	95.74	94.39	1.35
				(4.362)			(0.588)
Number of Institutional Investors Participating in IPO	mean	16.50	13.54	2.96***	16.89	16.25	0.63
				(5.183)			(0.715)
	median	15	9	6***	16	14	2**
				(7.472)			(1.991)
Institutional Investor Holdings as % of Shares Sold in IPO	mean	71.19	53.53	17.66***	73.35	69.87	3.49
				(9.319)			(1.106)
	median	69.74	51.57	18.17***	73.80	67.24	6.56***
				(10.39)			(2.474)
Panel C: Analyst Coverage in VC Backed and Non-VC Backed IPOs							
Percentage of IPOs with Analyst Coverage (Means)	Year 0	59.33	45.52	13.82***	67.10	54.39	12.71**
				(6.14)			(2.13)
	Year 1	86.02	70.09	15.93***	90.57	83.04	7.53***
				(10.92)			(2.60)
	Year 2	89.85	73.01	16.84***	94.91	86.55	8.36***
				(12.18)			(3.72)
	Year 3	86.68	70.21	16.47***	90.07	84.46	5.61*
				(8.95)			(1.54)
Number of Analysts Following (Means)	Year 0	2.90	2.74	0.159**	3.21	2.69	0.520***
				(1.93)			(4.00)
	Year 1	4.27	3.63	0.649***	4.89	3.85	1.041***
				(5.27)			(4.95)
	Year 2	5.08	4.22	0.866***	5.79	4.61	1.182***
				(5.20)			(4.03)
	Year 3	5.55	4.51	1.033***	6.30	5.02	1.280***
				(4.75)			(3.25)

Table 8
Institutional Investor Participation in VC Backed and Non-VC Backed IPOs: Multivariate Tests

This table reports the results of our regression analysis of institutional investors' participation in IPOs between 1983 and 1997. Panel A presents the results of regressions with the number of institutional investors with IPO holdings as the dependent variable. Panel B presents the results with the institutional investor holdings as a fraction of shares sold in IPO as the dependent variable. The independent variables are the VC dummy, the VC reputation dummy, and underwriter reputation. The control variables are size (log of Total Assets), industry dummies, and year dummies. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Panel A: Number of Institutional Investors Participating in IPO				**Panel B: Institutional Investor Holdings as % of Shares Sold in IPO**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VC Backing Dummy	1.820 (3.08)***	1.359 (2.34)**	1.376 (2.30)**	0.823 (1.40)	0.160 (7.55)***	0.141 (6.69)***	0.150 (7.21)***	0.128 (6.17)***
VC Reputation Dummy	1.672 (2.27)**	1.161 (1.57)*	2.098 (2.91)***	1.591 (2.21)**	0.049 (1.68)*	0.028 (0.95)	0.064 (2.23)**	0.043 (1.50)
Underwriter Reputation		0.621 (5.80)***		0.758 (6.68)***		0.026 (6.87)***		0.031 (8.23)***
Log(Assets)	7.742 (22.75)***	7.104 (17.40)***	7.238 (19.87)***	6.427 (14.49)***	0.170 (20.95)***	0.144 (14.95)***	0.151 (17.55)***	0.118 (11.51)***
Industry Dummies	+	+	+	+	+	+	+	+
Years Dummies	–	–	+	+	–	–	+	+
Observations	2485	2485	2485	2485	2485	2485	2485	2485
R^2	0.44	0.45	0.47	0.48	0.30	0.32	0.34	0.36

