

The equity ownership of brokerage firms in IPO issuers and the firms' research coverage

Abstract

We examine the relation between brokerage firms' research coverage and the firms' equity ownership in IPO issuers due to earlier venture investments. The ownership aligns the interest of firms and issuers by inducing affiliated firms to provide research coverage by *Institutional Investor* star analysts. The ownership also enhances the credibility of affiliated analysts with investors and does not encourage affiliated analysts to provide booster shots to issuers' stock prices. The recommendations of affiliated analysts are less overly optimistic and produce larger event period abnormal returns in magnitude, especially for issuers with greater information asymmetry. Our results indicate that offering venture investment and analyst research under one roof benefits both issuers and public investors and does not create serious conflicts of interest between affiliated firms and investors. Our results also yield several implications for the recent rules of the NASD and NYSE on the equity ownership of firms and analysts.

1. Introduction

Our paper examines whether the equity ownership of brokerage firms in venture capital (VC) backed IPOs (“brokerage VC ownership”, thereafter BVC ownership) affects the firms’ research coverage.¹ Since the early 1990s, firms made substantial venture investments in young, privately held companies, often suggesting a willingness to take the companies public. Firms’ analysts actively participated the decision-making about the investments, the going-public process, and ensuing coverage of these companies, frequently making personal investments as well [Maremont (2000), SEC (2005) and Unger (2001)]. Firms reaped billions of dollars of profits by bringing these companies public.²

Following the meltdown of internet and technology stocks, investors, regulators, and lawmakers have raised serious concerns that having venture investing and analyst research under one roof may create conflicts of interest between brokerage firms and public investors, similar to their concerns about having underwriting services and analyst research under one roof [e.g., Lin and McNichols (1998) and Michaely and Womack (1999)].³ Specifically, they are concerned that analysts from firms with VC ownership (“affiliated analysts and firms”) issue more overly optimistic recommendations about IPO companies than unaffiliated analysts, especially for weaker issuers and during the periods in which affiliated firms are likely to unload VC ownership, leaving public investor stranded.⁴ These concerns are similar to the arguments that lead to the passage of the Glass-Steagall Act that separated commercial and investment banking for almost seven decades and also predict that the stock recommendations of affiliated analysts are less informative in terms of the magnitude of associated abnormal returns. We term these concerns the

¹ According to SEC (2005), sell-side analysts typically work for full-service broker-dealers, whereas buy-side analysts work for institutional money managers. Independent analysts work for firms without investment banking business. We use “analysts” and “firms” to refer to sell-side analysts and brokerage firms, respectively. We use “issuers” or “companies” to refer to the entities that analysts cover.

² These profits were a considerable portion of the overall profits of brokerage firms. For example, about 15% of the net income of Goldman Sachs in 1999 is from these profits. The figure is similar in many other firms.

³ The SEC refers to this phenomenon as “venture investing,” which is among four areas of conflict that “stand out” [Unger (2001) and SEC (2005)]. See also a front-page story in the Wall Street Journal about this phenomenon [Maremont (2000)]. An *Institutional Investor* article argues that it is one of “the most fundamental conflict of interest of all Wall Street Analysts” [Schack (2001)].

⁴ For example, Chase H&Q took Infospace public in December 1998. Right after the expiration of the lockup period, Chase’ venture capital subsidiary sold all the shareholdings from a venture investment made six months before IPO, pocketing a 7,000% profit. At the same time, Chase’s analyst was reiterating a “must-own holding” on Infospace [Maremont (2000)].

investor conflicts of interest hypothesis. Supporters of this hypothesis have argued for the prohibition of analyst and BVC ownership in IPOs.

On the contrary, supporters of BVC ownership argue that combining VCs and analyst coverage under one roof may generate benefits for both issuers and public investors. BVC ownership can align the interests of firms and issuers by inducing affiliated firms to provide coverage from *Institutional Investor (II)* star analysts. Since *II* stars garner substantially higher reputation and recognition, and stars stake their reputation in covered companies, star coverage is likely to provide additional certification for IPO issuers and enhance the value of the firms' investments. We term this the *issuer alignment of interest hypothesis*. Given their riskier nature and lack of experience as public corporations, as well as the limited public information about their operations and financial conditions, IPO issuers have significantly more uncertainty and information asymmetry about their value than seasoned issuers do. The certification provided by star analysts is especially valuable to them.⁵

Supporters of BVC ownership also argue that it should enhance the information advantage of affiliated analysts, which may benefit public investors. Since the firms' VCs generally obtain board representation or observation rights, frequent financial reports, and easy access to management, BVC ownership is likely to provide information advantage to affiliated analysts over unaffiliated analysts and public investors. BVC ownership is also likely to give affiliated analysts stronger incentive to investigate the companies and collect new information. Since firms have long been required to disclose BVC ownership in prospectus, even without additional regulations, affiliated analysts may timely and truthfully communicate the information advantage to public investors because of 1) the greater vulnerability of affiliated firms to litigation risks and regulatory liabilities conditional on their information advantage and 2) the repeated game nature of IPO underwriting business, i.e., an institutional investor is unlikely to be receptive to IPO allocation from affiliated firms if affiliated analysts are more misleading. In addition, Ljungqvist, Marston, Wilhelm (2006) show that analyst optimism does not help their firms gain

⁵ Consistent with star coverage being valuable to the issuers, prior research shows that star coverage has a strong influence on the market shares of investment banks [e.g., Dunbar (2000), Krigman, Shaw, Womack (2001), Cliff and Denis (2004), Rau, Patel, Khorana, Clarke (2007)].

underwriting business from issuers. As a result, the recommendations of affiliated analysts may be less overly optimistic and more informative than unaffiliated analysts.⁶ We term this the *enhanced credibility hypothesis*. The fact that firms put their own capital at risk through post-IPO shareholdings with potentially lengthy lockup periods may give affiliated analysts even more credibility.⁷

The debate on whether and how analysts and BVC ownership should be allowed in pre-IPO companies culminated in the SEC approval of the new NASD Rule 2711 and amendments to the NYSE Rule 351 and 472 in 2002, a significant portion of which addresses the equity ownership and trading of analysts and their firms. Despite the public furor over biased analyst research, regulators mostly adopted a market based approach of encouraging disclosure, instead of prohibiting all types of ownership. Specifically, the rules prohibit analysts from obtaining securities before an issuer's IPO and from trading against their own recommendations. The rules also require analysts to disclose the presence of personal ownership in seasoned companies and of their firms' ownership exceeding 1% in IPO or seasoned companies in research reports and public appearance.⁸

Using a sample of venture-backed IPOs over the 1994-2000 period, we examine the impact of BVC ownership on analyst research before the passage of the new rules in order to investigate whether the new rules related to BVC ownership are necessary or appropriate. Since all the hypotheses predict that the impact of BVC ownership increases with the size of BVC ownership, we focus on the impact of percentage BVC ownership.

We first focus on the impact of BVC ownership on the recommendations made in the first year after IPOs. We find that the likelihood of firms assigning *II* stars, especially higher ranked stars, increases

⁶ Stock recommendations are known to be overly optimistic, especially those on IPO issuers [e.g., Lin and McNichols (1998), Michaely and Womack (1999), Bradley, Jordan, Ritter (2003), James and Karceski (2006), and Ljungqvist, et al. (2006)]. For our IPO sample, 85.5% of the recommendations are strong buys or buys. Sell recommendations are less than one percent of all recommendations.

⁷ Brokerage firms have to disclose more than 5% equity ownership if they are not in the syndicate, in which case the ownership is subject to the typical six-month lockup period faced by pre-IPO investors. They also have to disclose any equity ownership if they are also in the syndicate, in which case the ownership may be subject to a much longer lockup period.

⁸ See Appendix for details about the rules on equity ownership. The NYSE and NASD had rules that required disclosure in research reports. However, the language in those rules used to be particularly vague –requiring only a boilerplate statement that a firm, the analyst or another employee "may" have an interest in the shares.

with the size of BVC ownership, which is consistent with the *issuer alignment of interests hypothesis*.

BVC ownership also benefits public investors on two aspects. First, the size of BVC ownership reduces the likelihood of affiliated analysts issuing overly optimistic recommendations and increases the likelihood of them issuing negative recommendations when compared to unaffiliated analysts. Second, the magnitude of the event period abnormal returns of stock recommendations increases with the size of BVC ownership, and the magnitude of the post-event returns in the year after recommendation issuances are unrelated to BVC ownership. These results are consistent with the *enhanced credibility hypothesis* and are inconsistent with the *investor conflicts of interest hypothesis*.

The *conflicts of interest hypothesis* predicts that affiliated analysts would provide booster shots for weaker and riskier issuers in particular, whereas the *enhanced credibility hypothesis* predicts that affiliated analysts would be more objective and informative for the same issuers to avoid liabilities and tainted reputation. When we examine the subsamples of different information asymmetry and uncertainty, the enhanced credibility are stronger for riskier issuers with shorter history and fewer tangible assets, which provides further support for the enhanced credibility hypothesis.

In the second and third years after IPO, or after BVCs are likely to have made share distributions to VC investors, the alignment of interests and enhanced credibility that exist in the first year after IPOs dissipates, consistent with the benefits to issuers and investors being attributable to BVC ownership.

Further, we find that affiliated analysts are less overly optimistic than unaffiliated analysts during lockup expiration periods and other periods during which VCs are likely to make share distribution to investors in VC funds, even though the differences are mostly insignificant. We also do not find any concentration in the issuances or reiterations of positive recommendations from affiliated analysts during these periods when compared to unaffiliated analysts. Overall, our results suggest that allowing BVC ownership, when combined with detailed disclosure and restricted sales, benefits both IPO issuers and public investors and does not create serious conflicts of interest between firms and public investors. Our results support the generally market-based approach of regulators while providing specific implications to improve the new rules on several aspects.

Our paper makes at least four contributions to the existing literature. First, to our knowledge, our paper is the first to examine the impact of BVC ownership on firms' research coverage, a phenomenon that has attracted extensive media coverage and heightened attention from various market participants. Second, our paper provides evidence for an aspect of universal banking that has not been examined before and complements several other strands of universal banking literature as discussed in the next section. Third, our paper has direct implications for the necessity and appropriateness of the new NASD and NYSE rules on BVC ownership, and provides indirect evidence for the new rules on brokerage ownership in seasoned companies and analyst ownership in general, as discussed in the next section. Fourth, to our knowledge, our paper is the first to examine what determines star coverage and whether analysts provide booster shots to issuers' stock prices by reiterating positive recommendations at lockup expirations or other periods of likely share distribution of VCs.

Section 2 discusses the relation of our paper with the existing literature and with the questions about analyst ownership. Section 3 describes sample data. Section 4 reports the results of BVC ownership. The last section summarizes our conclusions.

2. Relation with the Existing Literature and with the Questions about Analyst Ownership

Our paper complements several strands of the universal banking literature. For example, a growing literature examines the impact of underwriting relationship on analyst research. This literature, also closely related to the recent NASD and NYSE rules, finds that the stock recommendations and earnings forecasts of underwriter analysts are more biased than the other analysts [e.g., Lin and McNichols (1998), Michaely and Womack (1999), O'Brien, McNichols, Lin (2005), and James and Karceski (2006)].⁹ We examine the impact of BVC ownership, another important relation between firms and issuers, on analyst research and we control for underwriter status in our analysis. We also provide evidence for the research coverage of underwriters on over a longer sample period than prior research.

