ASSESSING THE VENTURE CAPITAL LEGACY:

AN INVESTIGATION OF

POST-IPO PERFORMANCE AND IMPACT

by

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Andrew Carl Cochran

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ABSTRACT

While extensive literature documents the venture capital impact around the initial public offering, little is known about the enduring effects of venture financing. This paper follows the post-IPO performance of venture-backed U.S. firms in different IPO cohorts from 1970 to 2006, and measures the duration of any venture capital advantages after the IPO. Venture capital strongly correlates with higher R&D and market-to-book ratios ("*q*"), and venture-backed firms grow faster and perform better particularly in high-tech industries. This apparent advantage for venture-backed firms remains for years following the IPO.

INTRODUCTION

In recent decades, an increasing number of emerging firms relies on venture capital for early-stage financing. Extensive innovation and economic advancement has sprung from the entrepreneurial endeavors of venture-backed firms. From 1970 to 2006 nearly 2,800 firms financed with venture capital undertook an initial public offering (IPO) in the U.S., and more than 65% of these were in a high-tech industry.[1] By 2006, over 20% of publicly traded firms in the U.S. were venture-backed, and these firms accounted for nearly 12% of total sales. Even more impressive, venture-backed firms accounted for 27% of sales and 41% of research and development in key high-tech industries in 2006.

Venture capital is a source of early-stage financing where, instead of receiving interest on a loan, investors ("venture capitalists") receive a share of ownership in the company. In this way the potential returns are not bound above by an interest rate, but rather are as unlimited as the company's growth potential. As partial owners, venture capitalists play an active role guiding the company's business plan (Gompers and Lerner 1999, 2001).

Growth among venture-backed firms has occurred amidst general economic expansion in the United States, which raises an important question: What is the nature of venture capital in the success of the firms they finance? Venture capitalists are often praised for their contributions when times are good, and scorned as exploiters when times

[1] "High-tech" firms are those in industries that Loughran and Ritter (2004) considered to be high-tech, distinguished by the following SIC codes: 357, 366, 367, 3812, 382, 384, 481, 4899, and 737, with the addition of SIC 283 and SIC 873 (pharmaceuticals and life sciences).

are bad. Study of this issue has led some to believe that venture capital is an important factor in the early development of firms. Gompers and Lerner (1999, 2001) explain that venture capitalists help start-up firms prepare for an initial public offering. Hellmann and Puri (2000, 2002) show that venture-backed firms bring products to market faster, an important milestone for the viability of a firm, and are better organized internally. On the other hand, some argue that venture capitalists rush start-up firms too quickly to an IPO in order to achieve short run gains, at the expense of the firm's long-run growth potential.

A wide range of research has been conducted to examine initial advantages of venture-backed firms, but little is known about differences between VC- and NVC-backed firms over the long-run. This paper will evaluate the enduring effects of venture capital within high-tech and non-high-tech industries with an extensive sample of IPOs over the period 1970 to 2001.

I find that venture capital has a positive correlation with research and development and with a firm's book-to-market ratio in the post-IPO period. The post-IPO differences between VC- and NVC-backed firms are particularly pronounced in high-tech industries. Some of these VC advantages remain for years after the IPO.

These results have several important implications. First, this study contributes a fuller understanding of the venture capital legacy, a topic which has received limited empirical attention. In addition, the differences between VC- and NVC-backed firms persist for several years after the IPO. Second, by showing the advantages of venture capital in the high-tech sectors, venture capital can be directed to the relevant industries. This study will show that venture capital has a greater impact on the R&D intensive high-

tech sector. Third, understanding the true impacts of venture capital will aid the entrepreneur in his or her decisions and strategy for raising capital. In giving up partial ownership and control of a company, it is useful for the entrepreneur to know what typical payoffs have been.

In the first section of this paper I examine different theories in the venture capital literature that explain why venture financing could be advantageous or disadvantageous. Section two describes the sample and firm characteristics at the time of the initial public offering, and how these figures differ for high-tech and non-high-tech firms. The third section shows post-IPO VC-NVC shares of sales and R&D, sales and R&D growth, and changes in operating return on assets, both pooled and divided into high-tech and non-high-tech sectors, and examines how the differences within each cohort change in post-IPO years, as well as how IPOs differ across the various cohorts. Following the third section is a regression analysis which focuses especially on the duration of the VC advantage. The paper concludes with a discussion of implications and limitations of the results.

LITERATURE REVIEW

Long-Run Venture Capital Contributions

Comparing stock price returns on venture- and non-venture-backed IPOs, Gompers and Lerner (2001) show that venture-backed firms continue to outperform long after they go public, especially after the mid-1990s. Jain and Kini (1995) confirm that venture-backed firms maintain a similar advantage in post-issue operating performance, although their analysis is limited to three years after the IPO. Brav and Gompers (1997) attenuate these results by demonstrating that any disadvantages for non-venture-backed IPO firms disappear when returns are scaled by the size of the stock issue. They explain that "venture-backed firms do indeed outperform non-venture-backed IPOs over a five-year period, but only when returns are weighted equally" (p. 1791). A broad literature discusses the impact of venture financing, focusing on the relevant positive and negative factors.

Venture Capital Advantages

According to Kortrum and Lerner (2000, p. 676) venture capitalists often take roles as directors, advisors, and sometimes even managers in the firms they finance. Hellmann (2000, p. 2) describes venture capitalists as "coaches, who choose which athletes get to play, who train and motivate them, and who try to create the most favorable conditions for them to succeed." Gompers and Lerner (1999) state that the influence and oversight of venture capitalists on the firm's board of directors is especially

helpful when a new CEO is appointed. This guidance serves to assist a firm's internal organization, laying the foundation for future stability and growth.

Many young firms face binding financing constraints which restrict optimal business strategies, particularly in high-tech sectors where most investment is in R&D. Venture capital directly relaxes these constraints. Without venture backing, young firms may not be able to take advantage of investment opportunities as they come along, thus stalling performance and growth. Not only do venture capitalists provide much-needed early stage financing, they also aid young firms with "the assurance of future financing if they reach their milestones," which "releases them from having to track down new money" (Gompers and Lerner 2001, p. 62). Brav and Gompers (1997) suggest that financing constraints may remain relaxed even after the firm goes public.

Young firms also struggle to obtain external finance because of a principal agent problem and information asymmetry. The manager of a firm may more readily spend money generated externally because he does not bear the full cost. But even if the manager acts in the interests of shareholders, information asymmetry makes it difficult to raise additional financing. As Gompers and Lerner (1999) describe the problem, "If the manager is better informed about the investment opportunities of the firm and acts in the interest of current shareholders, then managers only issue new shares when the company's stock is overvalued." (p. 129). Thus young firms seeking external finance resemble "lemons."[2] When the investor cannot distinguish between good prospective young firms and bad, and when bad firms are more likely to seek external finance, then good firms suffer because bad firms drive up the average risk of investment. Good firms

[2] Akerlof (1970) first developed the "lemons" problem.

are perceived to be riskier than they really are. The problem is especially severe for young high-tech firms given the risky nature of their investments. Furthermore, even in the absence of asymmetric information investors are uncertain of a firm's future. For all of these reasons, external finance can be costly.

Venture capitalists ameliorate these problems in a number of ways.[3] By "generating information about the firm's prospects" (Gompers and Lerner 1999, p. 130), and reevaluating the firm's prospects regularly, the asymmetry of information is reduced, thus reducing investors' uncertainty costs. Venture capitalists also use stock incentives to align motives of managers and investors. Gompers and Lerner (1999, pp. 131-132) explain that banks and other financial intermediaries are at a disadvantage to venture capitalists for financing young firms because of regulations. For example, banks often cannot charge interest rates high enough to compensate for the high level of risk young firms present (especially young high-tech firms). Also, banks cannot hold equity stakes in the firms. The potential returns to banks have an upper bound, whereas venture capitalists, who own shares in companies, face limitless potential returns. Leach and Melicher (2006, p. 451) add that "the whole commercial lending system is set up to screen out risk takers."

As mentioned previously, the obstacles young firms face are amplified for firms in the high-tech sector as they are often riskier and have fewer tangible assets. Because they struggle to raise financing from alternative sources, high-tech firms stand to gain

[3] Venture Capitalists rarely get involved in daily management of the firm. Gorman and Sahlman (1989) describe their involvement: "Company performance is monitored regularly, and when more funds are needed or when there is a gap in the management team, the venture capitalist's involvement escalates." (p. 7).

more from venture financing. In their monitoring and mentoring roles venture capitalists determine good high-tech prospects and provide the capital needed to grow quickly, which might otherwise be prohibitively costly.

Supporting these theories, results from a number of recent studies suggest that venture-backed firms have an advantage, at least in their early stages. Hochberg (2008) shows that venture capital improved post-IPO corporate governance. Hellmann and Puri (2000) find that "obtaining venture capital is associated with faster time to market, especially for innovators" (p. 28). In a later study, they conclude that venture capital helps firms reach various organizational objectives, particularly in the early development stages (Hellmann and Puri 2002).

Choosing the right time to go public is an important decision for young firms to make, as is determining a firm's opening price. After the IPO, the price of a company's stock is set by the laws of supply and demand, but the opening sale price of the stock is the company's best guess of the stock value. Opening at a price above or below market equilibrium leads to lost gains from trade. Megginson and Weiss (1991) find that venture capital backing "maximizes the fraction of the proceeds of the IPO, net underpricing and direct costs, which accrues to the issuing firm," and "reduces the mean and median degree of IPO underpricing" (p. 3). In other words, venture capitalists use their experience to guide young firms in the IPO process so they go public at the optimal time and price.

While these theories cover initial advantages of venture capital, Brown (2005) shows that venture-backed U.S. firms in the high-tech sector have long-run benefits after

the IPO, particularly for R&D intensity and operating performance. I will expand on this study to show how the influence of venture capital varies between high-tech and non-high-tech sectors, and also consider how the impact of venture financing changes in different IPO cohorts.

Venture Capital Disadvantages

Some elements of venture backing may be damaging to a firm's long-term growth. Hellmann and Puri (2000) speak of the costly time commitment of the entrepreneur to convene with and meet the demands of venture capitalists.[4] Also when venture capitalists enter the picture, the entrepreneur gives up a degree of ownership and control, and may be less motivated by the firm's future performance. When an entrepreneur or an employee owns a stake in the firm, he has incentives to put his best forward because he internalizes the benefits of productive work. If the entrepreneur is disenfranchised enough he may even leave the company, which could be disastrous if his human capital is crucial to the firm's function.[5] The loss of ownership and forfeit of control could also lead to conflict between the entrepreneur and the venture capitalist, as Bygrave and Timmons (1992) discuss.

Another negative impact may result from venture capitalists manipulating a firm's business strategy to maximize short-term gain at the expense of long-term potential. Gompers and Lerner (1998) show that the majority of venture shares are distributed (sold

[4] Gompers and Lerner (2001) dismiss these "gripes" because the venture capitalists' demands are "necessary ingredients of the venture capital process" (p. 5).
[5] Gompers and Lerner (2001) say that in an effort to discourage the entrepreneur from leaving, venture capitalists are sensitive to the ownership issue and ensure that the entrepreneur retains a substantial stake in the company. According to Leach and Melicher (2006), venture capitalists normally require some amount of incentive ownership to motivate a unified effort to increase the company's equity value.

or transferred) within two years after the IPO. The venture capitalist's short-term incentives may affect the firm's investment strategy to influence the current stock price, postponing key long-term growth investments.

One way to accomplish this is to prematurely take the firm public, referred to as "grandstanding." Jeng and Wells (2000, p. 16) describe the IPO as an "exit mechanism" of venture capitalists, who earn 195 percent return from their shares after an average holding period of 4.2 years. An acquired firm, on the other hand, returns only 40 percent after an average of 3.7 years. Gompers (1996) shows that especially younger venture capitalists have an incentive to rush companies to an early IPO in order to establish their own reputations. It is also possible that venture capitalists would "trick" the entrepreneur to open the sale of stock at a price below the market value (unknown to the entrepreneur, but presumably better known to the venture capitalist). As a result of this "underpricing," the venture capitalist could buy up stock at the low price and sell after the market bids the price up to its equilibrium level.[6]

Sources of Bias

The benefits of venture backing could be overstated if the firms financed with venture capital are the "best" firms who would have outperformed even without venture capital. Venture capitalists choose to finance a select few firms that stand out among many. They are careful to pick the best firms—the best investments.

[6] As mentioned previously, Megginson and Weiss (1991) show evidence the contrary—that venture capitalists assist young firms to go public at the optimal time and price. One naturally wonders whose objectives are "optimized" when venture capitalists offer this assistance. Jain and Kini (1995) point out that venture capitalists, in the interest of establishing and protecting a favorable reputation, are motivated to maximize the company's gains from the IPO: "Their past success becomes a strong selling point as they negotiate VC contracts with issuers or raise funds from investors" (p. 4).

Conversely, perhaps the "best" firms purposely avoid venture backing. The firms with the best performance prospects may have an easier time raising alternative, cheaper financing. Also, a firm with good prospects for success may be less inclined to give up ownership and control to venture capitalists. The entrepreneur takes on business and financial risk attached to venture capital. Megginson and Weiss (1991) say that venture capitalists structure their investments such that they can bail out if the company fails to meet objectives, and even reserve the right to replace the entrepreneur with a new manager. The "best" firms may have the most to lose by accepting these costs of venture capital. If only inferior firms are venture-backed, then the effect of venture capital will be understated.

Furthermore, results may be biased because of attrition. Firms observed in the sample are the ones that survive. If venture-backed firms typically drop out before they go public, but the ones that survive to undergo an IPO perform better than non-venture-backed IPOs, I will overemphasize the venture capital "advantage" because I only see the surviving firms.