Table 9
Analyst Coverage in VC Backed and Non-VC Backed IPOs: Multivariate Tests

This table reports the results of our regression analysis of analyst participation in IPOs. The dependent variable is the number of analysts following an IPO company. The independent variables are VC dummy, VC reputation dummy, underwriter reputation, the share of institutional investors as percentage of shares sold in the IPO, and number of institutional investors participating in the IPO. The control variables are size (log of Total Assets), industry dummies, and year dummies. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(6)	(7)	(8)	(9)
VC Backing Dummy	0.304 (4.03)***	0.226 (3.03)***	0.198 (2.51)**	0.222 (2.91)***	0.248 (3.19)***	0.179 (2.32)**	0.189 (2.32)**	0.221 (2.79)***
VC Reputation Dummy	0.572 (4.83)***	0.499 (4.20)***	0.550 (4.30)***	0.509 (4.12)***	0.584 (4.81)***	0.505 (4.14)***	0.520 (3.98)***	0.490 (3.88)***
Underwriter Reputation		0.112 (7.65)***	0.093 (5.83)***	0.078 (4.59)***		0.098 (6.84)***	0.068 (4.39)***	0.058 (3.56)***
Institutional Investors Share			0.422 (3.37)***				0.619 (4.74)***	
Number of Inst. Investors				0.037 (6.18)***				0.041 (6.96)***
Log(Assets)	0.558 (15.72)***	0.441 (10.14)***	0.360 (6.89)***	0.174 (3.16)***	0.689 (21.27)***	0.588 (14.64)***	0.441 (8.63)***	0.240 (4.42)***
Years Dummies	–	–	–	–	+	+	+	+
Industry Dummies	+	+	+	+	+	+	+	+
Observations	2946	2946	2485	2485	2946	2946	2485	2485
R^2	0.31	0.32	0.29	0.33	0.26	0.27	0.25	0.30

Table 10
Analysis of the Valuation Premium in VC Backed and Non-VC Backed IPOs

This table reports the results of our regression analysis of overvaluation. The dependent variable is the log of the offer price to intrinsic value ratio (OP/IV). The OP/IV ratio is generated by the basic comparable firm approach using the EBITDA price multiple. The independent variables are the VC dummy, the VC reputation dummy, underwriter reputation, number of analysts following the firm in the first year after the IPO, share of institutional investors as a percentage of shares sold in the IPO, and the number of institutional investors participating in the IPO. Regression specifications (1) through (7) have size (log of Total Assets), share of the firm sold in IPO, and industry dummies as control variables. Regressions (8) through (14) have size, industry dummies, and year dummies. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VC Backing Dummy	0.292 (5.44)***	0.136 (2.26)**	0.079 (1.27)	0.092 (1.53)	0.070 (1.16)	0.064 (1.04)	0.337 (6.24)***	0.170 (2.80)***	0.096 (1.55)	0.111 (1.84)*	0.082 (1.36)	0.083 (1.35)
VC Reput. Dummy		0.430 (4.76)***	0.335 (3.67)***	0.337 (3.76)***	0.317 (3.52)***	0.328 (3.60)***		0.462 (5.11)***	0.365 (3.98)***	0.362 (4.02)***	0.332 (3.68)***	0.354 (3.87)***
Underwriter Reputation			0.027 (2.39)**	0.023 (2.03)**	0.005 (0.48)	0.019 (1.69)*			0.041 (3.55)***	0.035 (3.04)***	0.013 (1.10)	0.032 (2.74)***
Number of Analysts			0.044 (2.98)***	0.008 (0.52)	0.007 (0.45)	0.032 (2.09)**			0.035 (2.27)**	0.001 (0.05)	0.006 (0.36)	0.027 (1.72)*
Institutional Investors Share			0.238 (3.67)***		0.085 (1.35)	0.193 (3.00)***			0.193 (2.94)***		0.085 (1.32)	0.169 (2.59)***
Number of Institutional Investors				0.022 (9.48)***						0.021 (9.18)***		
1st Day Volume					0.210 (7.99)***						0.213 (7.25)***	
1st Day Turnover						0.00084 (4.40)***						0.00075 (3.68)***
Log(Assets)	-0.134 (6.48)***	-0.135 (6.59)***	-0.296 (10.92)***	-0.396 (14.23)***	-0.401 (13.82)***	-0.282 (10.23)***	-0.159 (7.29)***	-0.161 (7.44)***	-0.314 (11.37)***	-0.411 (14.48)***	-0.405 (13.90)***	-0.296 (10.42)***
Share of Firm Sold in IPO	-1.565 (8.97)***	-1.526 (9.00)***	-1.480 (12.55)***	-1.471 (12.45)***	-1.540 (12.06)***	-1.863 (12.16)***	-1.555 (9.08)***	-1.515 (9.12)***	-1.501 (12.48)***	-1.481 (12.25)***	-1.515 (11.79)***	-1.836 (11.76)***
Year Dummies	+	+	+	+	+	+	+	+	+	+	+	+
Industry Dummies	–	–	–	–	–	–	+	+	+	+	+	+
Observations	2946	2946	2462	2462	2454	2454	2946	2946	2462	2462	2454	2454
R^2	0.15	0.16	0.19	0.21	0.22	0.19	0.16	0.17	0.20	0.23	0.23	0.20