⁹ Some recent studies question the robustness of this evidence with different samples [e.g., Bradley et al. (2006) and McNichols, O'Brien, and Pamukcu (2006)]

Our paper is also related to the universal banking literature that examines the impact of VC equity ownership of financial institutions (FIs) on IPO process. For example, using the actual size of equity ownership of a variety of FIs including commercial banks, investment banks, and insurance companies, as well as the size of loan ownership of banks, Li and Masulis (2006) show that all types of ownership by various FIs reduces underpricing, or the discount demanded by rational investors to purchase IPO shares.¹⁰ Despite the beneficial impact of FI ownership, little is known why underpricing is reduced. Given that IPO underwriting service increasingly includes post-IPO services such as research coverage and market making [e.g., Aggarwal (2000), Ellis, Michaely, and O'Hara (2000), Krigman, Shaw, and Womack (2001), and Cliff and Denis (2004)], rational investors are likely to demand smaller underpricing at IPOs if they expect the IPO coverage from affiliated firms to be stronger, as well as more objective and informative. Thus, our paper helps provide potential evidence of a specific channel through which BVC ownership can reduce IPO underpricing.¹¹

Our paper also complements other prior literature. Our investigation of analyst research during the period that VCs are likely to make share distribution complements the analysis of Bradley, Jordan, Ritter (2003) for the period immediately after the quiet period. Our examination of star coverage complements the literature on regular coverage.¹² Star coverage has an independent and stronger influence on the issuers' decision to award investment banking deals than regular coverage [e.g., Dunbar (2000), Krigman, Shaw, Womack (2001), Cliff and Denis (2004), Rau, Patel, Khorana, Clarke (2007)].

Further, our paper indirectly addresses the concern that wide-spread analyst ownership in IPO issuers and seasoned companies makes analysts frequently tout these companies in research reports and

¹⁰ Our paper is also related to the extensive literature that examines the effects of bank lending on underwriting process. See Drucker and Puri (2006) for an excellent review.

¹¹ Another study by Gompers and Lerner (1999) finds no significant relation between underpricing and an indicator variable for underwriter share ownership in venture-backed IPOs.

¹² For example, Michaely and Womack (1999) and Bradley, et al. (2003) find that lead underwriters are more likely to provide IPO coverage and Cliff and Denis (2004) find that issuers purchase regular coverage with underpricing, whereas Bradley et al. (2006) show that for the 1999-2000 period these results are limited to the coverage initiated at the end of quiet period.

news media.¹³ Analyst ownership can create benefits and conflicts similar to BVC ownership and has attracted as much attention as BVC ownership [e.g., Gasparino and Opdyke (2001), Opdyke (2001a), Schack (2001), and Unger (2001)]. A division on whether analyst should own stocks they cover has led to the different approaches being adopted in practice [e.g., Schack (2001), Boni and Womack (2002a), Boni and Womack (2002b), Craig (2001), Delpit (2001)].¹⁴ For example, facing criticism, brokerage firms started to disclose their and analysts' stock ownership in research reports since 2001. In widely reported moves, several large firms banned any analyst ownership.¹⁵ The NASD and NYSE rules enacted later mandate disclosure of analyst ownership in regular stocks and prohibit pre-IPO ownership of analysts.¹⁶

The division and different approaches reflect a lack of empirical evidence about the impact of analyst ownership [Opdyke (2001a)], partly because data constraints preclude direct large sample analysis. Few data exist for analyst ownership. Before the implementation of the recent rules, Analysts do not have to disclose personal ownership. The spotty data that exist in this period make it difficult to clearly identify analyst with and without ownership. After the implementation of the recent rules, analysts are only allowed to invest in seasoned companies for which they have to disclose the presence but not the actual size of ownership. This makes it no longer possible to study the impact of pre-IPO analyst ownership on their IPO coverage. Also, even the post-regulation data for the presence of analyst ownership in seasoned companies is limited because several large firms now prohibit this ownership. Further, even if actual ownership is available, it is usually tiny in either percentage or dollar terms. Its

¹³ For example, about 120 of 600 Merrill Lynch analysts world-wide own stocks they cover [Gasparino and Opdyke (2001)]. CSFB and Edward Jones both report that one-third of their analysts own stocks under coverage. In a survey conducted by the Securities and Exchange Commission (SEC), nearly 30% of surveyed analysts bought cheap stock in private companies that they later covered after the companies finish IPOs. The survey also shows that some analysts pocketed millions of dollars of profits by executing trades contrary to their buy recommendations to investors, and some even sold short stocks that they have a buy rating [Opdyke (2001b)].

¹⁴ For example, among industry practitioners, Schack (2001) reports that most sell-side professionals do not see analyst ownership as problematic, whereas Boni and Womack (2002b) find that buy-side professionals are evenly divided about analyst ownership in regular stocks, but only 8% of their survey respondents agree that analysts should be allowed to have pre-IPO ownership.

¹⁵ For example, Morgan Stanley and Goldman Sachs require analysts to disclose their ownership and Goldman also requires disclosure of the ownership by members of their households. Prudential requires disclosure if analysts own more than \$10,000 of stocks. Edward Jones, Merrill Lynch, and Credit Suisse First Boston banned analysts from owning shares of companies under coverage [Gasparino and Opdyke (2001) and Opdyke (2001a)].

¹⁶ See Appendix for two recent enforcement cases by the SEC and NASD related to analyst ownership.

impact is difficult to understand unless we can compare it to the personal wealth of analysts. Given these data constraints, the controversies related to analyst ownership seem likely to remain unresolved.¹⁷

Fortunately, our results help understand the impact of analyst ownership on research coverage due to the following reasons. First, similar to the pre-new-rule disclosure requirements for BVC ownership, or the period that we examine, analysts are now required to disclose the presence of any ownership in covered companies. Second, the equity ownership of analysts and their firms in IPOs has always been subject to the same sale restrictions. Both analysts and their firms have to comply with lockup restrictions and have to file Form 144 to disclose trading of shares acquired through venture investing. Analyst ownership in seasoned companies is subject to sale restrictions after the passage of the new rules. Third, since analyst compensation is likely to depend on the returns of their firms' VC ownership, the incentives of analysts due to BVC ownership are likely to be similar to those due to their own ownership. For similar reasons, our paper also has implications for the impact of brokerage ownership in seasoned companies on research coverage.¹⁸

3. Data Sources and Descriptive Statistics

The IPO sample includes 1,286 venture-backed IPOs from Securities Data Corporation's (SDC) Corporate New Issue Database over the 1994-2000 period, excluding unit offers, closed-end funds (including REITs), ADRs, foreign issues, reverse LBOs, limited partnerships, equity carve-outs, and IPOs with offer prices below \$5, which are likely to have different accounting treatment and different incentives for going public.¹⁹ After obtaining prospectuses for all 1,286 IPOs, we verify their venture-

¹⁷ Our paper complements a contemporaneous study by Johnston (2006) who investigates the impact of analyst ownership on IPO research coverage on the basis of small samples. His examination is hampered by the above data constraints. He finds an insignificant impact of analyst stock ownership on research coverage, except that the ownership reduces recommendation bias. Given the much larger size of BVC ownership, the economic significance of BVC ownership is likely to dominate that of analyst ownership.

¹⁸ The differences for seasoned companies are that analysts need to disclose the presence of more than 1% brokerage ownership and of any ownership of themselves and that there is no sale restriction for brokerage ownership.

¹⁹ We focus on this period because it is associated with a large number of venture backed IPOs. We start our sample from 1994 also because our recommendation data start in October 1993. We end our sample in 2000 also because Ljungqvist, Malloy, and Marston (2006) argue that the I/B/E/S recommendation data are manipulated after 2000, because the complete analysis of our paper requires four years of data after IPOs, and because it helps understand

backing status by reading the “Principal Shareholder” and “Underwriting” sections of each prospectus. Excluding 17 IPOs that are not really venture backed and 34 IPOs without analyst coverage leaves us a final sample of 1,235 IPOs.

Stock recommendations are from the Institutional Brokers Estimate System (I/B/E/S) U.S. Detail Recommendation History File that we obtain in 2002. The database starts in October 1993, and includes both brokerage firm-specific recommendations and standardized I/B/E/S recommendations. The standardized I/B/E/S recommendations are integer ratings from 1 through 5, corresponding to “strong buy,” “buy,” “hold,” “underperform,” and “sell.” We merge underperforms and sells into one “sell” category and assign it an integer rating of 4 in our analysis given the scarcity of negative recommendations. Following the prior literature, we focus on the recommendations made in the first year after IPO, though we also examine those made in the second and third years [e.g., Bradley, Jordan, and Ritter (2006), Cliff and Denis (2004), James and Karceski (2006), and Michaely and Womack (1999)]. This leads to a sample of 8,551 recommendations made by 181 firms and 1,756 analysts in the first year after IPOs.

We obtain details on IPO characteristics from many sources. In this paper, we focus on the percentage shareholdings of brokerage firms in issuers right after IPOs because this is the most recent ownership figure when analysts initiate coverage after the quiet period.^{20, 21} We hand collect from IPO prospectuses detailed information on BVC ownership, the complete list of syndicate members, percentage of secondary shares offered, as well as pre-IPO information on shares outstanding and total assets. Firms who are not underwriters have to report above 5% equity ownership in the “Principal Shareholder” section of the prospectus. Underwriters have to disclose their pre-IPO equity ownership of all sizes in the “Underwriting” section of the prospectus, though we also find additional ownership in the “Principal Shareholder” section. BVC ownership includes shares held by firms’ subsidiaries such as a captive

the impact of BVC ownership before the recent rules are implemented and thus yields implications about the necessity and appropriateness of the recent rules, e.g., whether BVC ownership should be prohibited.

²⁰ Quiet period ends 25 days after IPOs during our sample period. During the quiet period, the SEC generally prohibits issuers and their underwriters from publishing opinions about valuation and from making forward-looking statements about different cash flow measures.

venture capital funds. We collect the number of shares corresponding to brokerage warrant holdings and include it in the post-IPO BVC ownership. Information on VC fund affiliations with brokerage firms comes from the Pratt's Guide to Venture Capital Sources, VentureXpert and individual VC websites.

During our sample period, brokerage firms experience a substantial number of mergers and acquisitions. If one firm acquires another, we assume that the surviving firm acquires the entire VC investment portfolio and analyst coverage of both firms after the acquisition completion date. We obtain the timing of the mergers from the appendix of Corwin and Schultz (2005).

We obtain additional IPO issue characteristics from an array of other sources. The Sand Hill Aggregate VC Portfolio Holdings Index is from Sand Hill Econometrics. This index measures the total value of VC portfolios companies each month, and its change measures the returns to VCs. Stock capitalization, closing prices, shares outstanding, shares traded, and stock returns are from the University of Chicago's Center for Research in Securities Prices (CRSP) database. SIC and GICS codes are from the Compustat annual database. The indicator for simultaneous global offerings is from SDC. The data on underwriter reputation and incorporation dates are from Jay Ritter's website.²² The VentureXpert database is the main source for the number of funding rounds for IPOs.

We construct a variety of variables that capture the characteristics of recommendations, analysts, and issuers. Table 1 reports the definitions and Table 2 presents the summary statistics. The sample is classified by whether firms have equity ownership. Given 8,551 recommendations on 1,235 IPOs, analysts make about seven recommendations on an IPO in the first year. Overly optimistic recommendations dominate IPO coverage; more than 85% of the recommendations are either buys or strong buys.

Comparing columns 2 and 3, although the IPOs with BVC ownership have fewer strong buys, they have more buys. They are also more likely to receive coverage from underwriters. Affiliated analysts cover fewer stocks and issue fewer reports. Turning to issuer characteristics, the issuers with BVC ownership are significantly larger. They have greater pre-IPO total assets and post-IPO market

²¹ The results are similar for pre-IPO shareholdings and are available upon request

capitalization, raise more gross proceeds, and conduct more global offerings. These IPOs experience smaller underpricing and first month returns, have less CEO ownership and other VC ownership, and offer fewer secondary shares. These IPOs are more frequently offered during the 1999-2000 period and when venture returns based on the changes in the Sand Hill Index are greater. The last two rows of the table show that although about 8% of recommendations are made by firms with BVC ownership, about 30% of IPOs have firms with BVC ownership making recommendations.