Also, because only publicly traded firms are included in the sample, results are limited to the impact of venture financing on venture-backed IPOs, and exclude any implications for private companies. However, since private companies concentrate in the non-high-tech sector, and as venture-backed IPOs are focused particularly on the R&D intensive high-tech sector, I expect this limitation is of little consequence.

SAMPLE DESCRIPTION AND FIRM CHARACTERISTICS

Data Sources

Data for this paper is compiled from Thomson Financial's SDC database, Venture Economics' VentureXpert database, and Compustat. The SDC data shows characteristics of firms undergoing an initial public offering. The VentureXpert database includes the quantity of venture funding received by each respective firm. Data from Compustat tracks these firms in post-IPO years.[7]

High-Tech and Non-High-Tech IPOs

IPOs between 1970 and 2001 are divided into four seven-year cohorts according to their initial public offering dates. The first cohort includes new public entrants from 1970 to 1977, while the second includes IPOs from 1978 to 1985, and so on. These firms are the primary focus of the study. Stopping in 2001 gives at least five years of post-IPO data for each cohort. Separating the data this way allows me to evaluate whether venture financing advantages among groups of IPOs have changed over time. Only publicly traded firms are included in the sample, although data is included from years before and after the initial public offering. Private companies are excluded from the sample. Spin-off companies are also not included in the IPO cohorts.

Firms are further divided into high-tech or non-high-tech industry subsets, as well as venture-backed or non-venture-backed subsets. High-tech industries include pharmaceuticals (SIC 283), computer hardware (SIC 357), communications equipment

[7] Firms not included in the Compustat database are dropped from the sample.

(SIC 366), electronics (SIC 367), navigation equipment (SIC 3812), measuring and controlling devices (SIC 382), medical instruments (SIC 384), telephone equipment (SIC 481), communications services (SIC 4899), software (SIC 737), and life sciences (SIC 873).[8]

Table 2 shows the count of IPO firms in each high-tech industry by cohort, and also includes the total non-high-tech firm count by cohort. Across the whole sample, there are 7005 IPOs—3079 high-tech and 3926 non-high-tech. The largest number of IPOs occurred in *SIC 737* (software and computer related services) with 1112, and *SIC 283* (pharmaceuticals) with 407, while *SIC 3812* and *SIC 4899* had the fewest with 17 and 37 respectively.[9] Table 2 shows that venture capitalists clearly focus on high-tech firms. Over the course of the sample, high-tech firms accounted for over 65% of venture-backed IPOs (35% of venture backed firms are in non-high-tech industries), whereas only 40% of high-tech IPOs were not venture-backed (60% of high-tech IPOs are venture-backed). Of non-high-tech IPOs, 24% are financed with venture capital.

The total count of venture-backed firms rose substantially from 97 in the first cohort to 1373 in the fourth. Among high-tech firms, non-venture-backed firms exceeded VC firms in the first cohort 71 to 66, but venture-backed IPOs progressively increased in numbers relative to NVC-backed firms thereafter. In the fourth cohort, 970 high-tech VC-backed firms underwent an initial public offering, compared to only 568 NVC-backed high-tech firms. Even in the non-high-tech sector VC-backed IPOs progressively

[8] Once again, these particular industries were determined to be "high-tech" in Loughran and Ritter (2004), with the addition of pharmaceuticals (SIC 283) and life sciences (SIC 873).

[9] For all but three of the high-tech sectors, the ratio of VC to non-VC IPOs is greater than 1 (SIC 382 is 0.98). But for navigation equipment (SIC 3812) and communications services (SIC 4899), the ratio is much less than 1 (0.7 and 0.6 respectively).

increased in number relative to NVC-backed IPOs in each cohort. Only 7% of non-high-tech IPOs were venture backed in the first cohort, increasing to 29% by the fourth cohort.[10]

IPO Characteristics

Tables 3 and 4 show various firm characteristics at the time of their initial public offerings. Median and mean values for firms in each cohort are reported in Tables 3 and 4 respectively.[11] Table 3 shows that in the pooled sample NVC-backed IPOs employ significantly more people in cohorts one and four, but fewer than VC-backed IPOs in cohorts two and three. In the high-tech sector, VC-backed firms employ significantly more people across the board in IPOs from 1970 to 2001, employing 152 more people in cohort one, 109 and 98 more in cohorts two and three, and 46 more in cohort four. In the case of non-high-tech IPOs, VC-backed firms employ significantly more in the second and third cohorts, while the first and fourth cohorts have insignificant differences with NVC-backed IPO employment.

After trailing in median sales (Table 3 - All) in the first cohort, venture-backed IPOs have significantly higher sales than NVC-backed IPOs in cohorts two and three. In cohort four NVC-backed IPOs have higher sales, but the difference insignificant. Restricting the sample to high-tech firms only (Table 3 – HT), VC-backed IPOs have significantly higher median sales in the first cohort—$29.290 million for VC-backed,

[10] 31 VC-backed NHT IPOs in cohort 1 divided by 441 NVC-backed NHT IPOs equals 7%. 403 VC-backed NHT IPOs in cohort 1 divided by 973 NVC-backed NHT IPOs equals 41%.
[11] Winsorized means at the 1% level are reported, reducing the pull of outliers without eliminating the information altogether. All mean values in subsequent tables are likewise winsorized.

compared to $19.575 million for NVC-backed—and this advantage is consistent with the remaining three cohorts.[12] For non-high-tech firms (Table 3 – NHT), VC-backed IPOs trail in median sales in the first cohort, show an insignificant lead in the second, and take a significant lead over NVC-backed IPOs in the third and fourth cohorts. There is not a clear trend in IPO sales changes across cohorts in the high-tech sector for either VC- or NVC-backed firms. In the non-high-tech sector we see entering VC-backed firms increase sales at the IPO from $38.020 million in the first cohort to $70.776 million by the fourth cohort, while at the same time median sales from new NVC-backed firms falls at the IPO from $64.012 million in cohort one to $25.659 million in cohort two before recovering to $55.825 million in cohort four.

In Table 3 (All) VC-backed IPOs have higher assets than NVC-backed IPOs in the later three cohorts (cohort one has an insignificant difference). In the high-tech restricted section, Table 3 shows significantly higher VC asset levels in every cohort. As with the pooled sample, VC-backed IPOs have significantly more assets for non-high-tech IPOs in cohorts two, three and four, with an insignificant lead in the first cohort. Notice that both high-tech and non-high-tech IPOs in the fourth cohort have substantially higher assets than IPOs in the first cohort. Assets for high-tech VC-backed IPOs increase from 28.019 to 66.291, while NVC-backed IPOs increase from $14.779 million to $35.765 million. In the non-high-tech sector, median assets among VC-backed IPOs increase from $41.039 to $99.143 million and NVC-backed IPOs from $36.489 to $55.505 million.

[12] Units are millions of U.S. dollars

The median R&D ratios to both sales and assets demonstrate almost identical results in Table 3. First, in Table 3 (All) each NVC column shows a median value of 0. This is because non-venture-backed IPOs focus on the non-high-tech sector, where R&D is normally small or zero. I will show later that of the non-high-tech firm doing R&D, nearly all are financed with venture capital. Venture-backed IPOs dominate median R&D ratios in the pooled section for this reason, and skipping down to the non-high-tech section of Table 3 the absence of non-high-tech R&D is apparent by the zero medians across the board for both VC- and NVC-backed IPOs. In the high-tech sector, where nearly all firms conduct R&D, IPOs with venture financing have significantly higher R&D ratios in every cohort. Accounting for the much higher levels of median assets in later cohorts, it especially interesting to note that *RD:Asst* increases in the high-tech sector at the time of the IPO in later cohorts as well. For VC-backed IPOs, *RD:Asst* increases from 0.077 in cohort one to as high as 0.119 in cohort three before settling at 0.100 in cohort four. For NVC-backed IPOs, *RD:Asst* increases from 0.033 to 0.056 from cohorts one to four.

Table 3 shows that in the pooled data VC-backed IPOs have a significantly higher capital spending to sales ratio in the first and fourth cohorts, but no advantage in cohorts two or three. In the high tech sector the *Capspg:Sales* ratio remains significantly larger for VC-backed IPOs in every cohort, although in the non-high tech sector the difference is insignificant in all but the fourth cohort where VC-backed IPOs have a slight advantage.

In Table 3, the pooled sample shows a slight but significant advantage to NVC-backed IPOs in cohorts two, three and four for the *Capsp:Asst* ratio, but the differences are nearly always insignificant and near zero in the high-tech and non-high-tech restricted samples. Notice that for both of the capital spending ratios, the values drop from the first cohort to the fourth in conjunction with the growing levels of assets mentioned earlier. *Capspg:Sales* falls from 0.093 to 0.039 for VC-backed IPOs from cohort one to cohort four. *Capsp:Asst* falls from 0.072 to 0.041 from cohorts one to four for NVC-backed IPOs.

The winsorized mean values in Table 4 present a noisier picture. In the pooled sample, NVC-backed firms employ 288 and 396 more people in the first and fourth cohorts respectively, but the employment differences are insignificant in cohorts two and three. High-tech VC-backed firms still employ more people in cohorts two and three, but no longer more in one or four. The standard errors are too big in the non-high-tech sector to determine any differences, except in cohort three where VC-backed firms employ 346 (1.355*1000 – 1.009*1000) more people on average.

In Table 4's pooled sample, NVC-backed IPOs have significantly higher sales in cohorts one, three and four, and nearly the same level of sales as VC-backed IPOs in the second cohort. In the high-tech sector, the first cohort is too noisy to tell, but VC-backed IPOs have higher sales in the second and third cohorts but less sales in cohort four. The differences in sales are insignificant in the non-high-tech sector.

Table 4 (All) shows insignificant differences between VC- and NVC-backed IPO asset levels except in cohort 2, where VC-backed IPOs have significantly higher assets.

As in Table 4 (HT), Table 4 (HT) shows that VC-backed IPOs have substantially higher asset levels than NVC-IPOs. The mean level of assets for a VC-backed IPO in cohort one is $44.177 million compared to $28.014 million for a NVC-IPO. Also, as the median assets greatly increased in later cohorts, we see these mean values increase to $131.162 million and $105.741 million respectively by cohort four. In the non-high-tech sector, the differences are insignificant except in cohort two, where VC-backed IPOs average $70.671 million in assets compared to the NVC average of $50.850 million. Notice that, once again, the levels of assets increase from $69.502 million and $68.334 million for VC- and NVC-backed firms in cohort one to $222.867 million and $204.053 million by cohort four.

In Table 4 (All) the R&D to sales ratio shows higher values for VC- than NVC-backed IPOs in every cohort, and a progressive increase from 0.122 and 0.012 for VC and NVC in cohort one to 1.348 and 0.443 in cohort four. In the high-tech restricted sample, VC-backed IPOs show a higher ratio in cohorts one and two before the standard errors make the differences insignificant in cohorts three and four. Remember that non-high-tech firms engage in little to no R&D, which is why *median* values were zero in Table 3 (NHT). In Table 4 (NHT) the *mean* values are greater than zero, but very small. Compare the mean R&D to sales ratios of a venture-backed IPO in cohorts one and two from the high-tech sector, 0.166 and 1.054, to the same columns in the non-high-tech sector, 0.032 and 0.164. Venture-backed non-high-tech IPOs show higher R&D to sales

ratios in cohorts two, three and four of Table 4 (NHT) and have an insignificant difference in the first cohort.[13]

Table 4 (All) shows higher R&D to assets ratios for VC-backed IPOs in every cohort, and, as Table 3 showed, the ratios increase over time in spite of rising levels of assets. VC- and NVC-backed IPOs in cohort one have ratios of 0.058 and 0.013 respectively, compared to 0.099 and 0.042 in cohort four. Among high-tech firms, VC-backed IPOs have higher R&D to assets ratios in the first and fourth cohorts, but have almost no difference in the second and third cohorts from NVC-backed IPOs.

The capital spending ratios to sales and assets are less clear in Table 4 (All). *CapSpg:Sales* shows higher ratios for VC-backed IPOs in the first cohort, an insignificant difference in cohort two, followed by higher ratios for NVC-backed IPOs in cohorts three and four. *CapSpg:Asst* shows a similar result, with NVC-backed IPOs overtaking the VC-backed IPOs in the second cohort.

In Table 4 (HT), *CapSpg:Sales* shows higher ratios for VC-backed IPOs in the first and fourth cohorts, but insignificant differences in the second and third cohorts, whereas *CapSpg:Asst* shows insignificant differences in the first two cohorts followed by higher ratios for NVC-backed IPOs in the final two cohorts. It is not clear what role venture capital plays in the influence of capital spending ratios, even in the high tech sector.

Table 4 (NHT) is even less conclusive. VC- and NVC-backed IPOs alternate in each cohort which has a higher ratio of *CapSpg:Sales*, and in each cohort the difference is

[13] It is not surprising that the first cohort has an insignificant difference considering that not only are these IPOs non-high-tech, but they are from 1970 to 1977 when there was considerably less R&D going on in general than in later cohorts.

significant. *CapSpg:Asst* shows a higher ratio for VC-backed IPOs in the first cohort, an insignificant difference in cohort 2, and significantly higher ratios for NVC-backed IPOs in cohorts three and four. The key differences between VC- and NVC-backed IPOs are seen in the R&D ratios, but not in the capital spending ratios.

The results in Table 4 are noisier than the results in Table 3. Some of the mean values in Table 4 were vastly different from the median values in Table 3. For example, the mean assets for a non-high-tech VC-backed IPO in cohort four was $222.867 million, while the median value was only $99.143 million, a difference of more than $123 million when the difference in cohort one was just $28 million. Table 4 also has far higher standard errors, as evidenced by the larger p-values throughout the table. The mean values in Table 4 are winsorized at the 1% level, but I can see that outliers are still affecting the data. At any rate, the key points to take from Tables 3 and 4 are that venture-backed IPOs have higher sales and assets particularly in the high-tech sector, are much more R&D intensive than non-venture-backed IPOs, and that most of the R&D is conducted in high-tech industries.