Table 11
Tests of Screening and Monitoring in VC Backed IPOs

This table reports median profitability measures, sales growth rates, and other measures of operating performance for 5 years after the IPO date. Compustat data items for these ratios are: Profit Margin (Net Income (172)/Sales (12)), EBITDA (13)/Total Assets (6), EBITDA (13)/Sales (12), Return on Assets (Net Income (172)/Total Assets (6)), CE+RD/Total Assets (Capital expenditure (128) and Research and Development Expense (46) / Total Assets (6)). Panel A presents statistics for the full sub-samples of IPOs. "Diff" in Panel A represents the differential in median between two sub-samples. Panel B present performance differences where each VC (high-reputation VC) backed IPO is matched to non-VC (low-reputation VC) backed IPO firm. The matching company has to have closest total assets, and be within the same year and industry as defined by Fama and French (1997). "Avg." corresponds to the pooled ratios, where numerators and denominators contain average annual values over a 5-year period. "Diff" in Panel B represent the median of differences in performance characteristics for matched firms. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, for Wilcoxon-Mann-Whitney rank sum test for the equality of medians of two sub-samples. The IPOs are from SDC Platinum and all other data are from CRSP and Compustat.

Year	Panel A: Full IPO Sub-samples (%)						Panel B: Matched IPO Sub-samples (%)					
	VC	Non-VC	Diff.	High Rep.	Low Rep.	Diff.	VC	Non-VC	Diff.	High Rep.	Low Rep.	Diff.
I. EBITDA/Total Assets												
0	15.31	16.30	-0.99**	15.03	15.50	-0.47	15.00	15.93	-0.33	15.51	14.24	0.16
1	14.35	13.57	0.78	14.73	13.89	0.84	14.35	12.94	0.84*	14.94	12.30	1.56*
2	12.58	12.71	-0.12	12.32	12.71	-0.40	12.35	11.92	0.78	12.08	11.67	0.42
3	12.41	12.05	0.35	11.14	13.30	-2.16**	12.46	11.71	-0.27	11.01	11.89	-2.15
4	11.72	11.98	-0.26	10.64	12.31	-1.66**	11.31	11.25	-1.48	9.91	11.12	0.27
Avg.	12.58	12.74	-0.16	12.20	12.93	-0.73**	12.34	12.15	0.24	12.22	11.77	-1.04*
II. Profit Margin												
0	6.38	5.12	1.26***	8.39	5.29	3.10***	6.53	5.44	0.89***	8.32	5.59	2.56***
1	5.39	4.13	1.25***	6.43	4.78	1.66***	5.40	4.17	1.06**	6.49	4.26	2.01***
2	3.96	3.02	0.94**	3.55	4.10	-0.55	3.96	3.05	0.44	3.91	3.75	2.16**
3	3.24	2.40	0.84**	2.78	3.47	-0.69	3.25	2.48	0.27	2.79	3.24	0.13
4	2.37	2.18	0.19	1.98	2.63	-0.65	1.98	1.92	-0.09	1.47	2.28	0.05
Avg.	2.66	2.69	-0.03	2.50	2.77	-0.27	2.49	2.63	0.17	2.66	2.62	-1.22**
III. Sales Margin												
0	14.67	13.71	0.96**	15.48	14.27	1.21*	14.78	13.78	1.14**	15.49	14.37	1.78**