Since a firm can issue several recommendations on an issuer, we report in Table 3 the summary statistics of the issuer-firm level data about research coverage, which is composed of 5,815 unique combinations of issuers and the firms covering the issuers. We use issuer-firm level data to investigate whether a firm with BVC ownership in an issuer is more likely to provide star coverage to the issuer. Combined with the information from Table 2, we can infer that within the first year of IPO, each firm makes an average of 1.47 recommendations on an IPO ($= 8,551 / 5,815$), and there are an average of 4.71 firms covering each IPO ($= 5,815 / 1,235$). About 11.20% of the coverage is done by *II* stars ($= 651 / 5,815$). About 8% of the firms covering IPOs have VC ownership ($= 465 / 5,815$), and the average firm has 4.45% of issuers' equity.

Underwriters are more active in covering issuers; 3,214 of the total unique combinations of issuers and the firms covering them are associated with underwriters ($= 1,538 + 1,676$). Underwriters, especially lead underwriters, are also more active in terms of providing star coverage and possessing BVC ownership. About 21% of the lead underwriters provide star coverage, which is the highest among all groups ($= 324 / 1538$). About 17% of the lead underwriters that provide coverage have BVC ownership, which is also higher than any other group ($= 263 / 1538$). The average ownership among these lead underwriters is 4.71%. These facts suggest that it is important to control for underwriter status in our analysis.²³

²² We thank Jay Ritter for making the data available at his website (<http://bear.cba.ufl.edu/ritter/ipodata.htm>).

²³ We only find BVC ownership for on-underwriters in 21 IPOs. This is likely to be due to the fact that firms who are not in the syndicate do not have to report below 5% ownership, as evident in the higher level of ownership when it does present (8.31%). This small sample is also likely to affect the significance level for coefficient estimates related to non-underwriter ownership.

Table 4 presents summary statistics of the recommendation level data by the level and direction of stock recommendations. We use recommendation-level data to analyze the optimism and abnormal returns of recommendations. We present the number of recommendations in each category, as well as the average industry-adjusted abnormal returns over the (-2, +2) event day window. We define the industry-adjusted abnormal return as the buy-and-hold return on issuer i minus the compounded return on the corresponding index portfolio based on 62 GICS industries:²⁴

$$Abnormal\ Return_{a\ to\ b} = [\prod_{t=a\ to\ b} (1 + r_t^i) - \prod_{t=a\ to\ b} (1 + r_t^{industry})], \quad (1)$$

where r_t^i is the raw return on issuer i on day t , and $r_t^{industry}$ is the return on the matched industry index.

For the direction of stock recommendations, initiations are 68% of the total sample (= 5,815 / 8,551), along with a significant number of downgrades. Investors seem to recognize that IPO coverage is overly optimistic. Initiations of holds are associated with significantly negative abnormal returns. The abnormal returns of negative recommendations of holds and sells, as well as all downgrades, are associated with much larger abnormal returns in magnitude than other recommendations, and these abnormal returns are all significantly negative. The largest abnormal returns in magnitude are about -16% for the downgrades to hold or sell recommendations. For the other recommendations, initiations of or upgrades to buys and strong buys are associated with positive and significant abnormal returns, with upgrades having relatively larger abnormal returns. Reiterations of buys and strong buys have insignificant abnormal returns, suggesting that investors perceive these reiterations to provide little information on average.

4. Empirical Analysis

4.1. BVC Ownership and the Likelihood of Star Coverage

We begin the analysis by examining the impact of BVC ownership on *II* star coverage. In its October issue each year, *II* publishes its lists of first, second, third, and runners-up All-American teams of

²⁴ The S&P/MSCI Global Industry Classification System (GICS) assigns each company to one of the 10 sections, 24 industry groups, 62 industries, and 122 sub-industries. Following Boni and Womack (2006), we match IPO issuers with industry indexes based on the 62 GICS industries.

analysts in each industry based on a survey of money managers. Star analysts wield significant influence to the investment banking market share. For example, Dunbar (2000) and Rau, et al. (2007) report that equity underwriters can increase their market shares if they have a star analyst. Krigman, et al. (2001) show that star coverage is the most important element in issuer management's decision to switch underwriters between an issuer's IPO and its subsequent seasoned equity offering. Using issuer level data, Cliff and Denis (2004) find that issuers use greater underpricing to pay lead underwriters for regular coverage, whereas Bradley et al. (2006) show that this phenomenon does not exist in the 1999-2000 period. If BVC ownership aligns the interests of firms and issuers, we expect the likelihood of coverage from stars, especially from higher ranked stars, to increase with percentage BVC ownership.

Because we examine whether a firm assigns an *II* star to cover an issuer, we use the issuer-firm level data in this section. We study the star coverage using two models expressed in the following form:

$$\begin{aligned} & \textit{Existence of Star}_{i,j} \textit{ or Rank of Star}_{i,j} \\ & = f(a_0 + a_1 \cdot \textit{Percentage BVC Ownership}_{i,j} + a_2 \cdot \textit{Control Variables}_{i,j}). \end{aligned} \quad (2)$$

We examine the probability of firms providing star analyst coverage using a probit model. The dependent variable, *Existence of Star*_{*i,j*}, is an indicator variable that is one if firm *j* assigns an *II* star to cover issuer *i* and zero otherwise. An analyst is an *II* star if the analyst is ranked as an *II* star in the year prior to the IPO. We analyze the probability of firms providing higher ranked stars for coverage using an ordered probit model. The dependent variable, *Rank of Star*_{*i,j*}, equals one through four if firm *j* assigns to issuer *i* an analyst who belongs to the first through the runners-up teams, respectively. The dependent variable is five if a non-star is assigned. If the likelihood of firms assigning star analysts, especially the higher ranked stars, increases with the size of BVC ownership, the coefficient estimate of BVC ownership should be positive in the probit model and negative in the ordered probit model.

The issuance of analyst recommendations clusters [Welch (2000)]. Bradley et al. (2003) also show that many recommendations are issued right after the end of quiet period. Thus, we adjust the standard error of coefficient estimates for cross-sectional correlation at issuer level throughout our paper.

We employ a broad set of control variables for the analysis throughout the paper. In all case, we avoid variables that are not known at the end of quiet period to avoid look-ahead bias. The control variables for star coverage include issuer and firm characteristics that could affect firms' decisions about star coverage. We include underwriter status because firms put more reputation and financial capital at stake when their responsibilities increase in the syndicate, which should increase the likelihood of star coverage in the same way as BVC ownership, as evident in Table 3. We include the size and investment bank reputation of firms because they are important determinants for analysts to become stars [Emory and Li (2007)]. As a result, larger firms and firms that do more investment banking deals are likely to have more star analysts to deploy. We also include a direct measure of star analyst availability. This is an indicator variable that is one if a brokerage firm has an *II* star in the same industry as the IPO issuer in a specific year, and zero otherwise. We include underpricing because Cliff and Denis (2004) show that issuers use part of the underpricing to compensate underwriters for providing regular coverage. Greater compensation to underwriters should also increase the likelihood of issuers to obtain star coverage.

We include a few measures of the size and prominence of an issuer: the logarithm of total assets and the indicators for NYSE listings. Since larger and more prominent companies are likely to generate more future investment banking business, they are more likely to obtain star coverage. Finally, we include a bubble period indicator to control for any time period variation during the 1999-2000 period.

Column (1) of Table 5 reports the coefficient estimates of the probit model on the existence of star coverage. The coefficient estimate of BVC ownership is positive and significant at the 1% level. In untabulated results, we find that the marginal effect of BVC ownership, or the increase in the probability of star coverage with a one-standard deviation increase in BVC ownership, is 0.93%. Since Table 3 shows that 11.20% (= 651 / 5815) of the firm-issuer level sample are associated with *II* star coverage, the marginal effect of BVC ownership results in a non-trivial increase in the unconditional probability of star coverage by 8.30% (= 0.93 / 11.20).

Column (2) of Table 5 reports the coefficient estimates of the ordered probit model used to examine whether firms assign stars of all ranks to provide coverage as the percentage BVC ownership

increases. Firms could assign mostly runners-up to cover the issuers instead of higher ranked stars who are more influential and more highly compensated, even if star coverage appears greater. The coefficient estimate of BVC ownership in column (2) is negative and significant at the 1% level. To understand the economic significance of the results, we examine the marginal effects of BVC ownership. In untabulated results, we find that the marginal effect of BVC ownership is 0.24%, 0.18%, 0.13%, and 0.24%, respectively, for the probability of firms assigning an analyst of the first through the runners-up teams of *II* stars. Given that the first through the runners-up teams of *II* stars are 2.41%, 2.53%, 2.03%, and 4.23% of our sample, the marginal effect of BVC ownership on the unconditional probabilities of firms assigning the first through the runners-up teams of *II* stars is 9.96%, 6.92%, 6.16%, and 5.67% ($= 0.24 / 4.23$), respectively. Thus, firms with larger VC ownership are particularly likely to assign higher ranked stars to cover issuers. In comparison, the marginal effect of BVC ownership is -0.79% for the probability of firms assigning a non-star. Given that non-stars are 88.80% of our sample, the marginal effect of BVC ownership reduces this unconditional probability by 0.89% ($= -0.79 / 88.80$).

In column (3), we disaggregate BVC ownership by the underwriting status of brokerage firms in the ordered probit model. The coefficient estimates on the BVC ownership of lead underwriters and co-managers are negative and significant at the 5% and 10% level, respectively, whereas that on the ownership of other firms is insignificant. Thus, our results suggest that BVC ownership induces firms to provide star coverage, especially coverage from higher ranked stars, when firms have greater reputation and financial capital at stake.²⁵

We also split the sample by measures of information asymmetry. If BVC ownership aligns the interests of affiliated firms with those of issuers, the impact of BVC ownership on star coverage should be stronger for the IPOs with greater information asymmetry and uncertainty, because these IPOs would benefit the most from the additional certification through star coverage. In columns (4) and (5), we report the results of the ordered probit model when the sample is split based on the median company age. BVC ownership has a negative effect that is significant at the 1% and 10% levels, respectively, on the rank of

stars for the IPOs with ages shorter and longer than the median company age, respectively. We find similar results when using other common measures of information asymmetry and uncertainty such as company size, the proportion of tangible assets, and aftermarket stock return variance over trading days +21 to +270. The fact that BVC ownership creates stronger alignments for weaker and riskier issuers provides further support for the *issuer alignment of interest hypothesis*.

Turning to the control variables, they are all statistically significant and have the expected signs. The pseudo R-squares are 44% and 37%, respectively, for the probit and ordered probit models, which indicates that our model explains a sizable portion of the cross-sectional variability in star coverage. Overall, our results in this section are consistent with the *issuer alignment of interest hypothesis*.

4.2. BVC Ownership and Recommendation Optimism

This section examines the impact of BVC ownership on recommendation optimism. IPO coverage is particularly tainted with overly optimistic recommendations. Table 2 shows that more than 85% of the sample recommendations are either strong buys or buys. The *enhanced credibility hypothesis* predicts that the recommendations of affiliated analysts should be relatively more objective than those of unaffiliated analysts, especially for weaker and riskier issuers, whereas the *investor conflicts of interest hypothesis* predicts the opposite.