POST-IPO PERFORMANCE

Shares of Sales and R&D

Whereas earlier tables are limited to the time of the IPO, the remaining tables all deal with post-IPO performance. Tables 5 and 6 display the total share of both sales and research and development that firms from each IPO cohort account for in the years 1977, 1985, 1993, 2001, and 2006. I divide each table into two panels: one is the share of total sales (or R&D), which is the proportion of a particular year's sales that VC- or NVC-backed IPOs account for among not only IPOs from that year but also from all other incumbent firms; the other is the share of IPO sales (or R&D), which is the proportion of a particular year's sales that VC- or NVC-backed IPOs from a particular cohort account for among only other IPO firms in the sample. For example, incumbent firms prior to 1970 are included in the former section, but excluded in the latter section. The first panel gives a sense of the cumulative impact that VC- and NVC-backed IPOs have had. The second panel will show the cumulative importance of VC-backed IPOs relative to NVC-backed IPOs.

Table 5-A includes share of sales for the whole pooled sample, while Tables 5-B and 5-C include share of sales for high-tech and for non-high-tech sectors respectively. Tables 6-A, 6-B and 6-C show results for shares of R&D in the same structure. Although every table contains two panels (share of *Total* Sales or R&D and share of *IPO* Sales or R&D), the ratio VC share to the NVC share is exactly identical between the two panels. For example, in Table 5-A, venture-backed firms from cohort one account for 0.68% of

total sales and 12.24% of IPO sales in 1985. Non-venture-backed firms from cohort one account for 2.07% of total sales and 37.34% of IPO sales in 1985. Thus, the ratio of VC to NVC shares of total sales is 0.0068 / 0.0207 = 0.328 and the ratio of VC to NVC shares of IPO sales is 0.1224 / 0.3734 = 0.328. While the VC-NVC ratios are the same, the cumulative impact of IPOs between the two tables greatly varies.

Shares of Sales (Pooled Sample)

In Table 5-A, non-venture-backed IPOs account for a greater share of sales than venture-backed IPOs in every cohort. In 1977, venture-backed IPOs from cohort one account for only 0.27% of total sales, and 12.86% of IPO sales, while non-venture-backed IPOs account for more than six times these shares. After the initial period, venture-backed firms make up some of this deficit. By 1985 the difference between VC- and NVC-backed IPOs from cohort one shrinks in half. Likewise, in cohort two, where the VC share was just 61.5% of the NVC share in 1985 (0.1922 / 0.3121), the VC share grew to 127% of the NVC share by 1993 (0.1270 / 0.0998). Moreover, this initial NVC proportional advantage diminishes in the first period across cohorts one, two and three. The ratio of the initial VC share to the initial NVC share rises from 14.7% in cohort one, to 61.5% in cohort 2, to 70.4% in cohort three before falling back to 44.7% in cohort four.

The first panel of Table 5-A shows that venture-backed IPOs in the first cohort gain a greater share of sales in the years after their IPO dates. A 0.27% share in 1977 increases gradually to 1.15% of total sales by 2006. It is remarkable that their market shares continue to grow since many new IPOs enter the market over that span of time and

since many IPOs from that cohort drop out of the sample. The same can be said of non-venture-backed IPOs in the first cohort, whose share of sales increases from 1.86% in 1977 to 5.56% in 2006. VC-backed IPOs from cohort two also build a greater share of total sales from 1.06% in 1985 to 2.25% by 2006, although the NVC share falls from 1.73% to 1.34% in the same period. VC-backed IPOs gain a larger share of total sales in cohorts three and four as well, while, the NVC share remains stable in cohort three and falls in cohort four.

The initial total market shares of sales for venture-backed firms also increases across cohorts. In cohort one, the initial VC share of total sales was 0.27%, which grew to 1.06% and 2.99% in cohorts two and three before receding slightly to 2.84% in cohort four. Initial shares of sales for NVC-backed IPOs grew across cohorts in a similar way, beginning with 1.86% of total sales in cohort one, dipping slightly to 1.73% in cohort two before picking up 4.25% and 6.35% in cohorts three and four. This increase is likely driven by the rising number of IPOs in later cohorts.

The second panel of Table 5-A shows that shares of IPO sales fall continuously in the post-IPO years for both VC- and NVC-backed IPOs; for example, the share of IPO sales from venture-backed IPOs in cohort two falls from 19.22% in 1985 to 12.70% in 1993, to 8.68% in 2001, and finally to 7.83% in 2006.

The initial share of IPO sales for venture-backed firms across cohorts first rises then falls; a 12.86% initial share in cohort one rises to 19.22% in cohort two before it falls to 18.88% in cohort three and 9.81% in cohort four. Initial shares for NVC-backed IPOs fall continuously across the cohorts, from 87.14% in cohort one, to 31.21% in

cohort two, and all the way down to 21.97% by cohort four. Notice that the sum of the IPO shares in each year column sum to one. As more cohorts enter the sample, the initial shares are taken from a larger pie, and so it is not surprising that they shrink.

By the end of the sample in 2006, venture-backed IPOs account for 11.74% of total sales and 40.86% of IPO sales, while non-venture-backed IPOs account for 16.99% of total sales and 59.14% of IPO sales. The next two tables will show that the higher cumulative effect of NVC-backed firms in the pooled sample is driven by larger sales among non-high-tech NVC-backed firms.

Shares of Sales (High-Tech)

Table 5-B restricts the sample to high-tech firms only. Unlike in the previous table, VC-backed IPOs account for a greater share of sales than NVC-backed IPOs in every cohort. In 1977, venture-backed IPOs from cohort one account for only 1.35% of total high-tech sales, and 62.33% of IPO sales, while non-venture-backed IPOs account for only a fraction of these shares (60% of the VC share). After the first period, the VC share actually grows in proportion to the NVC share, at least in the subsequent period. In cohort three, for example, the VC share of sales is 4.73 times larger than the NVC share in 1993, 7.07 times in 2001, and 4.73 times in 2006. Only in the fourth cohort does the VC proportional advantage fall in the subsequent period, from 1.56 to 1.45 times bigger in 2001 and 2006 respectively. The initial proportional VC advantage remains fairly constant across cohorts except in cohort three, where it jumps from 1.65% and 1.20% in cohorts one and two all the way up to 4.73% before falling back to 1.56% in cohort four.

The first panel of Table 5-B shows venture-backed IPOs in the first cohort gain a greater share of sales in the years after their IPO dates. A 1.35% share in 1977 increases to 3.33% of total sales by 2006, reaching a peak share of 4.04% in 1993. In subsequent cohorts, venture-backed IPOs likewise increase their market shares of total sales for at least one period in the years after the IPO date. Non-venture-backed IPOs gradually lose their share of total sales in cohorts one and two, but steadily gain a greater market share of total sales in cohorts three and four. For example, a 2.89% share of total sales in 1985 of cohort two falls steadily to 1.52% by 2006, but a 1.40% share of total sales in 1993 of cohort three rises steadily to 2.77% by 2006.

The initial shares of total sales for high-tech venture-backed firms also increases across cohorts. In cohort one, the initial VC share of total sales was 1.35%, which grew to 3.46% and 6.61% in cohorts two and three before falling back to 5.41% in cohort four. Initial shares of total sales for high-tech NVC-backed IPOs varied across cohorts in a somewhat different way, beginning with 0.81% of total sales in cohort one, rising to 2.89% in cohort two, dropping back to 1.40% in cohort three and finally rising back to 3.48% by cohort four.

The second panel of Table 5-B shows that in the first two cohorts, shares of IPO sales fall in the post-IPO years for both VC- and NVC-backed IPOs. For example, the share of IPO sales from venture-backed IPOs in cohort two falls from 37.59% in 1985 to 28.99% in 1993, to 15.26% in 2001, and finally to 12.59% in 2006. It is important to note that non-venture-backed IPOs lose their shares much faster than venture-backed IPOs; NVC-backed IPOs from the first cohort drop from a 37.67% share of IPO sales in

1977 to 6.37% in 1985, and NVC-backed IPOs from cohort two drop from a 31.40% share in 1985 to 9.99% by 1993. In the same cohorts, VC-backed shares drop from 62.33% in 1977 to 24.64% in 1985, and from 37.59% in 1985 to 28.99% in 1993 respectively. Unlike the first two cohorts, in the third and fourth cohorts, the share of high-tech IPO sales for VC- and NVC-backed IPOs increases.

The initial share of high-tech IPO sales for venture-backed firms across cohorts falls continuously; a 62.33% initial share in cohort one falls to 37.59% in cohort two, 31.69% in cohort three, and 15.17% in cohort four. Initial shares for NVC-backed IPOs also fall across the cohorts, from 37.67% in cohort one, to 31.40% in cohort two, all the way down to 6.71% in cohort three, then recovering slightly to 9.75% by cohort four. I believe the dramatic drop in share of sales from non-venture-backed IPOs is due in part to extensive innovation in high-tech industries, and that venture capital plays a key role in this high-tech innovation.

A large number of venture-backed IPOs have substantial sales, and have a major cumulative impact by the end of the sample. In 2006, venture-backed IPOs account for 26.53% of total sales and 74.84% of IPO sales, while non-venture-backed IPOs account for 8.92% of total sales and 25.16% of IPO sales.

Shares of Sales (Non-High-Tech)

Table 5-C restricts the sample to non-high-tech firms only. Unlike in the previous table, VC-backed IPOs account for a smaller share of sales than NVC-backed IPOs in nearly every cohort, although in the post-IPO years VC-backed firms generally gain a greater proportion. In 1977, venture-backed IPOs from cohort one account for only

0.13% of total non-high-tech sales, and 6.34% of IPO sales, while non-venture-backed IPOs account for more than fifteen times these shares (1.99% and 93.66% respectively). After the initial period, the VC proportion of the share grows for at least the subsequent period in each cohort. In cohort three, for example, the VC share of sales is 0.43 times the NVC share in 1993, 0.64 in 2001, and 0.60 in 2006. Across the different IPO cohorts, the initial proportion of VC sales share skyrockets from 7% of the NVC share (0.0013 / 0.0199) in cohort one to 39.5% (0.0059 / 0.0150) in cohort two and 43.4% (0.0214 / 0.0493) in cohort three, then falls to 29.6% (0.0212 / 0.0715) in cohort four.

The first panel of Table 5-C shows that non-high-tech venture-backed IPOs in the first cohort gain a greater share of sales in the years after their IPO dates. A 0.13% share in 1977 increases to 0.66% of total sales by 2006. In subsequent cohorts, venture-backed IPOs likewise increase their market shares of total sales. Non-venture-backed IPOs gradually gain a greater their share of total sales in the post-IPO years of the first cohort, maintain a reasonably constant share of total sales in cohorts two and three, and drop their share from 7.15% of total sales in 2001 to 5.85% in 2006 of the fourth cohort.

The initial shares of total sales for non-high-tech venture-backed firms also increases across cohorts. In cohort one, the initial VC share of total sales was 1.35%, which grew to 3.46% and 6.61% in cohorts two and three before falling back to 5.41% in cohort four. Initial shares of total sales for high-tech NVC-backed IPOs varied across cohorts in a somewhat different way, beginning with 0.81% of total sales in cohort one, rising to 2.89% in cohort two, dropping back to 1.40% in cohort three and finally rising back to 3.48% by cohort four.

The second panel of Table 5-C shows that in the first three cohorts, shares of IPO sales fall in the post-IPO years for both VC- and NVC-backed IPOs; for example, the share of IPO sales from venture-backed IPOs in cohort three falls from 14.58% in 1993, to 11.12% in 2001, to 10.94% in 2006. In the fourth cohort, the VC-backed share of IPO sales rises from 7.84% in 2001 to 11.27% in 2006, while the NVC-backed share falls from 26.47% to 21.46%.

The initial share of non-high-tech IPO sales for venture-backed firms across cohorts rises for three cohorts, before falling in the fourth; a 6.34% initial share in cohort one rises to 12.31% in cohort two, 14.58% in cohort three, then falls back to 7.84% in cohort four. Initial shares for NVC-backed IPOs falls from 93.66% in cohort one, to 31.13% in cohort two, rises a bit to 33.56% in cohort three, then falls again to 26.47% by cohort four.

By the end of the sample in 2006, venture-backed IPOs account for 8.48% of total sales and 31.11% of IPO sales, while non-venture-backed IPOs account for 18.77% of total sales and 68.89% of IPO sales.

It is interesting to note the cumulative impact of venture-backed IPOs especially in the high-tech sector, where they account for 26.53% of total sales by 2006, compared to just 8.48% of non-high-tech total sales. High-tech venture-backed IPOs account for 74.84% of IPO sales, but only 31.11% of non-high-tech IPO sales. Especially in the high-tech sector we see venture-backed firms accounting for greater shares of sales than their non-venture-backed counterparts, and maintaining these shares longer than non-

venture-backed IPOs. Moreover, venture-backed IPOs play an increasingly important role in the later cohorts coinciding with the high-tech boom.

Shares of R&D (Pooled Sample)

In Table 6-A, venture-backed IPOs account for a greater share of R&D than non-venture-backed IPOs in every cohort. I expect to see this in Tables 6-B and 6-C as well, showing a strong link between venture capital and R&D. In 1977, venture-backed IPOs from cohort one account for only 0.95% of total R&D, and 54.82% of IPO R&D, while non-venture-backed IPOs account for only a fraction of these shares. After the initial period, venture-backed firms increase this difference in every cohort and in almost every post-IPO period. In cohort two, for example, VC-backed firms account for 3.63 times the R&D share of NVC-backed firms in 1985, 10.62 times in 1993, 11.26 in 2001, and 12.46 times the share in 2006. This proportional difference in R&D shares between VC- and NVC-backed IPOs increases across the first three cohorts: VC-backed IPOs have a 121% (0.0095 / 0.0078) greater initial share of R&D than NVC-backed IPOs in the first cohort, rising to 363% greater in cohort two and 543% in cohort three, then falling to 242% in cohort four.