1	13.83	11.76	2.07***	14.18	13.38	0.80	13.97	11.39	2.02***	14.68	12.69	1.58*
2	12.15	10.38	1.77**	11.82	12.37	-0.54	11.99	9.84	1.40**	11.44	11.95	-0.52
3	11.13	9.69	1.44**	9.93	11.90	-1.97**	10.91	8.73	1.31**	9.66	11.27	-0.97
4	10.27	9.29	0.98	9.42	11.26	-1.84**	9.84	9.01	-0.10	8.42	10.51	0.63
Avg.	11.72	10.80	0.92	10.91	12.29	-1.38	11.41	10.28	-0.33	10.85	11.65	-0.31
IV. ROA												
0	7.11	6.50	0.61	8.22	6.21	2.01***	7.07	6.85	0.41	8.53	6.56	1.10***
1	5.82	4.84	0.97***	6.86	5.13	1.72**	5.80	5.10	0.39	6.57	4.83	1.33*
2	4.43	3.63	0.80*	4.25	4.43	-0.18	4.31	3.74	0.69*	4.65	3.58	0.82
3	3.72	3.14	0.58*	3.45	4.08	-0.63	3.68	3.44	-0.06	3.56	3.52	-0.24
4	2.95	2.83	0.12	2.26	3.14	-0.88	2.38	2.55	-0.27	1.49	2.55	-0.42
Avg.	3.28	3.48	-0.20	3.27	3.28	-0.01	3.10	3.47	0.69	3.33	2.87	-0.58
V. CE and RD in Total Assets												
0	12.47	8.43	4.04***	14.51	10.64	3.86***	12.41	8.62	2.19***	14.03	11.85	2.48***
1	14.47	9.39	5.08***	17.21	12.38	4.83***	14.58	9.81	2.48***	17.16	14.42	1.21**
2	13.14	7.98	5.15***	16.71	11.07	5.64***	13.25	8.50	2.88***	16.57	13.01	1.73**
3	12.77	7.30	5.47***	16.65	10.52	6.14***	13.13	8.50	2.90***	17.29	12.96	2.48***
4	13.31	6.93	6.37***	16.83	11.10	5.73***	13.33	7.84	3.11***	17.72	14.54	2.90***
Avg.	14.32	8.83	5.49***	17.65	11.76	5.90***	14.15	9.66	-2.14***	17.69	13.96	-2.44***
VI. Growth in Sales												
0	142.85	131.75	11.10***	150.64	137.27	13.36***	143.71	134.82	8.51***	143.71	134.82	8.51***
1	131.40	125.84	5.56***	136.04	128.88	7.16**	131.83	127.43	5.56***	133.69	128.48	0.79
2	123.80	117.19	7.53***	124.28	123.05	1.23	123.86	118.32	3.36*	123.27	120.13	2.80**
3	120.40	112.87	7.53***	123.47	118.76	4.71	121.13	114.01	3.37**	121.17	114.74	2.02
4	115.19	110.09	5.09***	115.14	115.40	-0.26	114.24	110.25	16.21***	113.02	111.83	0.78
Avg.	199.69	173.20	26.49***	219.53	192.62	26.90***	201.22	185.41	-0.61**	204.61	190.30	13.80***

Table 12
Volume and Turnover in VC backed and Non-VC Backed IPOs: Univariate Tests

This table reports the cross-sectional distribution of average daily volume and turnover for VC backed and non-VC backed IPOs from 1980 to 2000. Panels A and B report means and medians, respectively, of the trading volume calculated as daily averages of log (number of shares traded multiplied by price). Panels C and D report means and medians, respectively, of the daily turnover calculated as daily averages of the percentage of number of shares outstanding (NSO) traded during the period. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively. The trading volume data are from CRSP.