We use the recommendation level data in this and the next sections because we examine the relation between the likelihood that a particular recommendation is more overly optimistic or more informative and the size of BVC ownership. We examine recommendation optimism using two models of the following form.

$$\begin{aligned} & \textit{Existence of Strong Buy}_{i,j,k} \textit{ or Level of Recommendations}_{i,j,k} \\ & = f(a_0 + a_1 \cdot \textit{Percentage BVC Ownership}_{i,j,k} + a_2 \cdot \textit{Control Variables}_{i,j,k}). \end{aligned} \quad (3)$$

We use a probit model to analyze the probability that a recommendation is a strong buy. The dependent variable, *Existence of Strong Buy*_{*i,j,k*}, is an indicator variable that is one if a recommendation

²⁵ The insignificant estimate for the BVC ownership of other brokerage firms here and throughout the paper could

made by analyst k from firm j on issuer i is a strong buy and zero otherwise. We use an ordered probit model to analyze whether the percentage BVC ownership reduces the probability of positive recommendations, as well as increasing the probability of negative recommendations. The dependent variable, *Level of Recommendations* $_{i,j,k}$, equals one through four if a recommendation made by analyst k from firm j on issuer i is a strong buy, buy, hold, and sell, respectively. If BVC ownership enhances the credibility of affiliated analysts by reducing the likelihood of overly optimistic recommendations and increasing the likelihood of negative recommendations, the coefficient estimate of BVC ownership should be negative in the probit model and positive in the ordered probit model. If BVC ownership mainly creates conflicts of interest between firms and public investors, we expect its coefficient to have opposite signs as predicted by the *enhanced credibility hypothesis* in the above models.

We employ a broad set of control variables that represent the characteristics of firms, issuers, and analysts. We control for underwriter status because lead underwriters seem to be particularly biased in IPO coverage [e.g., Lin and McNichols (1998), and Michaely and Womack (1999)]. We use the size and investment bank reputation of brokerage firms to measure firm prestige. More prestigious firms are less likely to make overly optimistic recommendations because they have more reputation capital at stake by issuing misleading recommendations [e.g., Ljungqvist, Marston, Wilhelm (2006)]. We include the gross proceeds and the market capitalization of issuers to control for the size and prominence of an IPO. We also include the number of reports made by an analyst and the number stock covered by an analyst to control for the effects of analyst characteristics [Clement (1999) and Jacob, Lys, and Neale (1999)]. We include an indicator for *II* stars to examine whether stars are more overly optimistic than other analysts. If stars issue less overly optimistic recommendations because they have more reputation capital at stake by issuing misleading recommendations, we need to control for star status given our prior finding that star coverage increases with the size of BVC ownership. We include an indicator for recommendations made within the first month of IPOs because Bradley et al. (2006) show that the relatively more optimistic recommendations of underwriters during the bubble period concentrate in the period right after the quiet

be due to the very small number of other brokerage firms with BVC ownership.

period. Finally, we include a bubble period indicator to control for any time period variation during the last two years of our sample period.

Column (1) of Table 6 reports the coefficient estimates of the probit model on the existence of strong buy recommendations. The coefficient estimate of BVC ownership is negative and significant at the 1% level. In untabulated results, we find that the marginal effect of BVC ownership on the probability of strong buy recommendations is -7.18%. Since Table 2 shows that 39.12% of all recommendations are strong buys, the marginal effect of BVC ownership results in a reduction in the unconditional probability of strong buys by 18.35% ($= -7.18 / 39.12$).

We use the ordered probit model to examine the impact of BVC ownership on each level of recommendations. If the ordered probit model suggests that BVC ownership not only shifts the overly optimistic strong buy recommendations to less overly optimistic buy recommendations, as shown in Table 2, but it also increases the negative recommendations of holds and sells, the results will be even stronger.

Column (2) of Table 6 reports that the coefficient estimate of BVC ownership is positive and significant at the 1% level in this model. To understand the economic significance of the results, we examine the marginal effects of BVC ownership. In untabulated results, we find that the marginal effect of BVC ownership is -5.21%, 2.12%, 2.82%, and 0.28%, respectively, on the probability of a strong buy, buy, hold, and sell. Table 2 reports that these four levels of recommendations are 39.12%, 46.38%, 13.74%, and 0.76% of our sample. Thus, the marginal effect of BVC ownership reduces the unconditional probability of strong buys by 13.32% ($= -5.21 / 39.12$), and increases the unconditional probability of buys, holds, and sells by 4.57%, 20.52%, and 36.84%, respectively. The fact that BVC ownership significantly reduces the probability of strong buys is consistent with the results of probit model. The ordered probit model further shows that BVC ownership substantially increases the probability of the negative recommendations of holds and sells. The marginal effect of BVC ownership is actually much greater on negative recommendations.

In column (3), we disaggregate BVC ownership by the underwriter status of brokerage firms. The coefficient estimate on the BVC ownership of lead underwriters is positive and significant at the 1% level, whereas those on the ownership of co-managers and other firms are insignificant. To the extent that the recommendations of lead underwriters are usually the most biased, our results suggest that BVC ownership induces firms to provide less overly optimistic recommendations, especially when firms as lead underwriters face more acute conflicts of interest with IPO investors.

We also split the sample by measures of information asymmetry. If BVC ownership enhances the conflicts of interest or the credibility of affiliated analysts, the conflicts of interest or credibility should be stronger for the IPOs with greater information asymmetry and uncertainty. For example, *the conflicts of interest hypothesis* predicts that affiliated analysts will be more likely to provide booster shots to weaker and riskier issuers in particular. In columns (4) and (5), we report the results of the ordered probit model when the sample is split based on the median company age. BVC ownership has a positive effect that is significant at the 1% levels on the level of recommendations for the IPOs with ages shorter than the median company age, and BVC ownership is insignificant for the IPOs with above average company age. We find similar results when using other common measures of information asymmetry and uncertainty such as company size, the proportion of tangible assets, and aftermarket stock return variance over trading days +21 to +270. The results provide further support for the *enhanced credibility hypothesis*.

The coefficient estimates of almost all the control variables are highly significant with expected signs. One interesting finding is that recommendations made by II stars or during bubble period are more overly optimistic. Another two interesting findings are about the relative optimism of underwriters. First, the indicators for underwriters and quiet period are both insignificant for the probit model in column (1), even though we find that the coefficient estimates of underwriter indicators are significantly positive without quiet period indicator in untabulated results. Second, lead underwriters are more overly optimistic even after adjusting for quiet period indicator in columns (2) and (3). However, compared to the untabulated results without quiet period indicator, the tabulated results suggest that the impact of underwriters are weaker. Overall, our results suggest that the quiet period indicator weakens the perceived

positive optimism of underwriters but does not completely eliminate it for our sample, which complements Bradley et al. (2006) by examining a longer sample period. We also find that the pseudo R-squares are about 4% for all the models, consistent with the results in similar studies [e.g., James and Karceski (2006)]. Overall, our results in this section are consistent with the *enhanced credibility hypothesis* and inconsistent with the *investor conflicts of interest hypothesis*.

4.3. BVC Ownership and the Informativeness of Recommendations

In this section, we examine whether BVC ownership benefits investors by having analysts to provide more informative recommendations. The *enhanced credibility hypothesis* predicts that the recommendations of affiliated analysts are likely to be more informative than those of unaffiliated analysts, especially for weaker and riskier issuers, whereas the *investor conflicts of interest hypothesis* predicts the opposite. This analysis provides a test of the two hypotheses independent of our analysis in Section 4.2. Although affiliated analysts are less overly optimistic, their recommendations may not be more informative, because informativeness is affected many factors including optimism.

We use the following regression model to analyze the impact of BVC ownership on the informativeness of recommendations.

$$\text{Informativeness}_{i,j,k} = a_0 + a_1 \cdot \text{Percentage BVC Ownership}_{i,j,k} + a_2 \cdot \text{Control Variables}_{i,j,k} + u_{i,j,k}, \quad (4)$$

where we measure the informativeness of a recommendation made by analyst k from firm j on issuer i with the transformed abnormal returns generated by the recommendation over the (-2, +2) event day window. We transform the abnormal returns of holds and sells, as well as buy recommendations that are results of downgrades, by reversing the sign of the abnormal returns of these recommendations. Thus, the abnormal returns of a total of 1,701 recommendations have reversed sign according to Table 4 (= 1,175 + 65 + 461). Analysts essentially ask investors to unload or short sell the stocks involved in these recommendations, and investors recognize that these recommendations are negative signals as evident in the negative event period abnormal returns associated with these recommendations. We do not transform the abnormal returns of the other recommendations.

We calculate the abnormal returns based on a buy-and-hold strategy using benchmarks such as the value- and equal-weighted CRSP indexes, the value- and equal-weighted indexes of the stock exchanges on which the IPOs list, S&P 500 indexes, size decile indexes, and industry indexes. While the results are similar for all the indexes, we believe that the industry index is the most appropriate because analysts are usually industry expert [Boni and Womack (2006)]. We therefore focus our discussion on the industry-adjusted excess returns.²⁶

We employ a broad set of control variables in the above regression. We include underwriter status. Since the recommendations of lead underwriters are more biased, these recommendations may be less informative. We include the indicators for the levels and directions of recommendations because Table 4 shows that recommendations of different levels and directions have abnormal returns of very different magnitudes. We include broker size because larger brokers could provide more resources to enable their analysts to generate more informative recommendations and because larger brokers have a larger sales force to affect the event period abnormal returns [Stickel (1995)]. Larger brokers are also found to be less overly optimistic in Section 4.2. We include the IPO return from offer price and the percentage share turnover, both measured at the end of the quiet period. Divergence in opinions creates trading volume, and is also likely to increase the demand for and consequently the impact of analyst research. We include the number of reports issued and the number of stock covered by analysts. Issuing reports too frequently may reduce the informativeness of each recommendation, whereas covering more stocks could enable analysts to have a better understanding of industry trends. We include an indicator for *H* stars. If the recommendations of stars are different from those of non-stars in terms of informativeness, we need to control for star status given our prior finding that star coverage increases with the size of BVC ownership. We include an indicator for recommendations made within the first month of IPOs because Bradley et al. (2006) show that the relatively more optimistic recommendations of underwriters during the

²⁶ Boni and Womack (2006) show that industry groups constructed with 62 GICS industries are very good proxies for Wall Street industry groupings. They also find that the value of analyst recommendations lies in analysts' ability to pick stocks within industries. Following Boni and Womack (2006), we present results using industry indexes based on the 62 GICS industries. Using industry indexes based on two-digit SIC codes or Fama-French 48 industries yields similar conclusions.

bubble period concentrate in the period right after the quiet period. Finally, we include a bubble period indicator to control for time period variation during the last two years of our sample period.

Column (1) of Table 7 examines how percentage BVC ownership affects the transformed event period abnormal returns. The coefficient estimate of BVC ownership is positive and significant at the 1% level. To interpret the economic significance, the results suggest that a one percent increase in BVC ownership increases the transformed abnormal returns by 0.26%. Given an average transformed abnormal return of 3.99% during the event period and an average BVC ownership of 4.45% among the firms with the ownership, the average BVC ownership increases the transformed event period abnormal returns of recommendations by about 29% ($= 0.26 * 4.45 / 3.99$).

In column (2), we disaggregate BVC ownership by the underwriter status of brokerage firms. The BVC ownership of lead underwriters and co-managers has a coefficient estimate that is positive and significant at the 1% and 10% level, respectively. To the extent that lead underwriters are more biased (e.g., see Table 6), our results are also consistent with BVC ownership inducing firms to provide more informative recommendations, especially when firms are particularly biased. The results are consistent with the *enhanced credibility hypothesis*.

We also split the sample by measures of information asymmetry. If BVC ownership enhances the credibility of affiliated analysts, this credibility should have a stronger impact on the informativeness of recommendations for the IPOs with greater information asymmetry and uncertainty. The *investor conflicts of interest hypothesis* has the opposite predictions. In columns (3) and (4), we report the results when the sample is split based on the median company age. BVC ownership has a positive effect that is significant at the 1% and 10% levels, respectively, on the informativeness of recommendations for the IPOs with ages shorter and longer than the median company age, respectively. We find similar results when using other common measures of information asymmetry and uncertainty such as company size, the proportion of tangible assets, and aftermarket stock return variance over trading days +21 to +270. The results provide further support for the *enhanced credibility hypothesis*.

As a robustness check, we use the absolute value of event period abnormal returns to measure informativeness. The results in column (5) of Table 7 show that BVC ownership has a positive coefficient estimate significant at the 1% level, consistent with the results in columns (1)-(4). The coefficient estimates of control variables are also similar across the two measures of informativeness.