The first panel of Table 6-A shows that venture-backed IPOs in the first cohort gain a greater share of R&D in the years after their IPO dates. A 0.95% share in 1977 increases gradually to 4.55% of total R&D by 2006. It is remarkable that their market shares continue to grow since many new IPOs enter the market over that span of time, especially given the high-tech boom in the later cohorts. Perhaps the venture-backed firms from the first cohort are more innovative and adaptive than their non-venture-

backed counterparts, who demonstrate a declining share of R&D in the post-IPO years from the first two cohorts. NVC-backed IPOs from the second cohort begin with a 0.95% share of total R&D, which falls to 0.60% by 1993, 0.47% by 2001, and finally 0.43% in 2006. NVC-backed IPOs in the third cohort show an increasing share in the post-IPO years, however, from 1.37% in 1993 to 4.18% in 2006. In the fourth cohort, both VC- and NVC-backed shares of total R&D fall in the post-IPO period.

The initial total market shares of R&D for venture-backed firms also increases continuously across cohorts. In cohort one, the initial VC share of total R&D was 0.95%, which grew to 3.45%, 7.41% and 10.0% in cohorts two and three and four. Initial shares of R&D for NVC-backed IPOs also grew continuously across cohorts, though not as quickly, beginning with 0.78% of total R&D in cohort one, and rising to 0.95%, 1.37% and 4.13% in cohorts two, three and four.

The second panel of Table 6-A shows that shares of IPO R&D fall in the post-IPO years for both VC- and NVC-backed IPOs; for example, the share of IPO R&D from venture-backed IPOs in cohort one falls from 54.82% in 1977 to 11.50% in 2006. It is important to notice that the NVC-backed shares of IPO R&D falls much farther (and much quicker) than the VC-backed shares. The share of IPO R&D for NVC-backed IPOs in cohort one falls, by comparison, from 45.18% to just 1.02%, but notice that by 1985 the NVC-backed share has already fallen to 8.63% of IPO R&D, whereas the VC-share from the same cohort is 30.64%.

The initial share of IPO R&D for venture-backed firms across cohorts falls in half from the first cohort to the fourth, from 54.82% to 25.40%, due to the rapidly increasing

size of the R&D "pie" because of the high-tech boom in the late 1980s and 1990s. As shown in Table 3, a large number of R&D intensive firms went public during this time. Initial shares for NVC-backed IPOs fall even farther across the cohorts, from 45.18% in cohort one to 10.49% in cohort four.

By the end of the sample in 2006, venture-backed IPOs between 1970 and 2001 account for 31.88% of total R&D and 80.63% of IPO R&D, while non-venture-backed IPOs account remarkably smaller shares: 7.66% of total R&D and 19.37% of IPO R&D.

Shares of R&D (High-Tech)

Table 6-B restricts the sample to high-tech firms only. Like in the previous table, VC-backed IPOs account for a greater share of R&D than NVC-backed IPOs in every cohort. In 1977, venture-backed IPOs from cohort one account for 2.69% of total high-tech R&D, and 77.47% of IPO R&D, while non-venture-backed IPOs account for less than one third of these shares. After the initial period, the VC proportion of the share continues to grow. In cohort two, for example, the VC share of R&D is 4.11 times bigger than the NVC share in 1985, 13.52 times bigger in 1993, and is ultimately 15.92 times bigger in 2006. The initial proportional VC advantage increases across the first three cohorts, from 343% of the NVC share in cohort one to 411% and 838% in cohorts two and three, before falling to 290% in cohort four.

The first panel of Table 6-B shows venture-backed IPOs in the first cohort gain a greater share of R&D in the years after their IPO dates. A 2.69% share in 1977 increases to 5.57% of total R&D by 2006. In subsequent cohorts, venture-backed IPOs likewise increase their market shares of total R&D for at least one period in the years after the IPO

date, except in cohort four where the share declines from 13.14% in 2001 to 8.36% in 2006. Non-venture-backed IPOs gradually lose their share of total R&D in every cohort except the third, where the share surprisingly jumps from 1.51% in 1993 to 5.22% in 2006.

The initial shares of total R&D for high-tech venture-backed firms also increases across cohorts. In cohort one, the initial VC share of total R&D was 2.69%, which grew to 6.83%, 12.62% and 13.14% in cohorts two, three and four. These cross-cohort increases are larger than in the pooled sample in Table 6-A. Initial shares of total R&D for high-tech NVC-backed IPOs also increased across cohorts, from 0.78% in the first cohort to 4.53% in the fourth.

The second panel of Table 6-B shows that shares of IPO R&D fall in the post-IPO years for both VC- and NVC-backed IPOs; for example, the share of IPO R&D from venture-backed IPOs in cohort one falls from 50.31% in 1985 to 14.19% in 2006. It is important to note that non-venture-backed IPOs lose their shares much faster than venture-backed IPOs; a NVC-backed IPO from the second cohort drops from a 12.25% share of IPO R&D in 1985 to 2.63% in 1993 and ultimately to 0.89% in 2006. Consider, by comparison, that VC-backed IPOs from cohort two retain 35.51% of the share of IPO R&D in 1993.

The initial share of high-tech IPO R&D for venture-backed firms across cohorts falls continuously; a 77.47% initial share in cohort one falls to 50.31% in cohort two, 40.01% in cohort three, and 26.16% in cohort four. Initial shares for NVC-backed IPOs also fall across the cohorts, from 22.53% in cohort one, to 12.25% in cohort two, all the

way down to 4.78% in cohort three, then recovering slightly to 9.01% by cohort four. This drop in R&D shares is due to the increasing number of firms going public over time.

By the end of the sample in 2006, venture-backed IPOs account for 41.34% of total R&D and 82.25% of IPO R&D, while non-venture-backed IPOs account for 8.92% of total R&D and 17.75% of IPO R&D.

Shares of R&D (Non-High-Tech)

Table 6-C restricts the sample to non-high-tech firms only. It is difficult to recognize any trends in either panel. VC-backed IPOs account for a smaller shares of R&D than NVC-backed IPOs in the first and fourth cohorts, but in the post-IPO years venture-backed IPOs gain a greater share proportional to NVC-backed firms until they ultimately account for a greater share in every cohort. In 1977, venture-backed IPOs from cohort one account for only 0.09% of total non-high-tech R&D, and 10.27% of IPO R&D, while non-venture-backed IPOs account for more than eight times these shares (0.78% and 89.73% respectively). By 2006, however, the VC share is five times larger than the NVC share (1.93% compared to 0.38% of total R&D). Across the different IPO cohorts, the initial proportion of VC R&D share rises from 11.5% of the NVC share in the first cohort to 177% in the second, then falls to 101% and 77.8% in cohorts three and four.

The first panel of Table 6-C shows that non-high-tech venture-backed IPOs in the first cohort gain a greater share of R&D in the years after their IPO dates. A 0.09% share in 1977 increases to 1.93% of total R&D by 2006. This trend is visible in subsequent cohorts as well, until the fourth cohort where the VC share falls from 2.43% in 2001 to

2.34% in 2006. Non-venture-backed IPOs show a decreasing share of total R&D in post-IPO years, except in cohort three where the share increases from 1.20% in 1993 to 1.52% in 2006.

The initial shares of total R&D for non-high-tech venture-backed firms clearly increase across cohorts. In cohort one, the initial VC share of total R&D was 0.09%, which grew to 0.64%, 1.21% and 2.43% in cohorts two, three and four. Initial shares of total R&D for high-tech NVC-backed IPOs fell at first from 0.78% in the first cohort to 0.36% in cohort two, before increasing to 1.20% and 3.17% in cohorts three and four.

The second panel of Table 6-C shows that in the first three cohorts, shares of VC-backed IPO R&D rise in the post-IPO years for cohorts one and four, but fall in cohorts two and three. The NVC-backed shares fall in every cohort.

By the end of the sample in 2006, venture-backed IPOs account for 7.61% of total R&D and 63.21% of IPO R&D, while non-venture-backed IPOs account for 4.43% of total R&D and 36.79% of IPO R&D.

Because there is so little R&D in the non-high-tech sector, I am not surprised that it is so difficult to decipher trends in Table 6-C. However, we continue to see the strong link between R&D and venture capital, which was also apparent in the high-tech shares of Table 6-B. The cumulative impact of high-tech venture-backed IPOs on total R&D is an astounding 41%, while 82% of IPO R&D is from venture-backed IPOs. VC-backed shares of R&D consistently exceed those of NVC-backed IPOs, especially in the high-tech sector, across cohorts and in the post-IPO years.

Growth and Efficiency

To examine the enduring effects of venture capital on firm growth, Tables 7 and 8 show mean and median growth rates of sales and R&D in the post-IPO period, while Table 9 shows changes in operating return on assets. Each table shows results from each cohort for a series of five-year intervals after the IPO, and further divides the sample into high-tech and non-high-tech industries. Research and Development (R&D) growth is defined as the log change in R&D over the previous year. Sales growth is similarly defined. Operating return on assets is defined as operating income minus depreciation divided by average assets in each period. Leach and Melicher (2006) emphasize the importance of profitability and efficiency ratios, saying they "indicate how efficiently a venture controls its expenses and uses its assets. Growth is of little value if it does not lead to higher profits" (p. 165). Operating return on assets, sometimes referred to as a venture's basic earning power,[14] is an important indicator of a firm's efficiency. This variable is generated by dividing operating income before depreciation and amortization by the firm's total assets. As Leach and Melicher (2006, p. 167) point out, "It is particularly important to use average assets because growing ventures can add significantly to the asset base in a period, and if not taken into account, this will distort the apparent efficiency of asset utilization." To gauge the return from only the relevant assets in a given period, I averaged total assets from the beginning and the end of each period.

[14] Ibid 2006

Sales Growth

In the growth tables, as in the share tables discussed earlier, the mean values show noisier results than the median values do. In Table 7-A, venture-backed IPOs in the first cohort have a mean growth advantage more than 9% over NVC-backed IPOs in the first and second intervals following the IPO. By the third and fourth intervals after the IPO date this advantage is insignificant. In the adjacent section of Table 7-A, median values are reported. In this case, the same cohorts of IPOs have a higher than 8% median sales growth advantage in the first and second intervals that is followed by a 2.98% significant advantage in the third interval before the difference is insignificant in the fourth interval. Both mean and median results show a significant VC growth advantage in the first two intervals for firms with an IPO in cohort two. In cohort three, a 5.43% and 2.06% median advantage in intervals one and two becomes insignificant in the third interval, whereas the mean advantage is insignificant by the second interval of the same cohort. In the fourth cohort, VC-backed IPOs exceed NVC-backed IPOs by 5.88% in median sales growth in the first interval after the IPO, and 1.54% in the second; the mean values show an even larger difference.

Table 7-A shows declining sales growth from the first interval to the last in every cohort for mean and median values of both VC- and NVC-backed IPOs. It is also interesting to note how sales growth rates in a given interval vary for different cohorts. In the first interval, median sales growth for VC-backed IPOs increases from 18.49% in the first cohort to 22.90% by the fourth cohort, while median sales growth NVC-backed IPOs progressively increases from 9.58% to 17.02%.

Table 7-B restricts the sample to high-tech firms only, and shows that high-tech venture-backed IPOs from the first cohort have an 7.19% median sales growth advantage over non-venture-backed IPOs in the first interval, rising slightly to 7.88% by the second interval before becoming insignificant in the third and fourth intervals. This VC-advantage is evident in the first two intervals of the second cohort as well, where the median growth advantage is 8.36% and 4.16% respectively. The mean growth values are very similar, though slightly higher in favor in venture-backed firms. However, while the mean values show an insignificant difference in mean growth in the third cohort interval, Table 7-B shows that VC-backed IPOs have an initial median sales growth advantage of 4.33% in cohort three, and 4.88% in cohort four. As in Table 7-A, growth rates increase across cohorts in the first interval. While high-tech venture-backed IPOs in the first cohort grew at 20.36% in the first interval, in the fourth cohort they grew at 23.65% for the first interval. Average growth rates for NVC-backed IPOs in the first interval increased from 13.16% for cohort one to 18.78% for cohort four.

Table 7-C includes non-high-tech IPOs only. Perhaps surprisingly, this table shows that venture-backed IPOs from cohort one maintain a significant advantage in mean sales growth in all four intervals after the IPO date, and this initial advantage increases from 4.98% in the first interval to 5.75% in the final interval. I do not entirely trust the results of the last two intervals, however, as the median values show this first cohort VC-advantage only through the first two intervals before it becomes insignificant. Both mean and median growth rates agree in the second cohort of Table 7-C, which shows a 4.69% and 3.70% median sales growth VC-advantage (mean rates are slightly

higher) in the first and second intervals, and insignificant differences in subsequent intervals. While VC-backed IPOs have only an initial advantage in median sales growth for cohort three, the advantage extends for two intervals in the fourth cohort, from 5.41% to 0.84%.

As shown above with the pooled and the high-tech tables, sales growth rates increase across cohorts for non-high-tech industries Table 7-C: a venture-backed IPO in the first cohort has a median growth rate of 13.07% in the first interval, but 21.72% in the first interval of cohort four; non-venture-backed IPOs in the first cohort have 9.10% median growth, and 16.32% in the fourth cohort during the first interval.

The sales growth tables show that for both high-tech and non-high-tech industries there is faster sales growth for VC-backed IPOs, higher initial sales growth rates for later IPO cohorts, diminishing growth rates in the post-IPO period.