	VC	Non-VC	Difference	High Rep.	Low Rep.	Difference
Panel A: Log (Volume*Price): Means						
1st Day	16.44	16.15	0.30***	16.71	16.28	0.43***
1st Week	14.79	14.54	0.25***	15.04	14.62	0.42***
1st Month	13.61	13.33	0.27***	13.85	13.45	0.40***
Panel B: Log (Volume*Price): Medians						
1st Day	16.77	16.37	0.40***	17.03	16.60	0.42***
1st Week	14.97	14.65	0.32***	15.22	14.80	0.42***
1st Month	13.67	13.32	0.35***	13.94	13.50	0.43***
Panel C: Turnover (% of NSO): Means						
1st Day	21.418	19.237	2.181***	22.41	20.78	1.621*
1st Week	6.494	6.056	0.438**	6.82	6.29	0.532**
1st Month	2.269	2.121	0.148**	2.36	2.21	0.156*
Panel D: Turnover (% of NSO): Medians						
1st Day	18.243	14.325	3.918***	20.485	16.961	3.524**
1st Week	5.842	4.728	1.114***	6.421	5.384	1.037**
1st Month	2.026	1.674	0.352***	2.218	1.890	0.328**

Table 13
Volume and Turnover in VC backed and Non-VC Backed IPOs: Multivariate Tests

This table reports the results of our regression analysis of IPO first trading day volume and turnover. Panel A presents the analysis where the dependent variable is the first trading day volume calculated as log (number of shares traded during the first trading day multiplied by price). Panel B present the analysis where the dependent variable is the first trading day turnover calculated as a percentage of number of shares outstanding traded during the first trading day. The independent variables are the VC dummy, the VC reputation dummy, underwriter reputation, share of institutional investors as a percentage of shares sold in IPO, and number of institutional investors participating in the IPO. Specifications (1) though (4) use the following set of control variables: size (log of total assets) and number of shares sold in IPO as percentage of number of shares outstanding. Specifications (5) through (8) incorporate additionally industry dummies, and year dummies as control variables. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: First Day Volume								
VC Backing Dummy	0.428	0.245	0.071	0.116	0.256	0.100	0.056	0.102
	(6.98)***	(3.28)***	(1.23)	(2.25)**	(4.14)***	(1.37)	(1.03)	(2.07)**
VC Reput. Dummy		0.480	0.133	0.118		0.429	0.147	0.142
		(4.79)***	(1.84)*	(1.83)*		(4.51)***	(2.26)**	(2.41)**
Underwriter Reput.			0.114	0.108			0.137	0.129
			(9.57)***	(9.29)***			(10.97)***	(10.52)***
Number of Analysts			0.184	0.112			0.132	0.070
			(13.29)***	(7.24)***			(10.58)***	(5.12)***
Number of Inst. Inv.				0.046				0.040
				(15.64)***				(14.46)***
Inst. Investors Share			0.769				0.511	
			(8.15)***				(6.07)***	
Size	0.906	0.907	0.444	0.274	0.897	0.896	0.433	0.263
	(41.43)***	(41.67)***	(17.07)***	(10.14)***	(35.51)***	(35.69)***	(16.18)***	(9.37)***
Share of Firm Sold in IPO	-0.329	-0.275	0.132	0.095	-0.378	-0.342	-0.117	-0.148
	(2.01)**	(1.63)	(0.95)	(0.71)	(2.59)***	(2.31)**	(0.84)	(1.11)
Observations	2916	2916	2477	2477	2916	2916	2477	2477
R^2	0.38	0.39	0.52	0.58	0.47	0.48	0.61	0.66
Panel B: First Day Turnover								
VC Backing Dummy	43.714	28.280	17.501	21.244	34.644	20.575	14.731	17.611
	(6.72)***	(3.85)***	(2.55)**	(3.24)***	(5.32)***	(2.87)***	(2.22)**	(2.77)***
VC Reput. Dummy		40.423	9.403	8.483		38.698	12.638	12.358
		(3.81)***	(1.08)	(1.01)		(3.88)***	(1.56)	(1.56)
Underwriter Reput.			10.601	10.384			12.931	12.527
			(8.50)***	(8.26)***			(9.87)***	(9.58)***
Number of Analysts			14.487	10.028			9.507	5.942
			(8.72)***	(5.52)***			(6.27)***	(3.62)***
Number of Inst. Inv.				2.966				2.316
				(9.47)***				(7.89)***
Inst. Investors Share			55.752				31.756	
			(6.65)***				(4.09)***	
Size	17.310	17.394	-19.290	-29.414	11.017	10.856	-22.402	-32.116
	(6.90)***	(6.93)***	(7.10)***	(10.03)***	(3.97)***	(3.93)***	(8.14)***	(10.77)***
Share of Firm Sold in IPO	351.439	355.957	427.091	423.205	338.339	341.567	396.551	394.248
	(5.88)***	(5.85)***	(16.96)***	(17.23)***	(5.72)***	(5.70)***	(16.28)***	(16.57)***
Observations	2916	2916	2477	2477	2916	2916	2477	2477
R^2	0.19	0.19	0.33	0.36	0.29	0.30	0.44	0.46