The coefficient estimates of the control variables in Table 7 are all highly significant and have expected signs with two exceptions. First, consistent with Bradley et al. (2006), the recommendations of underwriters do not seem to be different in informativeness when compared to those of other brokerage firms after controlling for the timing of recommendations. Second, the recommendations of II stars do not seem to be different in informativeness when compared to those of non-stars. The adjusted R-squares are about 9%-14% for all the models, which indicates that our model explains a sizable portion of the cross-sectional variability in recommendation informativeness.

We further investigate the impact of BVC ownership on the transformed post-event abnormal returns over the three months, six months, and one year after the recommendation announcement period using Equation (4). We transform the post-event abnormal returns the same way as we transform the event-period abnormal returns. This investigation is important to determine whether there is investor underreactions or overreactions to the recommendations associated with BVC ownership. The event period impact of BVC ownership could be due to investors erroneously believing that affiliated analysts have enhanced credibility, which may be a result of the marketing efforts from the sales force of affiliated firms [Stickel (1995)]. This overreaction argument predicts a negative and significant impact of BVC ownership on the transformed post-event abnormal returns as investors eventually realize that affiliated analysts have no enhanced credibility. Alternatively, investors may not fully recognize the enhanced credibility of affiliated analysts during the event period. This underreaction argument predicts a positive and significant relation between BVC ownership and the transformed post-event abnormal returns, similar to the positive relation between BVC ownership and the transformed event-period abnormal returns.

In untabulated results, we find that the coefficient estimates of BVC ownership are insignificant when we use the transformed post-event abnormal returns as dependent variables in Equation (4), which

suggest that investors fully recognize the enhanced credibility of affiliated analysts during the event period. The results also suggest that the stronger event period return reactions associated with BVC ownership is not a result of marketing power of affiliated firms.

4.4. Share Distribution of VCs

News media and regulators have accused affiliated analysts of providing booster shots to issuer stock prices by reiterating overly optimistic recommendations around lockup expiration periods, whereas affiliated firms unload their shares and leave public investors stranded, as predicted by the *investor conflicts of interest hypothesis* [see, e.g., SEC (2005)]. If this is the case, the recommendations of affiliated analysts should be more overly optimistic and less informative than those of unaffiliated analysts during these periods, and their reiterations of strong buys and buys during these periods should be a larger portion of all their positive reiterations.

In untabulated results, we therefore examine the recommendations issued during the periods of 10 to 120 days around the lockup expiration dates with two approaches to investigate whether affiliated analysts provide booster shots to issuer stock prices. First, we use Equations (3) and (4) and find that affiliated analysts issue less overly optimistic and more informative recommendations during these periods than unaffiliated analysts, even though the differences are mostly insignificant. Second, we do not find a statistically significant concentration in the reiterations of positive recommendations by affiliated analysts during these periods when compared to unaffiliated analysts.

To further study the existence of booster shots to issuers' stock prices, we also examine other periods that VCs are likely to make share distributions. Gompers and Lerner (2004) report that VCs usually do not sell their holdings but distribute their shares to investors in the venture capital fund; the average VC distributes shares about a year after IPOs. In untabulated results, we do not find a concentration of positive reiterations from affiliated analysts between the lockup expirations and the eighteenth month after IPOs. Affiliated analysts also issue less overly optimistic recommendations during these periods, with the difference statistically insignificant in most cases. Thus, BVC ownership does not

seem to induce booster shots during lockup expiration periods or share distribution periods, and the allegations of booster shots that were used to argue for more stringent regulation toward BVC ownership seem to be unfounded. The results are inconsistent with the *investor conflicts of interest hypothesis* and weakly support the *enhanced credibility hypothesis*.²⁷

The share distribution of VCs represents the disappearance of a large blockholder. VCs usually leave the board at about the same time [Gompers and Lerner (2004)]. If our findings that are consistent with the *issuer alignment of interest hypothesis* and the *enhanced credibility hypothesis* are really due to BVC ownership, affiliated firms are likely to lose the information advantage, as well as the additional incentive to provide star coverage and to avoid legal and regulatory liabilities and tainted reputation, after the share distribution of their VCs. In untabulated results, we do not find significant difference between firms with and without BVC ownership in all aspects of research coverage among recommendations made after the average VC is likely to have made share distribution, i.e., the second and third year after IPOs. These results further support that the observed benefits to issuers and public investors that are likely to be attributable to BVC ownership.

4.5. *The Presence and Size of BVC Ownership and the “One Percent” Rule*

We can measure BVC ownership in an issuer qualitatively by an indicator or quantitatively on a percentage basis. The indicator of BVC ownership represents its presence, whereas percentage BVC ownership measures its size. We investigate whether brokerage firms should be required to disclose the size of their VC ownership, in addition to the presence of this ownership, by examining whether the existence of BVC ownership provides information additional to the actual size of BVC ownership. If both the presence and the size of BVC ownership, or if only the size of BVC ownership, have an impact on research coverage, the size of BVC ownership is likely to provide more information to investors, and regulators should consider requiring the disclosure of the size of BVC ownership, if that the cost of this disclosure is not prohibitively high.

²⁷ The insignificant results related to lockup expirations and share distributions could be due to the small samples.

We focus on the impact of an indicator variable for the existence of underwriter VC ownership on IPO coverage. Note that non-underwriters generally report BVC ownership of more than 5%, whereas underwriters have to report any ownership regardless of size. In untabulated results, we replace percentage BVC ownership with this indicator in Equations (2)-(4) and find that this indicator has a significantly negative effect on recommendation optimism (at the 5% level), a positive and weakly significant effect (at the 10% level) on star coverage, and an insignificant effect on the informativeness of recommendations. Thus, this indicator has weaker effects than percentage BVC ownership. This indicator also becomes mostly insignificant when we simultaneously include percentage BVC ownership in Equations (2)-(4), indicating that the information associated with the presence of BVC ownership is subsumed by the size of BVC ownership. The results suggest that investors could infer more information by knowing the size of BVC ownership.

The new NASD and NYSE rules actually require firms to disclose more than one percent equity ownership in any listed companies in analyst research reports. The “one percent” threshold is arbitrary, and the NASD particularly solicited public opinion about its appropriateness when issuing proposed rules [Unger (2001)]. We compare the impact of this threshold to that of requiring the disclosure of the existence of equity ownership. If this threshold does not bring additional information to investors, this threshold is likely to be less cost effective, given that it requires analysts to ascertain both the existence and the size of BVC ownership of their firms before issuing research reports. In untabulated results, we find that an indicator for more than one percent share ownership has qualitatively the same effects on all aspects of research coverage in Equations (2)-(4) as an indicator for the existence of underwriter VC ownership as discussed in the previous paragraph. Thus, the “zero percent” threshold is likely to be superior to the “one percent” threshold. Further, if obtaining the actual size of ownership is not too costly to brokerage firms, regulators should require the disclosure of the size of brokerage and analyst ownership because this disclosure would bring much more information to investors.

4.6. Sensitivity Analysis

4.6.1. Controlling for Endogeneity

In the earlier analysis, we treat BVC ownership as exogenous, but there are plausible reasons to believe otherwise. For example, BVC ownership may be an endogenous consequence of firms' investment criteria at the initial investment dates and any time afterwards so long as firms maintain equity ownership in the companies [e.g., Lee and Wahal (2004)]. As companies go through further rounds of venture financing, firms have to decide whether to continue investing, accept certain level of dilution, or exit from the investments. At the IPOs, firms also have to decide whether to sell some or all of its shares, as well as how many new shares to offer [Delaney (2005)].

Endogeneity may generate selection biases and result in inconsistent model estimates. To address the potential endogeneity problem, we estimate a two-equation treatment model [Maddala (1983)]. The endogenous decision is modeled through a treatment equation. Suppose there is an unobservable underlying variable, *BVC Ownership**, that determines the size of post-IPO BVC ownership in an issuer by a firm, the treatment rule for *BVC Ownership** is

$$BVC\ Ownership^* = M'b + \varepsilon \quad (5a)$$

$$BVC\ Ownership = \begin{cases} 100 & \text{when } 100 \leq BVC\ Ownership^* \\ BVC\ Ownership^* & \text{when } 0 < BVC\ Ownership^* \leq 100 \\ 0 & \text{when } BVC\ Ownership^* \leq 0 \end{cases} \quad \begin{matrix} (5b) \\ (5c) \\ (5d) \end{matrix}$$

where the indexes are omitted for simplicity. *BVC Ownership** is a latent variable observed only when a firm has post-IPO equity ownership in an issuer; *M* represents a vector of determinants of the firm's equity ownership; *b* is a vector of coefficients multiplying the elements of *M*; and ε is a disturbance term assumed to have a standard normal distribution. If *BVC Ownership** exceeds 100, the actually observed percentage ownership of the firm in the issuer, *BVC Ownership*, equals to 100; if *BVC Ownership** drops below 0, *BVC Ownership* equals to 0; otherwise *BVC Ownership** equals to *BVC Ownership*. Thus, *BVC Ownership* is a two-boundary Tobit variable constraint between 0 and 100.

The second equation of the treatment model analyzes the effects of BVC ownership on different aspects of research coverage by controlling for firm, issuer, and analyst characteristics. Depending on the question that we analyze, the second equation is a probit model, an ordered probit model, or an ordinary

least squares model from Equations (2)-(4). For example, for the informativeness of recommendations, the second equation will be the regression model of Equation (4), where the disturbance term u is assumed to be normally distributed with mean zero, variance σ_u^2 , and a correlation of ρ with ε .

Since we measure BVC ownership right after IPOs, we limit our explanatory variables for the Tobit model to the issuer and brokerage characteristics known by the time of issuances to avoid any look-ahead bias. To take into account investor demand at the IPOs, we include offer price revision. To control for an offer's credibility with investors, we include lead underwriters' reputation as measured by investment banking rankings. To control for underwriter status, we include separate indicators for firm that are lead managers or co-managers. We measure issuer size and issue complexity with pre-IPO total assets and an indicator for global offerings. We include company age to capture the information asymmetry between issuers and public investors. We use the percentage of secondary shares in the offering to control for the impact of insider selling. We include the number of financing rounds and other VC ownership to control for the size and intensity of VC investment. We include changes in the aggregate value of the portfolios of all the VCs (Sand Hill Index) over the prior quarter to proxy for expected VC returns. All the significant repressors in the Tobit model that do not appear in the second equation of the treatment model are actually insignificant in the second equation and thus serve as valid instrument variables.

To understand the expected impact of the explanatory variables, we need to understand the incentives of VCs. VCs are usually limited partnership designed to return the investment and any cash inflows realized by exiting their portfolio companies to their partners eventually. Exits through IPOs are the most attractive option because IPOs tend to generate the highest profits, which are essential for VCs to raise capital in the future. A crucial determinant of investor reception to IPOs is the size of equity ownership that VCs retain after IPOs. Prior research shows that given information asymmetry, public investors demand a greater underpricing as the discount to IPO shares if VCs retain less shares at the IPOs [e.g., Leland and Pyle (1977), Ritter (1984), and Downes and Heinkel (1982)]. Thus, the perceived information asymmetry has a positive relation with the size of ownership that VCs retain. Consistent with

these concerns about an extremely high level of perceived information asymmetry for IPO issuers, VCs accept lockup restrictions to enhance investor demand and limit IPO underpricing, and frequently hold the shares long after lockup expirations [Gompers and Lerner (2004)], with an objective to allow information asymmetry and uncertainty to dissipate more before making share distributions to VC investors.