R&D Growth

Table 8-A show that VC-backed firms from the first IPO cohort grow an average of 8.48% faster than NVC-backed IPOs, in the first interval following the IPO, and 11.71% faster in the second interval. In the third and fourth intervals, the VC growth advantage is swamped by the standard error. For VC-backed IPOs in cohort two, a similar growth advantage remains for the first two intervals before it becomes insignificant. In cohorts three and four, there are initial significant growth advantages for venture-backed firms of 5.73% and 4.62%, but they disappear by the second interval. The median values in Table 8-A show almost identical results. Notice also that R&D growth rates decline over time for each cohort. For example, median R&D growth for a

VC-backed firm in IPO cohort one is 17.37% in the first interval, and declines to 7.34% by the fourth interval. A NVC-backed firm in the same cohort declines from 9.63% growth to 4.25% from intervals one to four.

When the sample is restricted to high-tech firms in Table 8-B, venture-backed IPOs in cohorts one and two have an average 9.53% and 8.52% R&D growth advantage respectively in the first interval, which falls to 8.50% and 2.36% by the second interval, before it becomes insignificant in subsequent years after the IPO date.[15] All median growth differences are insignificant in cohorts three and four of Table 8-B, non-venture-backed IPOs from the third cohort have a 1.05% mean growth advantage in the second interval. This is unexpected, but may be due to outliers biasing the mean results (the same growth rate in the median panel has a z-score of 0.525). It is not surprising that growth rates in the second interval of the fourth cohort are always insignificant since some forth-cohort firms have no information in the second interval. An IPO in 2001, for example, fits into cohort four, but has no information six years after the IPO because the database concludes in 2006. As in Table 8-A above, R&D growth rates decline in later intervals in each cohort. For example, mean R&D growth for a high-tech VC-backed firm in IPO cohort two is 21.41% in the first interval, and declines to 1.29% by the fourth interval. A NVC-backed firm in the same cohort declines from 12.89% growth to 2.42% from intervals one to four.

[15] The median growth advantages for the same firms are 6.85% and 8.90% in the first interval, falling to 7.17% and 2.79% in the second interval, and insignificant in the later intervals.

The R&D growth differences, both mean and median values, are rarely significant in Table 8-C whether firms are venture-backed or not. Given that non-high-tech firms invest in very little R&D, it is not surprising that the differences are insignificant.

Overall, the differences in R&D growth are similar in magnitude and duration to the differences in sales growth. The R&D growth tables show that for both high-tech and non-high-tech industries there is faster sales growth for VC-backed and diminishing growth rates in the post-IPO period. For high-tech industries, initial R&D growth rates increase in later IPO cohorts, while they remain stable for the less R&D intensive non-high-tech sector.

Operating Return on Assets

Table 9-A includes the level of operating return on assets from the pooled sample of firms as it changes in four IPO cohorts during four sets of time intervals after the IPO date. In the first cohort, VC-backed IPOs have a 2.73% higher median operating return on assets (ROA) than NVC-backed IPOs in the first interval, 3.42% higher return in the second interval, and no significant difference in the third and fourth intervals. Mean values are similar (1.96% and 2.16% for the first two intervals respectively, and insignificant thereafter).

The second cohort of Table 9-A is more confusing, as the mean and median sections do not agree. While the mean difference in ROA shows a significant VC-advantage of 1.7% in the first interval, the difference is insignificant in the subsequent three intervals. On the other hand, the median difference in ROA shows an insignificant difference in the first interval, while NVC-backed IPOs have significantly higher ROA in

intervals two, three and four. Continuing the mean and median unconformity, cohort three shows no significant mean differences in ROA, while there is a median VC-advantage of 0.75% in the first interval but a NVC-advantage of 1.49% and 1.75% in intervals three and four. Finally, in the fourth cohort of Table 9-A, the mean and medians results agree, that non-venture-backed IPOs have higher ROA through two intervals after the IPO date.

The first cohort of Table 9-B is similar to that of Table 8-A: high-tech venture-backed IPOs have higher median (and mean) ROA in the first two intervals. In Table 9-B, however, the mean and median results agree in cohort two, where VC-backed IPOs have higher median ROA by 2.85% in the first cohort, and no significant difference in the remaining intervals. In the third cohort, VC-backed IPOs have higher median ROA in the first three intervals by 8.76%, 2.62% and 4.97% respectively. The mean results are similar, but with larger differences in favor of venture-backed IPOs. Mean and Median results disagree by the fourth cohort, however, where mean differences favor VC-backed IPOs through two intervals, while median differences favor NVC-backed IPOs only for the first interval.

In Table 9-C, very few of the differences are significant, and there is no trend for the differences. In each subset of Table 9, cohorts three and four tended to show insignificant differences, or mean and median contradictions. Often ROA was negative—in Table 9-B, all high-tech mean ROA values are negative. This reflects what the financial economics literature considers a decline in profitability of firms in recent decades, and what we observe to be negative operating income. Fama and French (2004)

explain that in the 1980s and 1990s more readily available equity expanded the class of firms entering the market, leading to skewed profitability and declining survival rates. Perhaps this trend explains the ambiguous venture-capital differences in later cohorts of Tables 7, 8 and 9.

REGRESSION ANALYSIS

Specification

Tables 10-A through 10-F report regressions that examine the effects of venture capital on a set of firm performance and efficiency indicators. Sales growth (*lnsgrowth*) relates to a firm's performance and success. R&D intensity (*lrd_ta*), defined as R&D divided by average total assets in a period, is a proxy for innovation. Sales intensity (*lsales_ta*), defined as sales divided by average assets, and operating return on assets (*lroa*), defined as operating income before depreciation divided by average assets, are measures of how efficiently a firm uses its assets. The *q* term in these regressions is sometimes referred to as "Tobin's Q ratio," or "market-to-book ratio," defined as a firm's total market value divided by its asset value. It is a measure of the value the market places on the firm.

These five variables ($G_{i,t}$) are regressed on the following specification primarily in order to determine how VC- and NVC-backed firms differ in these performance measures over the post-IPO period:

$$G_{i,t} = \beta_1 vcdumA_i + \beta_2 t + \beta_3 \ln\left(AGE_{i,t=0}\right) + \beta_4 ipo\_cat\_dum1_i + \cdots + \beta_7 ipo\_cat\_dum4_i + \varepsilon_{i,t}$$

Variables are logged in order to reduce the bias of outliers and to make interpretation easier.

In some specifications I use the entire pooled sample and include a dummy variable to control for differences across high-tech and non-high-tech IPOs (Tables 10-A and 10-D). In other specifications I focus only on high-tech IPOs (Tables 10-B and 10-E)

or only on non-high-tech IPOs (Tables 10-C and 10-F). The main variable of interest is *vcdumA*, which shows the impact venture capital has on each of the various performance or efficiency variables on the left-hand-side.

The number of years since the IPO (*t*) is important to control for as firms exhibit variation in growth and efficiency at different stages, which could bias the effects of venture capital if omitted. *AGE* represents the age (in years) of each firm at the time of its IPO.[16] A firm that is established for a number of years by the time it undergoes an IPO may face a different financing constraint, or be better organized internally, or have more business savvy in order to survive to that age. Conversely, older new public entrants may have passed up crucial investments already, and be ill-equipped to sustain future growth. By adding the log of this variable I control for these effects. I include dummy variables for each cohort to control for changes in post-IPO performance across difference IPO cohorts.

In Tables 10-D through 10-F, I also include an interaction term between venture capital and years since the IPO (*vc_t*). This variable tells us how differences between VC- and NVC-backed firms change in the years following the IPO. I expect it to show how quickly on average the venture advantage disappears.

I restrict the sample to the first 20 years following each firm's IPO date. The choice of a 20 year cutoff is consistent with interval duration in the growth tables and the results are not sensitive to adjustments of the restriction in either direction.

Regular Regressions

[16] Since *AGE* is logged in the regression, I generated *ln(AGE+1)* to avoid taking the log of 0.

Table 10-A shows regressions from the pooled sample with a high-tech dummy variable. The first column shows that venture-backed firms have on average 5.48% higher sales growth than NVC-backed firms in the post-IPO period. While the difference between high-tech and non-high-tech sales growth is insignificant, sales growth appears to decline for each firm by an average of 2% each year after a firm's IPO. Also, the older a firm is when it undergoes an IPO the slower its sales growth will be. Each year older is associated with 4.59% slower sales growth on average.

The second regression in Table 10-A shows an enormous VC impact on R&D intensity of 51.6%. Given the correlation between R&D and venture financing discussed earlier, this result is expected. This regression also shows that high-tech industries are much more R&D intensive, as expected. As in regression (1), *lrd_ta* declines the longer after the IPO date one looks, this time by 0.784% per year, and it also declines the longer a firm waits to go public.

Regression (3) in Table 10-A shows that venture-backed firms have 18.8% *lower* sales intensity, and that high-tech firms are 43.1% lower. In fact, the signs for the time and age coefficients are also flipped from the previous two regressions. It appears that venture-capital has a negative influence on a firm's sales intensity. It may be that venture capitalists select less sales intensive firms to finance.

Regression (4) in Table 10-A shows an 18.6% VC advantage on a firm's market-to-book ratio, while high-tech firms average a 70.5% higher Q ratio. As in the first two regressions, regression (4) shows the Q ratio declining by 3.12% per year after the IPO date, and 4.24% per year the longer new firms wait to go public.

The fifth regression in Table 10-A shows a small but significant disadvantage for venture capital on operating return on assets (*lroa*) of 3.52%, and that high-tech firms are likely to yield 4.25% less ROA. It appears that venture capitalists select to finance firms with lower operating return on assets. Gompers and Lerner (1999) say that the types of firms who benefit from venture capital, in their struggle to acquire the necessary debt financing, expect "several years of negative earnings" (p. 5). Older public firms show declining ROA by 1.93% per year, although waiting to go public appears to benefit the firm's ROA by 3.43% per year on average.

Table 10-B restricts the sample to high-tech firms only. The first column is remarkably similar to that of Table 10-A: venture-backed firms have 5.48% higher sales growth among high-tech firms (compared to 5.42% in the pooled data), while older firms lose 2.77% of sales growth per year after the IPO (compared to 2.09% in the pooled data). The impact of waiting an extra year before going public is stronger in Table 10-B where sales growth declines by 8.13% per year (compared to 4.59% in Table 9-A).

The second regression of Table 10-B shows that venture-backed firms have 39.6% higher R&D intensity than NVC-backed firms. This coefficient is smaller than in the pooled sample of Table 10-A (51.6%) because high-tech firms all engage heavily in R&D, with or without venture financing, it is not surprising that the VC coefficient is smaller in the high-tech-restricted regression. I expect to see a *larger* VC coefficient in regression (2) of Table 10-C (non-high-tech). Continuing down the second column of Table 10-B, time and age show 1.02% and 13.6% lower R&D intensity per year respectively. These last two coefficients are similar to those from the previous table.

Regression (3) in Table 10-B shows 27.5% *lower* sales intensity for venture-backed high-tech firms than non-venture-backed high-tech firms (compared to -18.8% in Table 10-A). While time has an insignificant coefficient this time, the reward for delaying the IPO is even greater (26% per year in Table 10-B compared to just 14% previously.

In the fourth regression of Table 10-B, venture-backed firms show 12.1% higher Q ratios, which is lower than the 18.6% reported in Table 10-A (4). Recall that high-tech firms have 70.5% higher Q ratios in the pooled sample; perhaps the impact of venture capital on the Q ratio, like its impact on R&D intensity, is more pronounced among non-high-tech industries (indeed, Table 10-C will show this to be the case for both R&D intensity and the Q ratio). Once again, time and age correlate with lower Q ratios in higher years.

In the final column of Table 10-B, venture financing is associated with lower ROA yet again, this time by 7.79%. Time and age have similar coefficients to the previous table, now leading to 2.61% decline in ROA per year after the IPO and a 2.60% increase in ROA per year delaying the IPO.

Table 10-C restricts the sample to non-high-tech firms. The first column shows that venture-backed firms have 5.42% higher sales growth, an identical coefficient to the high-tech-restricted regression in Table 10-B. The time and age coefficients match the sign and significance of Table 10-B, but for non-high-tech firms the magnitude is a bit smaller (-1.57% and -3.48% respectively).

The second column of Table 10-C shows a very large VC coefficient. Among non-high-tech firms, venture financing means 81.4% higher R&D intensity. Recall that for high-tech firms in Table 10-B, this coefficient was only 39.6%; remember also that the high-tech dummy in Table 10-A showed 116% higher R&D intensity. In other words, non-high-tech firms do little or no R&D, but those that do are financed with venture capital. This correlation between venture capital and R&D is less pronounced in the high-tech sector where nearly all firms have high R&D levels. I believe this result highlights the strong link between venture capital and R&D, showing that the connection is more than an incidental relationship simply stemming from a strong VC link to high-tech industries—the VC-R&D link is strong, stronger even, among non-high-tech firms.

Continuing down the second column of Table 10-C, time has an insignificant effect on R&D intensity, while the age at the IPO leads to 15.3% less R&D intensity with each delayed year.

Regression (3) in Table 10-C shows 9.17% lower sales intensity for venture-backed firms. While this is a smaller coefficient than for high-tech firms, venture capital remains ineffective at achieving higher sales intensity. Time since the IPO has an ambiguous impact, while age leads to 9.88% higher sales intensity per year (compared to 26% higher for high-tech firms).

Venture capital leads to a 24.3% higher Q ratio in regression (4) of Table 10-C. As I predicted earlier, this coefficient is higher than the VC impact in the high-tech sector. At -3.22% and -1.32%, the time and age coefficients are almost identical to those in Table 10-B.

In the final column of Table 10-C, the VC impact on operating return on assets is insignificant, while all the remaining coefficients are similar in sign and magnitude to those in high-tech regressions in Table 10-B regression (5).

In summary, venture-backed firms have higher sales growth, R&D intensity, and Q ratios, but lower sales intensity and operating return on assets. High-tech firms (*ht*) are more R&D intensive (*rd_ta*), and have higher book-to-market values (*q*) than non-high-tech firms, but have lower return on assets and sales intensity (*sales_ta*) (at the 1% level of significance).