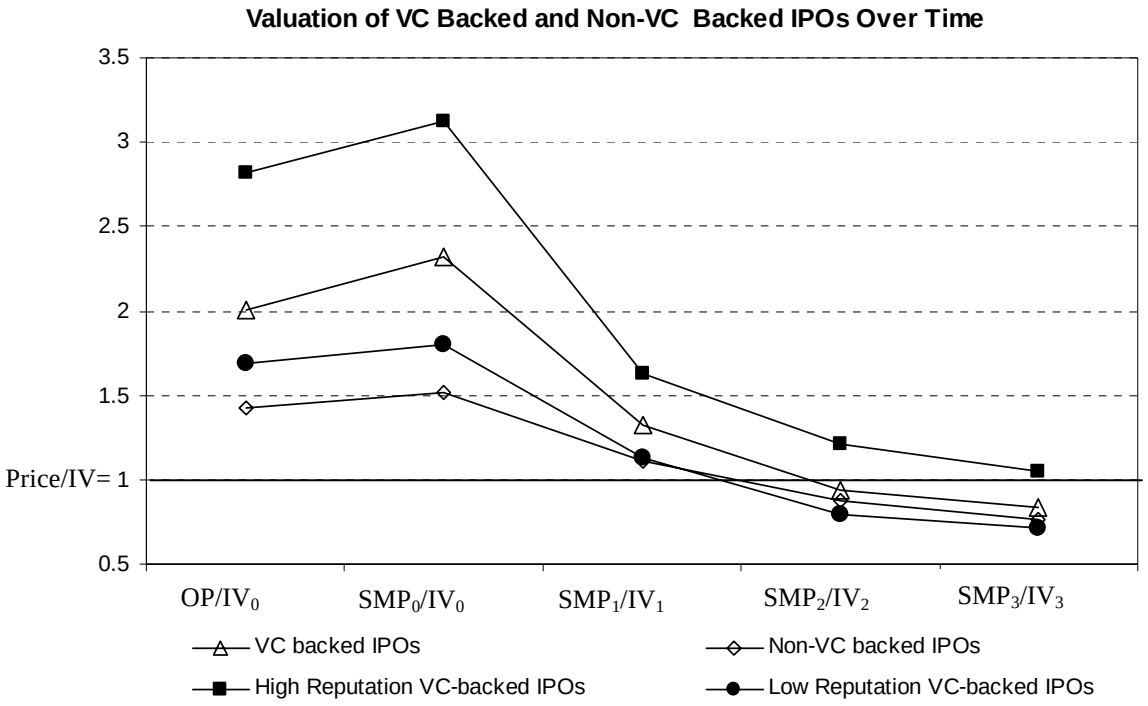

Figure 2: Valuation of VC backed and Non-VC Backed IPOs Over Time
This figure depicts the changes in the price to intrinsic value ratios of venture backed and non-venture backed IPOs over time. OP/IV is the offer price to intrinsic value ratio at the IPO date. SMP_t/IV_t is the ratio of secondary market price to intrinsic value at time t. Time 0 is the first secondary market trading day, while times one through three correspond to exactly one, two, and three years after the first secondary market trading day. The horizontal line Price/IV=1 indicates the cut-off point where market price is equal to the intrinsic value.