Since VCs of brokerage firms have incentives similar to regular VCs, we expect company age, underwriter reputation, prior venture returns, offer price revisions, and secondary shares proportion to have negative effect on the post-IPO brokerage ownership, because these variables are likely to be negatively correlated with the level of information asymmetry between issuers and public investors. Issuers with longer history generally have more financial and operating information available. Underwriter reputation serves as a certification of issuer quality that can alleviate information asymmetry. Higher venture returns measured as the changes in Sand Hill Index raise investor perceptions about the issuer quality. Larger upward price revisions also indicate investor optimism about issuer quality. Optimistic expectations of investors can reduce investor concern about information asymmetry and cause them to demand a smaller underpricing. Secondary share proportion is likely to rise when underwriters consider information asymmetry to be relatively low and do not object to insider sales at the IPO date. BVCs are likely to retain fewer shares in issuers if other investors feel comfortable to sell more shares.

We expect the other explanatory variables to have positive effects on BVC ownership. Global offerings are more complicated than purely domestic IPOs. They also face myriad securities regulations in different countries and can entail information asymmetry for foreign investors. The BVCs whose firms are also underwriters are likely to have more information advantage over public investors than do regular BVCs, and thus are likely to retain more shares to avoid the appearance of conflicts of interest with public investors. BVCs may keep a larger VC position in larger issuers because these issuers are less risky or because these issuers are more complex. Further, the investments from traditional VCs may crowd out the investments of BVCs in the competition to meet issuers' funding needs.²⁸

²⁸ We also control for many other variables that could affect firms' decision of the post-IPO equity ownership. It is well documented that individual VCs specialize in a few promising industries or technologies, and VC backed IPOs cluster geographically and over time [e.g., Lee and Wahal (2004)]. Thus, we include indicators for two-digit SIC

We simultaneously estimate the two-equation treatment model using maximum likelihood methods. After adjusting for selectivity, our estimates of BVC ownership are similar to those reported in Tables 5 through 7. In untabulated results, the coefficient estimate of BVC ownership is 0.03 for the existence of star coverage and -0.03 for the ranks of analysts, with t-statistic of 2.42 and -2.47, respectively. The coefficient estimate of BVC ownership is -0.19 for the existence of strong buys and 0.14 for the level of recommendations, with t-statistic of -3.39 and 2.87, respectively. Further, the coefficient estimate of BVC ownership is 0.33 for the transformed event period abnormal returns, with a t-statistic of 2.73. Thus, our conclusions are not affected by the adjustments of endogeneity.²⁹

In Table 8, we present the estimates from the stand-alone estimations of the Tobit model (Equation (5)) using both the recommendation-level sample and the firm-issuer level sample. These results are similar to those obtained from the joint maximum likelihood estimation of Equation (5) and one of Equations (2) through (4). We do not present the five sets of coefficient estimates of the Tobit model corresponding to the five models in Equations (2) through (4) for the purpose of brevity. As evident in Table 8, all the coefficient estimates have expected signs and are statistically significant at the conventional significance level. The pseudo R-squares are 29% for the recommendation-level sample and 13% for the firm-issuer level sample, which indicates that our model explains a sizable portion of the

code, issuing year, and incorporation state. We also alternatively control for industry effects using indicators for Internet, technology, financial, and utility companies, 62 GICS industries, and the forty-eight Fama-French industries. We include matched market returns, number of IPOs, and average underpricing of IPOs over the prior three months, as well as the days between filing and issuing dates, to measure investor sentiment. We control for auditor and VC reputation with a big six auditor indicator and several VC reputation measures such as lead VC age and the number of IPOs backed by lead VCs. A lead VC is defined as having the largest pre-IPO stockholdings, and it almost always corresponds to the VC with the largest investment. We control for star availability for the possibility that issuers select firms with star analysts as VC investors. We control for the industry specialization of brokerage firms by including the proportion of analysts in a firm that are in the same industry as an issuer. We control for issuer size with its equity valued at the offer prices and an NYSE listing indicator. We control for issue size with gross proceeds and the percentage of new shares offered. We measure information asymmetry with tangible assets as a percentage of fixed assets, indicators for the Internet bubble period and for the existence of lockup agreements. We control for other VC ownership. We include the percentage of secondary shares in the offering to control for secondary selling. Given that these control variables are insignificant and that including them does not affect our results, these results are not tabulated but are available upon request.

²⁹ One explanation for the prior findings of more overly optimistic recommendations from underwriters has been the mutual selection between issuers and firms based on optimism: issuers are likely to select firms with more optimistic views about their prospects and firms are likely to underwrite issuers in which they have a strong conviction. This hypothesis cannot consistently explain our findings. Although more optimistic firms are more likely to have larger

cross-sectional variability in BVC ownership. The significant coefficient estimates and pseudo R-squares are clear evidence that BVCs actively determine their on-going investment level on the basis of issuer characteristics, even though this endogeneity does not seem to affect our conclusions.

4.6.2. Additional Control Variables

We include a variety of other control variables. We include some for all aspects of research coverage that we examine, whereas we include others only for some aspect of research coverage. Given that they are almost always insignificant and that including them does not affect our results, the results are not tabulated but are available upon request.

We first report the control variables that we include for all aspects of research coverage. We control for industry fixed effect using the indicators for 62 GICS industries, indicators for two-digit SIC codes, indicators for Fama-French 48 industries, and indicators for financial, utility, Internet, and technology companies, respectively. We include yearly fixed effects to control for variations in IPO market conditions. Since more reputable VCs are likely to bring more investment banking business, firms may provide star coverage and issue more overly optimistic recommendations to please these VCs, and the increased optimism may also reduce the informativeness of these recommendations, we include measures of VC reputation such as VC age and the number of IPOs backed by the VCs. We include the equity ownership of other VCs to control for the effects of VC ownership other than that of brokerage firms. We include gross spread to control for underwriter compensation other than underpricing. Greater compensation to underwriters may increase the likelihood to receive star coverage and more overly optimistic coverage. We include the number of IPOs, the average underpricing of all the IPOs, and the matched market index returns in the past three months to control for recent market activities. We include an indicator for the largest six auditors to control for auditor reputation. We also include pre-IPO issuer characteristics such as company age, the proportion of tangible assets, the number of business segments, the number of two-digit SIC industries that an issuer expands, and the prior-year number of companies in

shareholdings in the issuers and to provide star coverage, it is not clear why the firms would simultaneously issue

the same two-digit SIC code. We include CEO ownership and the proportion of secondary shares because firms may issue overly optimistic recommendations and provide star coverage to boost up stock prices when insiders sell more shares and when CEOs own more shares.³⁰

With respect to star coverage and recommendation informativeness, we also control for issue size with the logarithm of gross proceeds. With respect to star coverage and recommendation optimism, we include the percentage share turnover and the IPO return from offer price by the end of the quiet period. Since higher share turnover and return momentum signal and induce trading interest, firms are more likely to provide star coverage to attract trading volume. Higher return momentum may also indicate investor optimism, which is likely to result in more optimistic recommendations.

With respect to the optimism and informativeness of recommendations, we control for the industry specialization of a firm by including the proportion of analysts in the firm that are in the same industry as an issuer. We also include underpricing because companies that compensate underwriters through greater underpricing may receive more overly optimistic coverage. We include an indicator for global offerings to control for the prominence and complexity of the issues. We include pre-IPO issuer characteristics such as listing exchange and total assets. We include the number of other recommendations issued during the announcement period of a recommendation. We also include analyst characteristics such as the number of analysts that cover the same issuer and experience measured as the number of years that an analyst appears in the I/B/E/S earnings forecast database.

4.6.3. Other Sensitivity Tests

We segment the sample by periods in several ways. Bradley et al. (2003) report that I/B/E/S coverage is less complete in the early part of our sample period. Although we do not see any reason how this could affect our results, splitting our sample into two subperiods by 1997 does not affect our results.

less optimistic recommendations.

³⁰ News media reports that CEOs were crucial in the decision of awarding investment banking deals. For example, in the recent controversies about “spinning,” issuer CEOs awarded the investment banking business of their own companies to underwriters in exchange for share allocations in hot IPOs [e.g., Chaffin, Michaels, and Silverman (2002), and Smith (2002)].

Splitting by the bubble period of 1999-2000 does not affect our results either. Bradley et al. (2003) also show that intensive analyst coverage, especially overly optimistic recommendations, appears right after the quiet period and Bradley et al. (2006) find that recommendations made right after the quiet period are different from those made in the next 11 months. Thus, we examine whether BVC ownership has a different impact on the subsample of the recommendations made right after the expiration of the quiet period. We find that affiliated analysts are not significantly different from the other analysts in terms of recommendation optimism, possibly due to sample size, whereas the recommendations of affiliated analysts are more informative.

Because Cliff and Denis (2004) report that Merrill Lynch is not covered in the I/B/E/S database until 1998, we exclude IPOs in which Merrill Lynch is in the syndicate. We also substitute dollar ownership of brokerage firms in place of percentage ownership. To ensure that our results are not driven by outliers, we estimate quantile regressions and alternatively winsorize our sample at the 1% and 5% levels. Since other VC ownership and BVC ownership are likely to be negatively correlated, we eliminate other VC ownership in Table 8 to avoid potential simultaneity problem. We also eliminate star availability in Table 5, or define star availability by whether the firm has a star analyst. We find very similar results for all these additional tests.

5. Conclusions

Using a comprehensive sample of VC-backed IPOs over the 1994-2000 period, we examine the impact of the post-IPO equity ownership of brokerage firms as a result of venture investments on the firms' IPO research coverage. We find that this ownership aligns the interests of firms and issuers by inducing firms to provide *Institutional Investor* star coverage, especially the coverage from higher ranked stars. This ownership also enhances the credibility of affiliated analysts and benefits public investors. Affiliated analysts produce less overly optimistic and more informative recommendations than unaffiliated analysts, especially for weaker and riskier issuers and especially when firms face potentially more acute conflicts of interest as lead underwriters. Our evidence demonstrates that combining venture

investing and analyst research under one roof benefits issuers and public investors instead of creating conflicts of interest between firms and public investors.

Although our sample is based on the brokerage ownership in IPOs, our results are likely to have several implications for the new NASD and NYSE rules related to the equity ownership of firms and their analysts in both IPOs and seasoned companies. First and most importantly, our results suggest that regulators are correct in adopting a generally market-based approach of requiring more detailed disclosure, which should significantly benefit companies and public investors. Simply prohibiting brokerage and analyst ownership will not be beneficial to either issuers or investors. Second, our results indicate that disclosing of the size of brokerage and analyst ownership would provide much more information to public investors than simply disclosing the presence of the ownership. Regulators should require this disclosure if the costs to brokerage firms are not prohibitively high. If actual size is not required for disclosure, simply disclosing the existence of ownership would be more cost effective than disclosing whether the ownership is more than one percent. Third, since the pre-IPO ownership of analysts are subject to the same restricted sales as brokerage ownership, requiring detailed disclosure of pre-IPO analyst ownership should be more beneficial than prohibiting this ownership as required by the new rules. Similarly, several large firms should reverse their prohibition of analyst ownership given that the new rules have required more detailed disclosure. Fourth, since brokerage ownership in IPOs has been disclosed in the IPO prospectus, and it benefits issuers and investors even without the new rules, repeated disclosure in analyst reports is probably not productive from a cost-benefit analysis. Finally, anecdotal evidence suggests that the equity ownership of independent firms and analysts may create similar conflicts of interest between analysts and public investors without disclosure [Davis and Craig (2004)]. Our results indicate that regulators should consider expanding the current disclosure requirements for sell-side firms and analysts to include independent firms and analysts.

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Appendix:

Provisions of the NASD and NYSE rules on the stock ownership of analysts and their firms

On May 10, 2002, the SEC approved the new NASD Rule 2711 and amendments to the NYSE Rule 351 and 472. The rules intend to increase analyst independence and to provide more extensive disclosure of conflicts of interest in research reports and public appearance. In particular, the rules require disclosure of financial interests in covered companies by analysts and firms and restrict personal trading by analysts. The rules are implemented by the end of 2002. Here is a summary of the provisions of the rules that are related to the ownership and trading of analysts and their brokerage firms.