Interaction Regressions

In Tables 10-D through 10-F, I introduce an interaction term to evaluate how the venture capital dummy's impact changes over the life of a firm (*vc_t*). In each of these interaction regressions, the coefficients for time and age variables and for high-tech and IPO cohort dummies remain almost exactly the same as in the corresponding regressions from Tables 10-A through 10-C, and so I will omit them from further discussion and focus now on the *vcdumA* and *vc_t* coefficients. Also in each of the interaction regressions, the venture-capital dummy coefficient has the same sign and significance as in the corresponding regular regressions, although magnitude of the coefficients changes.

Table 10-D shows regressions from the pooled sample with a high-tech dummy variable. In the first regression, venture-backed firms have 13.1% higher sales growth, which diminishes by 1.37% per year (*vc_t* coefficient of -0.0137). At this rate of

diminishment, the VC sales growth advantage remains for more than nine years after the IPO date.

The second regression in Table 10-D shows that venture-backed firms have 59.6% higher R&D intensity diminishing at 1.39% per year. While the data does not extend so long, at this rate the VC advantage for R&D intensity would endure for forty-two years after the IPO date.

Regression (3) in Table 10-D shows that venture-backed firms have 22.8% lower sales intensity than their non-venture-backed counterparts, but there is convergence at a rate of 0.738% per year. Still, at this slow rate it will take thirty years for venture-backed firms to catch up with non-venture-backed firms.

Regression (4) shows the association between venture capital and the Q ratio, which comes out to an 18.6% VC advantage. In this case, the *vc_t* coefficient is small and insignificant, indicating that VC- and NVC-backed firms do not converge in their impact on a firm's market-to-book value.

Regression (5) shows once again that venture capital has 3.27% lower operating return on assets than NVC-backed firms. Also, as in regression (4), the insignificant *vc_t* coefficient means there is no convergence, although the VC disadvantage is comparatively small.

Table 10-E restricts the sample to high-tech firms only. Coefficients in the first regression are almost identical to those from Table 10-D regression (1). Once again, the VC sales growth advantage endures for nearly ten years after the IPO.

The second regression in Table 10-E shows that the 48.3% VC advantage for R&D intensity takes thirty-two years to disappear as it diminishes at 1.49% per year. As shown in Table 10-B, the high-tech restricted venture capital advantage is smaller than the advantage in the pooled sample. Table 10-F will show, once again, that size of the relative advantage of VC- to NVC-backed firms is more distinct and convergence is slower in the non-high-tech sector.

Regression (3) in Table 10-E shows a venture capital disadvantage of 28.2% (compared to 22.8% in Table 10-D). In this case, however, the difference remains for much longer as it diminishes by 0.117% per year (compared to 0.738%).

In regression (4), venture-backed firms have 15.8% higher Q ratios. The advantage diminishes at 0.651% per year, converging in twenty-four years. Previously the *vc_t* was insignificant; now it is significant with a 90% confidence interval. While the VC market-to-book advantage remains long after the IPO, there was no convergence in Table 10-D. As is the case with the R&D intensity regression (2), in regression (4) the *vcdumA* coefficient is smaller and the advantage diminishes faster in Table 10-E (high-tech only) than in Table 10-D (pooled). We will see the converse in Table 10-F. This result contributes once again to the evidence that venture capital is strongly linked to R&D and to the market-to-book values, whether in high-tech or non-high-tech industries.

Regression (5) shows that non-venture-backed firms have 7.13% higher operating return on assets, and this VC disadvantage does not converge (insignificant coefficient for *vc_t*)

Table 10-F restricts the sample to non-high-tech firms only. In the first regression, a 10.2% VC advantage diminishes by 8.62% per year, converging in almost twelve years after the IPO date. This is very close to the advantage and convergence interval for high-tech firms in Table 10-E regression (1).

In the second regression of Table 10-F, venture capital has 81.5% higher R&D intensity, which is considerably higher than the 48.3% advantage for high-tech firms in Table 10-E regression (2). What is more, this sizable VC advantage does not diminish as the *vc_t* coefficient is very near zero and is insignificant. I am reassured by this result because it reiterates the importance of venture financing for R&D.

In regression (3) of Table 10-F, venture-backed firms have 14.2% lower sales intensity. This disadvantage is smaller than for high-tech firms (28.2% VC disadvantage). At a rate of 0.922% per year, VC- and NVC-backed firms converge in just over fifteen years, whereas there is no convergence for high-tech firms in Table 10-E (high-tech only).

Regression (4) of Table 10-F shows a 19.0% venture-capital advantage for the market-to-book value. For the first time in any of the regression, *vc_t* has a significant coefficient that does not yield convergence. In the non-high-tech sector, the venture-capital Q ratio advantage actually increases gradually over time. Once again I am relieved to see more evidence that the strong link between venture capital and the Q ratio is not limited to the high-tech sector, and is even more distinctly visible in the non-high-tech sector.

Regression (5) of Table 10-F shows that venture-backed firms have 3.26% lower operating return on assets, but this NVC advantage diminishes by 0.483% per year, converging in under seven years.

The pertinent question to ask is this: Where venture capital proves advantageous, how quickly does the advantage disappear? In every case, venture capital correlates with higher sales growth, R&D intensity, and market-to-book values. While for some regressions the difference remained indefinitely or even increased, the shortest duration of a venture-capital advantage was more than nine years (in the first regression of Table 10-D). This is consistent with a theory that venture capital has enduring beneficial effects on a firm's performance and efficiency after the initial public offering. Or perhaps venture capitalists simply select firms that are persistently superior.

IMPLICATIONS AND CONCLUSIONS

Venture-backed firms emerge particularly in high-tech industries, as shown in Table 4, and venture financing is an important factor for research and development. High-tech firms typically need to invest heavily in R&D to survive. Venture financing is an important factor for this much needed R&D for these firms, and it is also strongly correlated with the little R&D that takes place in the non-high-tech sector.

Tables 4 and 5 show that venture-backed firms account for a greater share of both sales and R&D in high-tech than non-high-tech industries, and within the high-tech sector venture-backed IPOs account for greater shares than non-venture-backed firms. Table 5-C provides corroborating evidence of the R&D correlation with venture financing by showing that even among non-high-tech firms, venture-backed IPOs account for a greater share of R&D.

The growth tables (Tables 6 and 7) add to the evidence of a persistent difference between VC- and NVC-backed IPOs in the post-IPO period. Venture-backed firms grow R&D at a faster rate than non-venture-backed firms in the pooled data and the high-tech sector. Again, not surprisingly, the results are insignificant in the non-high-tech sector where very little R&D exists. However, sales growth is faster for venture-backed firms in all three tables (pooled, high-tech, and non-high-tech). For both sales and R&D, this faster growth rate remains through the second interval for the first two cohorts; even though in third and fourth cohorts the advantage is insignificant in later intervals, an initial venture capital advantage exists.

The results of the operating return on assets (ROA) table are less conclusive about a venture capital advantage. While the median values show a VC initial advantage in each cohort, the advantage disappears after the first interval.

Regressions in Table 10-A through 10-F provide further evidence of a venture capital advantage across several important performance measures. Every regression shows a relatively large significant coefficient for the venture capital dummy as it explains R&D intensity.[17] Venture capital is also strongly related to the firm's market-to-book value (q) in high-tech and non-high-tech industries alike. While the coefficient is sometimes small, venture capital also has a positive and significant impact on sales growth in every regression. Venture capital appears to be very important for these relevant factors of a firm's success, yet it does not have a positive relationship with sales intensity or operating return on assets.

Tables 10-D through 10-F show that the venture capital advantages for these three dependent variables persists for years past the IPO. Recall that Gompers and Lerner (1998) said venture capitalists "distribute" their shares within just two years of the IPO. The enduring venture capital advantage shown by the slowly diminishing *vc_t* coefficient contradicts the theory that venture-backed firms maximize short term gain before the venture capitalists liquidate their stock in the company. In every regression where *vcdumA* has a positive and significant coefficient, *vc_t* is either a small negative leading to slow convergence, or it is a very small positive or insignificant, implying no

[17] This is consistent with the venture advantage in share of R&D mentioned earlier, and also the venture advantage for R&D growth; venture-backed firms do more R&D.

convergence. Where *vcdumA* is negative and significant, *vc_t* is either insignificant or it is positive, such that the disadvantage diminishes instead of exploding.

All this evidence points to a persistent venture capital advantage most especially for R&D growth, but also for market-to-book value and sales growth. Venture financing seems less important for the efficiency of assets as indicated by the operating return on assets or sales intensity, or perhaps venture capitalists tend to fund less profitable firms. The regression results for ROA agree with the inconclusiveness of the ROA growth in Table 8.

It still is not clear what is driving these differences. The evidence fits a story where venture capital relaxes the financing constraint young firms face, especially in the high-tech sector where firms have few assets and need to invest heavily in R&D in a timely manner. With the "coaching" and "mentoring" that venture capitalists supposedly bring to the table, I expected to see stronger correlation between venture financing and the various measures of efficiency (sales intensity, or operating return on assets). It is possible that I am stumbling on a selection bias, as the more profitable firms have less need of venture financing. Or perhaps the strength of the VC advantages for sales growth, R&D intensity, and market-to-book values is due to the selection of the most profitable firms by venture capitalists.

We do see an increasing number of firms financed today by venture capital, and these firms represent a growing portion of the U.S. economy. This venture capital boom coincides with the high-tech boom of the 1980s and 1990s. Venture financing has no doubt been a catalyst in the growth of these industries, giving young entrepreneurs the

capital needed to turn their ideas into reality—entrepreneurs who might otherwise never make it off the starting block, or at least not be very competitive in the race.

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APPENDIX A

TABLES

Table 1: Description of Variables

Variable	Description	Units
Firm Count	Total number of publicly traded firms	firms
Employment	Total number of employees	thousands of employees
Sales	Total Sales	millions of U.S. dollars
Assets	Total Assets	millions of U.S. dollars
RD:Sales	Total R&D / Total Sales	
RD:Asst	Total R&D / Total Assets	
CapSp:Sales	Total Capital Spending / Total Sales	
CapSp:Assets	Total Capital Spending / Total Assets	
Sales Growth	Log change in sales growth for a firm from last period to the current period, with winsorized means: [ln(sales)-ln(l.sales)]	
R&D Growth	Log change in sales growth for a firm from last period to the current period, with winsorized means: [ln(rd)-ln(l.rd)]	
ROA	Operating return on assets, with winsorized means: opincbd/avg_ta (operating income before depreciation divided by average total assets for a period	
vcdumA	Dummy variable equal to 1 if IPO is venture-backed, 0 if NVC-backed	
vc_t	Interaction variable between *vcdumA* and *t*, change in VC impact in post-IPO years	
ht	Dummy variable equal to 1 if IPO is in the high-tech sector, 0 if non-HT	
t	Time variable increasing from 0 at the time of the IPO	years
lAGE	Log of the firm's age at the time of the IPO (log of AGE + 1)	years
ipo_cat_dum( )	Set of dummy variables for IPO cohorts 1-4	

Table 2: IPO Firm Count

This table displays the count of high-tech firms in each IPO cohort separated by SIC industry code and by venture/non-venture backing. This sample includes firms with an initial public offering between 1970 and 2001, divided into four seven-year cohorts.

	IPO Cohort:									
	(1) 1970-1977		(2) 1978-1985		(3) 1986-1993		(4) 1994-2001		Total	
Industry:	VC	NVC	VC	NVC	VC	NVC	VC	NVC	VC	NVC
283	3	10	24	28	108	51	123	60	258	149
357	21	11	74	37	70	34	66	42	231	124
366	9	12	27	31	24	21	68	34	128	98
367	9	10	24	23	40	24	66	39	139	96
3812	0	2	3	5	2	1	2	2	7	10
382	7	10	25	30	29	22	31	31	92	93
384	6	8	32	39	61	52	74	36	173	135
481	2	1	9	5	16	16	45	34	72	56
4899	0	1	0	2	2	6	12	14	14	23
737	9	4	68	81	141	81	465	263	683	429
873	0	2	8	7	13	8	18	13	39	30
Total HT	66	71	294	288	506	316	970	568	1836	1243
Total non-HT	31	441	177	585	348	968	403	973	959	2967
Total	97	512	471	873	854	1284	1373	1541	2795	4210

Table 3: Initial Firm Characteristics (Medians)

Table 3 shows various firm characteristics at the time of their initial public offerings (t = 0). Median values for firms in each cohort. This table shows higher levels for venture-backed IPOs, particularly in the high-tech sector. Employment is reported in hundreds of employees, while sales and assets are reported in millions of U.S. dollars. "Firm Count" represents the totals in each cohort, but all the remaining variables are reported as median levels.

Medians when t=0

	All											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*
Firm Count	97	512	*NA*	471	873	*NA*	854	1,284	*NA*	1,373	1,541	*NA*
Employment	0.351	0.475	*(0.041)*	0.207	0.141	*(0.000)*	0.215	0.167	*(0.008)*	0.225	0.270	*(0.006)*
Sales	33.126	58.627	*(0.000)*	25.751	15.985	*(0.001)*	38.876	24.666	*(0.000)*	32.608	36.650	*(0.129)*
Assets	32.237	33.156	*(0.910)*	30.472	16.018	*(0.000)*	46.620	21.728	*(0.000)*	72.542	46.513	*(0.000)*
RD:Sales	0.051	0.000	*(0.000)*	0.053	0.000	*(0.000)*	0.066	0.000	*(0.000)*	0.152	0.000	*(0.000)*
RD:Asst	0.045	0.000	*(0.000)*	0.048	0.000	*(0.000)*	0.060	0.000	*(0.000)*	0.071	0.000	*(0.000)*
CapSp:Sales	0.088	0.042	*(0.000)*	0.100	0.105	*(0.743)*	0.060	0.056	*(0.483)*	0.088	0.060	*(0.000)*
CapSp:Assets	0.099	0.073	*(0.302)*	0.085	0.099	*(0.050)*	0.045	0.054	*(0.004)*	0.042	0.048	*(0.011)*

	HT											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	p-value	VC	NVC	*p-value*
Firm Count	66	71	*NA*	294	288	*NA*	506	316	*NA*	970	568	*NA*
Employment	0.313	0.161	*(0.028)*	0.183	0.074	*(0.000)*	0.150	0.052	(0.000)	0.191	0.145	*(0.002)*
Sales	29.290	19.575	*(0.067)*	22.370	8.028	*(0.000)*	23.281	4.874	(0.000)	26.328	18.534	*(0.001)*
Assets	28.019	14.779	*(0.029)*	28.631	8.457	*(0.000)*	40.770	8.024	(0.000)	66.291	35.765	*(0.000)*
RD:Sales	0.074	0.023	*(0.000)*	0.084	0.068	*(0.080)*	0.148	0.055	(0.000)	0.223	0.087	*(0.000)*
RD:Asst	0.077	0.033	*(0.000)*	0.072	0.061	*(0.035)*	0.119	0.050	(0.000)	0.100	0.056	*(0.000)*
CapSp:Sales	0.092	0.060	*(0.664)*	0.106	0.108	*(1.000)*	0.067	0.076	(0.312)	0.098	0.076	*(0.009)*
CapSp:Assets	0.093	0.085	*(0.933)*	0.081	0.074	*(0.641)*	0.045	0.042	(0.532)	0.039	0.041	*(0.309)*

	Non-HT											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*
Firm Count	31	441	*NA*	177	585	*NA*	348	968	*NA*	403	973	*NA*
Employment	0.502	0.526	*(0.855)*	0.305	0.215	*(0.030)*	0.525	0.284	*(0.000)*	0.500	0.415	*(0.223)*
Sales	38.020	64.012	*(0.270)*	32.971	25.659	*(0.143)*	67.394	42.027	*(0.000)*	70.766	55.825	*(0.034)*
Assets	41.039	36.489	*(0.700)*	32.576	20.826	*(0.003)*	60.634	33.592	*(0.000)*	99.143	55.505	*(0.000)*
RD:Sales	0.000	0.000	*(0.102)*	0.000	0.000	*(0.000)*	0.000	0.000	*(0.001)*	0.000	0.000	*(0.000)*
RD:Asst	0.000	0.000	*(0.097)*	0.000	0.000	*(0.001)*	0.000	0.000	*(0.001)*	0.000	0.000	*(0.000)*
CapSp:Sales	0.083	0.038	*(0.136)*	0.093	0.101	*(0.811)*	0.049	0.052	*(0.524)*	0.066	0.053	*(0.045)*
CapSp:Assets	0.107	0.072	*(0.456)*	0.100	0.112	*(0.399)*	0.046	0.059	*(0.070)*	0.050	0.054	*(0.481)*

Table 4: Initial Firm Characteristics (Means)

Table 4 shows various firm characteristics at the time of their initial public offerings (t = 0). Mean values for firms in each cohort are reported. This table shows higher levels for venture-backed IPOs, particularly in the high-tech sector. Mean values are winsorized at the 1% level to attenuate the effect of outliers. Employment is reported in hundreds of employees, while sales and assets are reported in millions of U.S. dollars. "Firm Count" represents the totals in each cohort, but all the remaining variables are reported as mean levels.

Means when t=0 — Winsorized Means (1%)

	All											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*
Firm Count	97	512	*NA*	471	873	*NA*	854	1,284	*NA*	1,373	1,541	*NA*
Employment	**0.541**	0.829	*(0.030)*	0.471	0.513	*(0.412)*	0.700	0.797	*(0.148)*	0.664	1.060	*(0.000)*
Sales	**56.562**	89.303	*(0.005)*	56.576	54.234	*(0.694)*	98.228	123.609	*(0.029)*	89.895	151.812	*(0.000)*
Assets	**52.529**	62.716	*(0.320)*	53.159	40.220	*(0.001)*	91.830	104.965	*(0.200)*	157.950	159.782	*(0.873)*
RD:Sales	**0.122**	0.012	*(0.001)*	0.608	0.123	*(0.000)*	1.078	0.293	*(0.000)*	1.348	0.443	*(0.000)*
RD:Asst	**0.058**	0.013	*(0.000)*	0.070	0.039	*(0.000)*	0.094	0.033	*(0.000)*	0.099	0.042	*(0.000)*
CapSp:Sales	**0.511**	0.126	*(0.001)*	0.452	0.556	*(0.257)*	0.279	0.415	*(0.024)*	0.727	0.352	*(0.000)*
CapSp:Assets	**0.140**	0.106	*(0.011)*	0.120	0.147	*(0.001)*	0.070	0.100	*(0.000)*	0.067	0.089	*(0.000)*

	HT											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	p-value	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*
Firm Count	66	71	*NA*	294	288	*NA*	506	316	*NA*	970	568	*NA*
Employment	**0.423**	**0.366**	*(0.605)*	0.312	0.218	*(0.004)*	0.313	0.191	*(0.001)*	0.324	0.424	*(0.004)*
Sales	**43.790**	**40.453**	*(0.782)*	36.610	22.219	*(0.000)*	47.948	28.443	*(0.000)*	44.871	71.996	*(0.000)*
Assets	**44.177**	**28.014**	*(0.081)*	43.739	19.677	*(0.000)*	60.385	28.941	*(0.000)*	131.162	105.741	*(0.032)*
RD:Sales	**0.166**	**0.048**	*(0.068)*	1.054	0.319	*(0.009)*	1.812	2.605	*(0.305)*	1.906	1.718	*(0.665)*
RD:Asst	**0.078**	**0.054**	*(0.022)*	0.097	0.102	*(0.625)*	0.147	0.149	*(0.001)*	0.129	0.103	*(0.000)*
CapSp:Sales	**0.399**	**0.142**	*(0.078)*	0.586	0.376	*(0.105)*	0.729	1.001	*(0.415)*	0.712	0.467	*(0.046)*
CapSp:Assets	**0.130**	**0.123**	*(0.746)*	0.105	0.102	*(0.689)*	0.058	0.071	*(0.012)*	0.059	0.070	*(0.005)*

	Non-HT											
	Cohort 1			Cohort 2			Cohort 3			Cohort 4		
	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*	VC	NVC	*p-value*
Firm Count	31	441	*NA*	177	585	*NA*	348	968	*NA*	403	973	*NA*
Employment	**0.801**	0.913	*(0.575)*	0.746	0.701	*(0.689)*	1.355	1.009	*(0.007)*	1.555	1.487	*(0.723)*
Sales	**82.519**	107.654	*(0.301)*	90.317	71.309	*(0.111)*	172.475	158.315	*(0.512)*	199.014	210.976	*(0.667)*
Assets	**69.502**	68.334	*(0.942)*	70.671	50.850	*(0.011)*	136.996	129.576	*(0.683)*	222.867	204.053	*(0.476)*
RD:Sales	**0.032**	0.005	*(0.751)*	0.164	0.023	*(0.000)*	0.126	0.042	*(0.002)*	0.397	0.028	*(0.000)*
RD:Asst	**0.018**	0.006	*(0.732)*	0.029	0.011	*(0.000)*	0.021	0.009	*(0.000)*	0.026	0.010	*(0.000)*
CapSp:Sales	**0.740**	**0.123**	*(0.001)*	0.321	0.618	*(0.041)*	0.161	0.320	*(0.010)*	0.743	0.280	*(0.000)*
CapSp:Assets	**0.159**	**0.103**	*(0.009)*	0.146	0.169	*(0.104)*	0.088	0.110	*(0.005)*	0.087	0.102	*(0.036)*

NOTE: The bold cells are not winsorized means because too few observations to winsorize.

Table 5-A: Share of Total Sales

This table shows the total share of sales from the pooled sample that firms from each IPO cohort account for in the years 1977, 1985, 1993, 2001, and 2006. I divide each table into two panels: the first is the share of total sales (or R&D), and is the proportion of a particular year's sales that VC- or NVC-backed IPOs account for among not only IPOs from that year but also from all other incumbent firms publicly traded in the U.S. The second panel is the share of IPO sales (or R&D), which is the proportion of a particular year's sales that VC- or NVC-backed IPOs from a particular cohort account for among only other IPO firms in the sample. For example, incumbent firms prior to 1970 are included in the first panel, but excluded from the second panel. The first panel gives a sense of the cumulative impact that VC- and NVC-backed IPOs have had among all publicly traded firms. The second panel shows the cumulative importance of VC-backed IPOs relative to NVC-backed IPOs.

Share of Total Sales			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0027	0.0068	0.0121	0.0098	0.0115
		non-VC	0.0186	0.0207	0.0380	0.0509	0.0556
	2	VC		0.0106	0.0201	0.0251	0.0225
		non-VC		0.0173	0.0158	0.0164	0.0134
	3	VC			0.0299	0.0539	0.0481
		non-VC			0.0425	0.0412	0.0460
	4	VC				0.0284	0.0353
		non-VC				0.0635	0.0549
						Sum VC:	0.1174
						Sum NVC:	0.1699

Share of IPO Sales			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.1286	0.1224	0.0764	0.0339	0.0399
		non-VC	0.8714	0.3734	0.2398	0.1759	0.1935
	2	VC		0.1922	0.1270	0.0868	0.0783
		non-VC		0.3121	0.0998	0.0567	0.0465
	3	VC			0.1888	0.1865	0.1675
		non-VC			0.2681	0.1424	0.1602
	4	VC				0.0981	0.1229
		non-VC				0.2197	0.1912
						Sum VC:	0.4086
						Sum NVC:	0.5914

Table 5-B: Share of High-Tech Sales

This table is structured exactly like Table 5-A, but restricts the pooled sample to high-tech firms only.

Share of Total Sales (HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0135	0.0227	0.0404	0.0271	0.0333
		non-VC	0.0081	0.0059	0.0068	0.0072	0.0074
	2	VC		0.0346	0.0605	0.0544	0.0446
		non-VC		0.0289	0.0208	0.0200	0.0152
	3	VC			0.0661	0.1394	0.1311
		non-VC			0.0140	0.0197	0.0277
	4	VC				0.0541	0.0563
		non-VC				0.0348	0.0389
						Sum VC:	0.2653
						Sum NVC:	0.0892

Share of IPO Sales (HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.6233	0.2464	0.1936	0.0760	0.0939
		non-VC	0.3767	0.0637	0.0326	0.0201	0.0209
	2	VC		0.3759	0.2899	0.1526	0.1259
		non-VC		0.3140	0.0999	0.0560	0.0429
	3	VC			0.3169	0.3908	0.3699
		non-VC			0.0671	0.0553	0.0781
	4	VC				0.1517	0.1587
		non-VC				0.0975	0.1097
						Sum VC:	0.7484
						Sum NVC:	0.2516

Table 5-C: Share of Non-High-Tech Sales

This table is structured exactly like Table 5-A, but restricts the pooled sample to non-high-tech firms only.

Share of Total Sales (non-HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0013	0.0036	0.0054	0.0050	0.0066
		non-VC	0.0199	0.0236	0.0454	0.0631	0.0662
	2	VC		0.0059	0.0106	0.0169	0.0176
		non-VC		0.0150	0.0146	0.0154	0.0130
	3	VC			0.0214	0.0301	0.0298
		non-VC			0.0493	0.0472	0.0501
	4	VC				0.0212	0.0307
		non-VC				0.0715	0.0585
						Sum VC:	0.0848
						Sum NVC:	0.1877

Share of IPO Sales (non-HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0634	0.0757	0.0371	0.0184	0.0243
		non-VC	0.9366	0.4899	0.3094	0.2333	0.2430
	2	VC		0.1231	0.0723	0.0626	0.0647
		non-VC		0.3113	0.0998	0.0570	0.0476
	3	VC			0.1458	0.1112	0.1094
		non-VC			0.3356	0.1745	0.1838
	4	VC				0.0784	0.1127
		non-VC				0.2647	0.2146
						Sum VC:	0.3111
						Sum NVC:	0.6889

Table 6-A: Share of Total Research and Development (R&D)

Tables 6-A, 6-B and 6-C are the corresponding panels in Table 5, but show shares of R&D instead of sales.