1. Analyst accounts are prohibited from obtaining any securities before an issuer's IPO if the issuer is in the same industries that the analyst follows. If already owned, analysts cannot provide research coverage until divesting all pre-IPO shares.
2. Trading for a period between 30 calendar days before and five calendar days after the publication of a research report are generally prohibited. Analysts also cannot trade in a manner inconsistent with their recommendations.
3. Analysts need to disclose in research reports and public appearances if their brokerage firms own more than one percent of any class of common equity. Financial interests by analysts or their household members need to be disclosed. Analysts cannot publish reports or conduct interviews with news media if they are not sure about the ownership of their firms.

Two recent enforcement cases

1. In 2003 the SEC sued Paul Johnson, a former Robertson Stephens analyst, alleging that he failed to inform investors about his ownership in two public companies in which he issued bullish research reports about proposed mergers and that he would reap substantial profits upon completion of each merger [Solomon (2005)].

2. The NASD has fined Sanford C. Bernstein, a subsidiary of Alliance Capital Management LP, and one of its star analysts a combined \$550,000. The NASD says analyst Brad Hintz sold shares of Morgan Stanley and Lehman Brothers in January 2005, even as he had favorable ratings on the companies. Mr. Hintz also traded in a personal account in six securities he covered, with many other transactions contrary to his ratings. This type of sale is in violation of NASD rules against trading contrary to an analyst's recommendation. Sanford C. Bernstein was fined \$350,000 and Mr. Hintz was fined \$200,000. This is the largest fines the regulator has ever levied for this type of behavior. [Craig (2006)]

Table 1. Definitions of Variables used in the Analysis

BVC Ownership (%)	Post-IPO percentage equity ownership of brokerage firms in venture backed IPOs
Strong Buy, Buy, Hold, and Sell	Indicator variable that is one if a recommendation is a strong buy, buy, hold, or if a recommendation is a underperform or sell, respectively, and zero otherwise
Lead, Co-Manager	Indicator variable that is one if a brokerage firm is a lead underwriter or a co-manager, respectively, and zero otherwise
<i>II</i> Star	Indicator variable that is one if an analyst is in the <i>Institutional Investor All-American</i> teams in the prior year, and zero otherwise
Number of Reports	Logarithm of the average number of recommendations that an analyst issues on the stocks under coverage
Number of Stocks	Logarithm of the number of stocks that an analyst covers
Broker Size	Logarithm of the number of analysts employed by the analyst's firm. For analysts who switch firms within a given year, we use the time-weighted average of the two firms
Total Assets	Logarithm of issuer total assets in the fiscal year-end prior to IPO in \$millions
Company Size	Logarithm of the market capitalization of the issuers that the analyst covered at the end of the quiet period in \$millions
Gross Proceeds	Logarithm of offer price x shares offered in \$millions
Global Offering	Indicator that is one if an IPO is a simultaneous global offering and zero otherwise
Underwriter Reputation	Investment banking reputation of lead underwriters
Star Availability	Indicator variable that is one if a brokerage firm has an <i>II</i> star in the same industry as the IPO issuer prior to the IPO year, and zero otherwise
Offer Price Revisions (%)	$(\text{Offer price} / \text{midpoint of initial filing range}) - 1$
Underpricing (%)	$(\text{Closing price on trading day 0} / \text{offer price}) - 1$
First Month Return (%)	$(\text{Stock price at the end of quiet period} - \text{offer price}) / \text{offer price} * 100$
Share Turnover (%)	Share turnover (shares traded / shares outstanding) by the end of quiet period
Other VC Ownership (%)	Percentage of post-IPO share held by traditional and corporate venture funds
Secondary Shares (%)	Number of shares sold by pre-IPO investors / pre-IPO shares outstanding
NYSE	Indicator variable that is one if an IPO is listed on the NYSE, and zero otherwise
Number of Rounds	Number of venture financing rounds up to the IPO
Sand Hill Index	A index for the total value of the portfolio holdings of all the VCs
Aggregate Venture Returns (%)	Percentage change in the Sand Hill Index in the quarter before IPOs
Company Age	Logarithm of (1 + age of an issuer at IPO)
Quiet Period	Indicator variable that is one if a recommendation is made in the first 30 days after IPO, and zero otherwise
Bubble Period	Indicator variable that is one if an IPO is offered in 1999 or 2000, and zero otherwise

Table 2. Average Characteristics of Venture Backed IPOs

Descriptive statistics are reported for our sample of venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers. Variable definitions are given in Table 1. BVC Ownership represents IPOs in which a brokerage house has equity ownership right after IPOs, whereas No BVC Ownership represents the remaining IPOs. We also conduct *t*-tests on the differences of IPO characteristics between IPOs with brokerage equity ownership and IPOs without it. ***, **, and * indicate that *t*-statistics are significant at the 1%, 5%, and 10% levels, respectively.

	All	No BVC Ownership	BVC Ownership	
Recommendation Characteristics				
Strong Buy (%)	39.12	39.50	34.77	***
Buy (%)	46.38	45.84	52.44	***
Hold (%)	13.74	13.90	12.08	
Sell (%)	0.76	0.76	0.71	
Lead Underwriter (%)	28.14	25.55	57.33	***
Co-managers (%)	30.05	29.27	38.94	***
Analyst and Brokerage Firm Characteristics				
Number of Reports	11.94	12.03	9.89	**
Number of Stocks	8.38	8.43	7.16	**
Broker Size	47.70	47.67	48.44	
Issuer Characteristics:				
Total Assets (\$Millions)	84.58	40.47	125.45	**
Company Size (\$Millions)	329.48	291.36	364.80	**
Gross Proceeds (\$Million)	61.00	55.35	66.25	***
Global Offering (%)	29.15	26.94	31.20	**
Underwriter Reputation	8.01	8.11	7.92	
Offer Price (\$)	13.42	13.36	13.46	
Offer Price Revision (%)	8.93	10.40	7.57	
Underpricing (%)	44.67	48.89	40.76	**
First Month Return (%)	59.86	65.16	54.95	*
Share Turnover (%)	134.28	127.95	140.14	
Other VC Ownership (%)	48.71	54.15	43.66	***
Secondary Shares (%)	7.38	9.10	5.79	***
NYSE (%)	2.75	2.02	3.43	
Number of Rounds	4.29	4.19	4.39	
Aggregate Venture Returns (%)	47.94	48.54	47.38	
Company Age	8.92	9.22	8.64	
Bubble Period (%)	39.76	36.20	43.06	***
Number of Recommendations	8551	7855	696	
Number of IPOs	1235	872	363	

Table 3. Summary Statistics of the Firm-Issuer Level Data

Table 3 reports the summary statistics of the firm-issuer level data about research coverage for venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers. It reports for the whole sample, as well as the subsamples classified by underwriter status. For each sample, it reports the total number of firm covering issuers, the number of coverage by *II* stars, the number of coverage in which firms have equity ownership, and the average percentage of equity ownership of firms that have ownership. Variable definitions are given in Table 1.

Total	(No.)	5815
Total with <i>II</i> Star Availability	(No.)	1443
Total with <i>II</i> Star Coverage	(No.)	651
First Team <i>II</i> Star Coverage	(No.)	140
Second Team <i>II</i> Star Coverage	(No.)	147
Third Team <i>II</i> Star Coverage	(No.)	118
Runners-Up Team <i>II</i> Star Coverage	(No.)	246
Total with BVC Ownership	(No.)	465
	Mean Share (%)	4.45
Lead Underwriters	(No.)	1538
Lead Underwriters with <i>II</i> Star Availability	(No.)	593
Lead Underwriters with <i>II</i> Star Coverage	(No.)	324
Lead Underwriters with BVC Ownership	(No.)	263
	Mean Share (%)	4.71
Co-Managers	(No.)	1676
Co-Managers with <i>II</i> Star Availability	(No.)	434
Co-Managers with <i>II</i> Star Coverage	(No.)	195
Co-Managers with BVC Ownership	(No.)	181
	Mean Share (%)	3.62
Other Brokerage Firms	(No.)	2601
Other Brokerage Firms with <i>II</i> Star Availability	(No.)	416
Other Brokerage Firms with <i>II</i> Star Coverage	(No.)	132
Other Brokerage Firms with BVC Ownership	(No.)	21
	Mean Share (%)	8.31

Table 4. Distribution of Recommendation Level Data

Table 4 reports the distribution of recommendations for venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers and the related average industry adjusted abnormal returns by the levels and directions of recommendations. We define the industry-adjusted abnormal return as the buy-and-hold return on issuer i minus the compounded return on the corresponding industry portfolio:

$$Abnormal\ Return_{a\ to\ b} = [\prod_{t=a\ to\ b} (1 + r_t^i) - \prod_{t=a\ to\ b} (1 + r_t^{industry})]$$

where r_t^i is the raw return on issuer i on day t , and $r_t^{industry}$ is the return on the matched industry index. For each category of recommendations, we report the number of recommendations, the average event period abnormal return over the (-2, +2) event day window, and the t-statistic for the returns. For example, the intersection of “Strong Buy” and Upgrades has 685 recommendations. This number means that 685 strong buy recommendations are a result of upgrades. We merge the recommendations with I/B/E/S ratings of 4 and 5 into the sell category, because there are very few recommendations for these levels. Given that there is no upgrade from sells to underperforms, this merge does not affect our results. The data are from January 1994 through December 2001.

		Strong Buy	Buy	Hold	Sell
Initiation					
Number of Recommendations	5815	2430	2919	440	26
Average Abnormal Return (%)		3.19	1.52	-1.83	-6.50
t-statistic		(9.49)	(4.46)	(-2.38)	(-2.55)
Reiteration					
Number of Recommendations	682	230	407	43	2
Average Abnormal Return (%)		-0.68	0.90	-6.07	-6.45
t-statistic		(-0.66)	(1.06)	(-2.91)	(-1.27)
Downgrade					
Number of Recommendations	1184	N/A	461	686	37
Average Abnormal Return (%)			-9.02	-15.82	-14.75
t-statistic			(-9.47)	(-17.64)	(-3.94)
Upgrade					
Number of Recommendations	870	685	179	6	N/A
Average Abnormal Return (%)		6.19	3.35	-6.91	
t-statistic		(8.13)	(2.72)	(-0.96)	
Number of Recommendations		3345	3966	1175	65

Table 5. Brokerage Equity Ownership and Star Coverage

Table 5 reports the determinants of *Institutional Investor (II)* star coverage for venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers. In column (1), we report the estimates of a probit model regression where the dependent variables is one if a brokerage firm assigns an *II* star to cover an issuer, and zero otherwise. In columns (2)-(5), we report the estimates of an ordered probit model. The dependent variable of this model equals one through four if a recommendation is made by an analyst who belongs to the first through the runners-up teams of *II*, respectively. The dependent variable equals five if a recommendation is made by a non-star analyst. Variable definitions are given in Table 1. ***, **, and * indicate that *t*-statistics are significant at the 1%, 5%, and 10% levels, respectively. The *t*-statistics are heteroscedasticity consistent and are adjusted for cross-sectional correlation among observations for the same issuer. We use the firm-issuer level data about research coverage from January 1994 through December 2001.

	Probit Model		Ordered Probit		Ordered Probit		Ordered Probit		Ordered Probit	
	(1)		(2)		(3)		Firm Age <= Median		Firm Age > Median	
	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.
BVC Ownership	0.02 **	2.74	-0.02 ***	-2.94			-0.02 ***	-2.60	-0.01 *	-1.71
BVC Ownership*Lead					-0.02 **	-2.28				
BVC Ownership*Co-manager					-0.02 *	-1.89				
BVC Ownership*Other					-0.01	-0.29				
Lead	0.49 ***	7.52	-0.49 ***	-7.85	-0.49 ***	-7.84	-0.47 ***	-5.33	-0.45 ***	-4.11
Co-manager	0.19 ***	2.82	-0.18 ***	-2.83	-0.17 ***	-2.76	-0.21 ***	-2.34	-0.03	-0.21
Broker Size	0.41 ***	8.61	-0.43 ***	-9.34	-0.43 ***	-9.34	-0.41 ***	-5.50	-0.31 ***	-3.84
Underwriter Reputation	0.21 ***	5.30	-0.21 ***	-5.55	-0.21 ***	-5.53	-0.23 ***	-3.70	-0.26 ***	-4.03
Star Availability	1.14 ***	20.01	-1.10 ***	-20.26	-1.10 ***	-20.25	-1.38 ***	-16.62	-1.23 ***	-12.35
Underpricing	0.01 ***	2.93	-0.01 ***	-2.94	-0.01 ***	-2.95	0.00 **	-2.23	0.00	-0.14
Log (Total Assets)	0.12 ***	5.37	-0.11 ***	-5.22	-0.11 ***	-5.23	-0.07 ***	-2.41	-0.17 ***	-4.10
NYSE	0.29 **	2.11	-0.39 ***	-3.14	-0.39 ***	-3.15	-0.52 ***	-2.79	-0.15	-0.72
Bubble Period	-0.42 ***	-6.73	0.43 ***	7.35	0.43 ***	7.34	0.39 ***	4.69	0.45 ***	4.18
Intercept	-5.48 ***	-15.41	6.63 ***	19.24	6.63 ***	19.23	6.85 ***	12.05	6.91 ***	11.91
Pseudo R ²	0.44		0.37		0.37		0.41		0.37	
N	5815		5815		5815		3370		2445	

Table 6. Brokerage Equity Ownership and Recommendation Optimism

Table 6 reports the determinants of recommendation optimism for venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers. In column (1), we report the estimates of a probit model regression where the dependent variables is one if a recommendation is a strong buy, and zero otherwise. In columns (2)-(5), we report the estimates of an ordered probit model. The dependent variable equals one through four if a recommendation is a strong buy, buy, hold, and sell, respectively. Variable definitions are given in Table 1. ***, **, and * indicate that *t*-statistics are significant at the 1%, 5%, and 10% levels, respectively. The *t*-statistics are heteroscedasticity consistent and are adjusted for cross-sectional correlation among observations for the same issuer. We use the recommendation level data from January 1994 through December 2001.

	Probit Model		Ordered Probit		Ordered Probit		Ordered Probit		Ordered Probit	
	(1)		(2)		(3)		Firm Age <= Median		Firm Age > Median	
	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.	Est.	t-stat.
BVC Ownership	-0.18 ***	-3.29	0.14 ***	2.93			0.17 ***	2.51	0.06 *	0.76
BVC Ownership*Lead					0.20 ***	3.18				
BVC Ownership*Co-manager					0.06	0.77				
BVC Ownership*Other					0.09	0.39				
Lead	0.06	1.40	-0.08 **	-2.04	-0.09 **	-2.27	-0.07	-1.16	-0.08	-1.38
Co-manager	-0.01	-0.36	0.00	-0.13	0.00	0.11	0.00	-0.01	-0.02	-0.37
Broker Size	-0.08 ***	-3.80	0.07 ***	4.00	0.07 ***	4.02	0.08 ***	3.24	0.07 ***	2.77
Underwriter Reputation	-0.06 ***	-3.30	0.05 ***	2.91	0.05 ***	2.99	0.05 **	2.11	0.04	1.62
Log (Gross Proceeds)	0.27 ***	5.66	-0.21 ***	-5.01	-0.20 ***	-4.98	-0.20 ***	-3.12	-0.22 ***	-3.89
Company Size	-0.24 ***	-6.18	0.20 ***	6.02	0.20 ***	5.98	0.16 ***	3.08	0.23 ***	5.06
Number of Reports	-0.43 ***	-6.08	0.45 ***	7.41	0.45 ***	7.42	0.44 ***	4.98	0.45 ***	5.17
Number of Stocks	0.38 ***	4.62	-0.42 ***	-5.86	-0.42 ***	-5.87	-0.43 ***	-4.18	-0.41 ***	-4.01
II Stars	0.05 ***	2.50	-0.03 *	-1.89	-0.03 *	-1.87	0.00	-0.08	-0.06 ***	-2.51
Quiet Period	0.06	1.36	-0.25 ***	-6.92	-0.25 ***	-6.93	-0.23 ***	-4.54	-0.27 ***	-4.95
Bubble Period	0.03	0.94	-0.08 ***	-2.41	-0.08 ***	-2.41	-0.04	-0.76	-0.10 ***	-2.06
Intercept	0.74 ***	3.67	-0.64 ***	-3.57	-0.65 ***	-3.62	-0.64 ***	-2.41	-0.53 **	-2.04
Pseudo R ²	0.04		0.05		0.05		0.04		0.05	
N	8551		8551		8551		4983		3568	

Table 7. Brokerage Equity Ownership and Recommendation Informativeness

Table 7 reports the coefficient estimates of the following model used to analyze the determinants of the informativeness of stock recommendations for venture-backed IPOs completed between January 1994 and December 2000 by U.S. issuers:

$$\text{Informativeness}_{i,j,k} = a_0 + a_1 \text{Percentage BVC Ownership}_{i,j,k} + a_2 \text{Control Variables}_{i,j,k} + u_{i,j,k}$$

In columns (1)-(4), we use the transformed event period abnormal returns of recommendations to measure the informativeness of the recommendation made by analyst k from firm j on issuer i . The event period abnormal return of a recommendation is defined as the industry-adjusted abnormal returns over the (-2, +2) event day window. The industry-adjusted abnormal return is the buy-and-hold return on issuer i minus the compounded return on the corresponding industry portfolio based on 62 GICS industries:

$$\text{Abnormal Return}_{a \text{ to } b} = \left[\prod_{t=a \text{ to } b} (1 + r_t^i) - \prod_{t=a \text{ to } b} (1 + r_t^{\text{industry}}) \right],$$

where r_t^i is the raw return on issuer i on day t , and r_t^{industry} is the return on the matched industry index. We transform the abnormal returns of hold and sell recommendations, as well as buy recommendations that are results of downgrades, by reversing the sign of the abnormal returns of these recommendations. Analysts essentially ask investors to unload or short sell the stocks involved in these recommendations and investors recognize that these recommendations are negative signals. Thus, the abnormal returns of a total of 1,701 recommendations have reversed sign. We do not transform the abnormal returns of the other recommendations. In column (1), we report for the whole sample. In column (2), we interact BVC ownership with the underwriter status of firms. In columns (3) and (4), we report for the two subsamples split according to the median firm age of IPO companies. In column (5), we report the estimates of the same model where we use the absolute value of the event period abnormal returns to measure the informativeness of recommendations. Variable definitions are given in Table 1. ***, **, and * indicate that t -statistics are significant at the 1%, 5%, and 10% levels, respectively. The t -statistics are heteroscedasticity consistent and are adjusted for cross-sectional correlation among observations for the same issuer. We use the recommendation level data from January 1994 through December 2001.

	Transformed Abnormal Returns								Absolute Abnormal Returns	
	Overall Sample		Overall Sample		Firm Age <= Median		Firm Age > Median		Overall Sample	
	(1)	(2)	(3)	(4)	(5)	Est.	t-stat.	Est.	t-stat.	
BVC Ownership	0.26 ***	3.48			0.34 ***	3.12	0.17 *	1.71	0.20 ***	3.55
BVC Ownership*Lead			0.26 ***	2.79						
BVC Ownership*Co-manager			0.26 *	1.80						
BVC Ownership*Other			0.36	1.09						
Lead	0.90	1.48	0.91	1.50	1.05	1.19	0.62	0.77	0.50	1.13
Co-manager	0.14	0.24	0.14	0.25	0.11	0.13	-0.15	-0.18	0.57	1.36
Strong Buy	-1.88 ***	-2.35	-1.88 ***	-2.35	-1.40	-1.25	-2.56 **	-2.28	-1.97 ***	-3.35
Buy	-3.68 ***	-5.02	-3.68 ***	-5.02	-3.76 ***	-3.68	-3.66 ***	-3.59	-2.57 ***	-4.78
Sell	0.72	0.29	0.73	0.29	0.94	0.25	-0.09	-0.03	-0.16	-0.09
Upgrade	3.52 ***	4.72	3.52 ***	4.71	3.97 ***	3.78	2.71 ***	2.64	3.16 ***	5.79
Downgrade	10.17 ***	13.17	10.17 ***	13.16	9.39 ***	8.47	11.07 ***	10.64	7.71 ***	13.63
Reiteration	-0.82	-1.03	-0.82	-1.03	-1.61	-1.45	0.34	0.30	1.12 *	1.91
Broker Size	1.22 ***	4.07	1.22 ***	4.07	0.95 **	2.25	1.57 ***	3.76	0.84 ***	3.83
First Month Return	0.01 ***	5.17	0.01 ***	5.17	0.01 ***	4.43	0.01 ***	2.70	0.00 ***	3.16
Share Turnover	0.94 ***	15.04	0.94 ***	15.04	1.06 ***	13.32	0.63 ***	5.99	0.80 ***	17.33
Number of Reports	-3.24 ***	-3.18	-3.24 ***	-3.18	-3.97 ***	-2.76	-2.15	-1.53	-1.86 ***	-2.50
Number of Stocks	3.21 ***	2.72	3.21 ***	2.71	4.29 ***	2.58	1.59	0.97	1.77 **	2.04
II Star	-0.07	-0.11	-0.07	-0.10	-0.57	-0.59	0.47	0.48	-0.33	-0.65
Quiet Period	1.84 ***	2.90	1.84 ***	2.90	3.23 ***	3.67	-0.34	-0.39	1.72 ***	3.70
Bubble Period	-1.13 **	-2.27	-1.13 **	-2.28	-1.58 **	-2.31	-0.50	-0.69	4.59 ***	12.66
Intercept	-1.05	-0.67	-1.05	-0.67	-0.85	-0.39	-0.69	-0.31	6.57 ***	5.71
Adjusted R ²	0.09		0.09		0.09		0.10		0.14	
N	8551		8551		4983		3568		8551	

Table 8. Determinants of Brokerage Equity Ownership

Table 8 reports estimates of a Tobit model. The dependent variable is BVC ownership, which is constraint between zero and 100. We present the results using the recommendation-level sample of 8,551 observations in column (1), whereas we present the results using the firm-issuer level data of 5,815 observations in column (2). Variable definitions are given in Table 1. ***, **, and * indicate that *t*-statistics are significant at the 1%, 5%, and 10% levels, respectively. The *t*-statistics are heteroscedasticity consistent and are adjusted for cross-sectional correlation among observations for the same issuer. The data are from January 1994 through December 2001.

	Recommendation- Level Sample		Firm-Issuer Level Sample	
	(1)	(2)	(1)	(2)
	Est.	t-stat.	Est.	t-stat.
Lead	18.07 ***	16.39	17.83 ***	13.93
Co-Manager	14.13 ***	13.40	13.77 ***	11.30
Log (Total Assets)	0.64 ***	2.70	0.58 **	2.01
Global Offering	1.74 ***	2.42	2.17 **	2.48
Number of Rounds	0.43 ***	4.01	0.35 ***	2.75
Company Age	-1.19 ***	-2.89	-0.92 *	-1.84
Underwriter Reputation	-1.46 ***	-5.07	-1.29 ***	-3.71
Secondary Shares	-0.09 ***	-3.40	-0.09 ***	-2.95
Aggregate Venture Returns	-0.01 *	-1.93	-0.01 *	-1.71
Offer Price Revision	-0.02 ***	-2.55	-0.02 *	-1.75
Other VC Ownership	-0.10 ***	-8.50	-0.10 ***	-6.43
Intercept	-17.88 ***	-6.31	-18.24 ***	-5.40
Pseudo R ²	0.29		0.13	
N	8551		5815	