Share of Total R&D			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0095	0.0222	0.0300	0.0387	0.0455
		non-VC	0.0078	0.0063	0.0044	0.0030	0.0040
	2	VC		0.0345	0.0637	0.0525	0.0536
		non-VC		0.0095	0.0060	0.0047	0.0043
	3	VC			0.0741	0.1373	0.1530
		non-VC			0.0137	0.0161	0.0418
	4	VC				0.1000	0.0667
		non-VC				0.0413	0.0264
						Sum VC:	0.3188
						Sum NVC:	0.0766

Share of IPO R&D			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.5482	0.3064	0.1566	0.0984	0.1150
		non-VC	0.4518	0.0863	0.0227	0.0077	0.0102
	2	VC		0.4760	0.3319	0.1333	0.1357
		non-VC		0.1312	0.0312	0.0118	0.0109
	3	VC			0.3864	0.3489	0.3869
		non-VC			0.0712	0.0409	0.1057
	4	VC				0.2540	0.1687
		non-VC				0.1049	0.0669
						Sum VC:	0.8063
						Sum NVC:	0.1937

Table 6-B: Share of High-Tech Research and Development (R&D)

Share of Total R&D (HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0269	0.0458	0.0508	0.0451	0.0557
		non-VC	0.0078	0.0050	0.0030	0.0027	0.0041
	2	VC		0.0683	0.1120	0.0706	0.0713
		non-VC		0.0166	0.0083	0.0054	0.0045
	3	VC			0.1262	0.1848	0.2027
		non-VC			0.0151	0.0170	0.0522
	4	VC				0.1314	0.0836
		non-VC				0.0453	0.0284
						Sum VC:	0.4134
						Sum NVC:	0.0892

Share of IPO R&D (HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.7747	0.3378	0.1612	0.0898	0.1108
		non-VC	0.2253	0.0366	0.0096	0.0054	0.0083
	2	VC		0.5031	0.3551	0.1406	0.1419
		non-VC		0.1225	0.0263	0.0107	0.0089
	3	VC			0.4001	0.3679	0.4034
		non-VC			0.0478	0.0339	0.1038
	4	VC				0.2616	0.1663
		non-VC				0.0901	0.0565
						Sum VC:	0.8225
						Sum NVC:	0.1775

Table 6-C: Share of Non-High-Tech Research and Development (R&D)

Share of Total R&D (non-HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.0009	0.0025	0.0053	0.0234	0.0193
		non-VC	0.0078	0.0073	0.0060	0.0039	0.0038
	2	VC		0.0064	0.0061	0.0087	0.0082
		non-VC		0.0036	0.0033	0.0029	0.0039
	3	VC			0.0121	0.0229	0.0252
		non-VC			0.0120	0.0138	0.0152
	4	VC				0.0243	0.0234
		non-VC				0.0317	0.0215
						Sum VC:	0.0761
						Sum NVC:	0.0443

Share of IPO R&D (non-HT)			Year				
			1977	1985	1993	2001	2006
Cohort	1	VC	0.1027	0.1277	0.1181	0.1778	0.1599
		non-VC	0.8973	0.3698	0.1338	0.0293	0.0315
	2	VC		0.3214	0.1360	0.0664	0.0684
		non-VC		0.1812	0.0732	0.0220	0.0320
	3	VC			0.2705	0.1738	0.2093
		non-VC			0.2684	0.1051	0.1262
	4	VC				0.1849	0.1946
		non-VC				0.2407	0.1781
						Sum VC:	0.6321
						Sum NVC:	0.3679

Table 7: Sales Growth

This table shows growth in sales from one period to the next for IPOs in each of the four cohorts from 1970 to 2001, and how sales growth changes in four five-year intervals of time after the IPO date. Units are in millions of U.S. dollars. Mean values, reported in the panels on the left, are winsorized at the 1% level to attenuate the impact of outliers. Median values are reported in the panels on the right. For both mean and median values, three panels present results from the pooled sample (A), from the high-tech sector only (B), and from the non-high-tech sector only (C). The reported *p-values* show if the VC-NVC differences are statistically significant.

Sales Growth (lnsgrowth_w) Winsorized Means (1%)

MEAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1981	0.1183	0.0753	0.0600
	NVC	0.1020	0.0260	0.0467	0.0358
	Diff	*0.0961*	*0.0922*	*0.0286*	*0.0242*
	(p-value)	*(0.000)*	*(0.000)*	*(0.105)*	*(0.195)*
Cohort 2:	VC	0.2522	0.0497	0.0594	0.0361
	NVC	0.1715	0.0123	0.0660	0.0502
	Diff	*0.0807*	*0.0374*	*-0.0066*	*-0.0141*
	(p-value)	*(0.000)*	*(0.002)*	*(0.637)*	*(0.455)*
Cohort 3:	VC	0.2364	0.0859	0.0626	**ins. obs**
	NVC	0.1907	0.0827	0.0530	**ins. obs**
	Diff	*0.0457*	*0.0031*	*0.0096*	
	(p-value)	*(0.000)*	*(0.787)*	*(0.476)*	
Cohort 4:	VC	0.3164	0.0690	**ins. obs**	**no obs**
	NVC	0.2344	0.0477	**ins. obs**	**no obs**
	Diff	*0.0820*	*0.0213*		
	(p-value)	*(0.000)*	*(0.100)*		
B: High Tech ONLY					
Cohort 1:	VC	0.2219	0.1271	0.0637	0.0435
	NVC	0.1351	0.0272	0.0435	0.0434
	Diff	*0.0868*	*0.0999*	*0.0202*	*0.0001*
	(p-value)	*(0.002)*	*(0.000)*	*(0.431)*	*(0.998)*
Cohort 2:	VC	0.2621	0.0471	0.0642	0.0166
	NVC	0.1684	0.0023	0.0591	0.0218
	Diff	*0.0938*	*0.0448*	*0.0051*	*-0.0052*
	(p-value)	*(0.000)*	*(0.009)*	*(0.799)*	*(0.857)*
Cohort 3:	VC	0.2463	0.0798	0.0589	**ins. obs**
	NVC	0.2297	0.0997	0.0420	**ins. obs**
	Diff	*0.0167*	*-0.0199*	*0.0169*	
	(p-value)	*(0.359)*	*(0.376)*	*(0.507)*	
Cohort 4:	VC	0.3252	0.0686	**ins. obs**	**no obs**
	NVC	0.2358	0.0453	**ins. obs**	**no obs**
	Diff	*0.0894*	*0.0233*		
	(p-value)	*(0.000)*	*(0.292)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.1462	0.1027	0.0947	0.0913
	NVC	0.0964	0.0259	0.0475	0.0340
	Diff	*0.0498*	*0.0768*	*0.0473*	*0.0573*
	(p-value)	*(0.059)*	*(0.002)*	*(0.089)*	*(0.030)*
Cohort 2:	VC	0.2340	0.0546	0.0501	0.0709
	NVC	0.1730	0.0177	0.0699	0.0676
	Diff	*0.0610*	*0.0369*	*-0.0198*	*0.0034*
	(p-value)	*(0.002)*	*(0.049)*	*(0.361)*	*(0.898)*
Cohort 3:	VC	0.2217	0.0953	0.0682	**ins. obs**
	NVC	0.1786	0.0767	0.0574	**ins. obs**
	Diff	*0.0432*	*0.0186*	*0.0108*	
	(p-value)	*(0.000)*	*(0.165)*	*(0.490)*	
Cohort 4:	VC	0.2948	0.0701	**ins. obs**	**no obs**
	NVC	0.2337	0.0491	**ins. obs**	**no obs**
	Diff	*0.0611*	*0.0210*		
	(p-value)	*(0.000)*	*(0.163)*		

MEDIAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1849	0.1299	0.0830	0.0680
	NVC	0.0958	0.0426	0.0532	0.0403
	Diff	*0.0892*	*0.0873*	*0.0298*	*0.0277*
	(p-value)	*(0.000)*	*(0.000)*	*(0.021)*	*(0.108)*
Cohort 2:	VC	0.2038	0.0683	0.0721	0.0567
	NVC	0.1346	0.0325	0.0620	0.0487
	Diff	*0.0692*	*0.0359*	*0.0100*	*0.0080*
	(p-value)	*(0.000)*	*(0.000)*	*(0.331)*	*(0.505)*
Cohort 3:	VC	0.1979	0.0872	0.0698	**ins. obs**
	NVC	0.1436	0.0666	0.0585	**ins. obs**
	Diff	*0.0543*	*0.0206*	*0.0113*	
	(p-value)	*(0.000)*	*(0.002)*	*(0.136)*	
Cohort 4:	VC	0.2290	0.0700	**ins. obs**	**no obs**
	NVC	0.1702	0.0546	**ins. obs**	**no obs**
	Diff	*0.0588*	*0.0154*		
	(p-value)	*(0.000)*	*(0.038)*		
B: High Tech ONLY					
Cohort 1:	VC	0.2036	0.1410	0.0794	0.0490
	NVC	0.1316	0.0621	0.0886	0.0436
	Diff	*0.0719*	*0.0788*	*-0.0093*	*0.0054*
	(p-value)	*(0.000)*	*(0.000)*	*(0.636)*	*(1.000)*
Cohort 2:	VC	0.2178	0.0647	0.0767	0.0360
	NVC	0.1342	0.0231	0.0627	0.0391
	Diff	*0.0836*	*0.0416*	*0.0140*	*-0.0031*
	(p-value)	*(0.000)*	*(0.001)*	*(0.465)*	*(1.000)*
Cohort 3:	VC	0.2226	0.0936	0.0677	**ins. obs**
	NVC	0.1793	0.0934	0.0644	**ins. obs**
	Diff	*0.0433*	*0.0002*	*0.0032*	
	(p-value)	*(0.004)*	*(0.987)*	*(0.871)*	
Cohort 4:	VC	0.2365	0.0744	**ins. obs**	**no obs**
	NVC	0.1878	0.0542	**ins. obs**	**no obs**
	Diff	*0.0488*	*0.0203*		
	(p-value)	*(0.000)*	*(0.111)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.1307	0.1066	0.0862	0.0766
	NVC	0.0910	0.0411	0.0486	0.0402
	Diff	*0.0397*	*0.0655*	*0.0377*	*0.0364*
	(p-value)	*(0.000)*	*(0.000)*	*(0.636)*	*(1.000)*
Cohort 2:	VC	0.1816	0.0775	0.0693	0.0693
	NVC	0.1347	0.0405	0.0618	0.0548
	Diff	*0.0469*	*0.0370*	*0.0076*	*0.0146*
	(p-value)	*(0.000)*	*(0.001)*	*(0.465)*	*(1.000)*
Cohort 3:	VC	0.1761	0.0836	0.0733	**ins. obs**
	NVC	0.1331	0.0599	0.0572	**ins. obs**
	Diff	*0.0429*	*0.0237*	*0.0161*	
	(p-value)	*(0.004)*	*(0.987)*	*(0.871)*	
Cohort 4:	VC	0.2172	0.0636	**ins. obs**	**no obs**
	NVC	0.1632	0.0552	**ins. obs**	**no obs**
	Diff	*0.0541*	*0.0084*		
	(p-value)	*(0.035)*	*(0.000)*		

Table 8: Research and Development (R&D) Growth

This table is structured just like Table 7, displaying instead R&D growth from one period to the next for IPOs from cohorts between 1970 and 2001 and how R&D growth changes in the twenty years following the IPO date.

R&D Growth (lnrdgrowth_w) Winsorized Means (1%)

MEAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1648	0.1575	0.0876	0.0744
	NVC	0.0800	0.0405	0.0232	0.0230
	Diff	*0.0848*	*0.1171*	*0.0644*	*0.0513*
	z-score	*(0.000)*	*(0.000)*	*(0.105)*	*(0.195)*
Cohort 2:	VC	0.1987	0.0363	0.0706	0.0107
	NVC	0.1173	0.0134	0.0618	0.0363
	Diff	*0.0814*	*0.0230*	*0.0088*	*-0.0257*
	z-score	*(0.000)*	*(0.002)*	*(0.637)*	*(0.455)*
Cohort 3:	VC	0.1984	0.0595	0.0434	**ins. obs**
	NVC	0.1410	0.0473	0.0671	**ins. obs**
	Diff	*0.0573*	*0.0121*	*-0.0237*	
	z-score	*(0.000)*	*(0.787)*	*(0.476)*	
Cohort 4:	VC	0.2056	0.0157	**ins. obs**	**no obs**
	NVC	0.1593	0.0046	**ins. obs**	**no obs**
	Diff	*0.0462*	*0.0111*		
	z-score	*(0.000)*	*(0.100)*		
B: High Tech ONLY					
Cohort 1:	VC	0.1882	0.1781	0.0705	0.0596
	NVC	0.0929	0.0931	0.0155	0.0700
	Diff	*0.0953*	*0.0850*	*0.0550*	*-0.0104*
	z-score	*(0.067)*	*(0.000)*	*(0.397)*	*(0.686)*
Cohort 2:	VC	0.2141	0.0426	0.0797	0.0129
	NVC	0.1289	0.0190	0.0831	0.0242
	Diff	*0.0852*	*0.0236*	*-0.0034*	*-0.0113*
	z-score	*(0.023)*	*(0.040)*	*(0.400)*	*(0.776)*
Cohort 3:	VC	0.2086	0.0625	0.0502	**ins. obs**
	NVC	0.1868	0.0730	0.0607	**ins. obs**
	Diff	*0.0217*	*-0.0105*	*-0.0104*	
	z-score	*(0.218)*	*(0.092)*	*(0.745)*	
Cohort 4:	VC	0.2078	0.0134	**ins. obs**	**no obs**
	NVC	0.1823	0.0134	**ins. obs**	**no obs**
	Diff	*0.0255*	*0.0000*		
	z-score	*(0.066)*	*(0.133)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.0576	0.0849	0.1490	0.1417
	NVC	0.0719	0.0041	0.0306	-0.0197
	Diff	*-0.0143*	*0.0808*	*0.1184*	*0.1614*
	z-score	*(0.347)*	*(0.128)*	*(0.013)*	*(0.009)*
Cohort 2:	VC	0.1243	0.0044	0.0258	-0.0006
	NVC	0.0922	-0.0007	0.0083	0.0650
	Diff	*0.0321*	*0.0051*	*0.0174*	*-0.0656*
	z-score	*(0.117)*	*(0.665)*	*(0.200)*	*(0.093)*
Cohort 3:	VC	0.1506	0.0438	0.0100	**ins. obs**
	NVC	0.0869	0.0137	0.0755	**ins. obs**
	Diff	*0.0637*	*0.0301*	*-0.0655*	
	z-score	*(0.176)*	*(0.162)*	*(0.058)*	
Cohort 4:	VC	0.1895	0.0334	**ins. obs**	**no obs**
	NVC	0.1091	-0.0150	**ins. obs**	**no obs**
	Diff	*0.0804*	*0.0485*		
	z-score	(0.044)	(0.563)		

MEDIAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1737	0.1744	0.1124	0.0734
	NVC	0.0963	0.0662	0.0745	0.0425
	Diff	*0.0774*	*0.1082*	*0.0378*	*0.0309*
	z-score	*(0.002)*	*(0.000)*	*(0.216)*	*(0.441)*
Cohort 2:	VC	0.2099	0.0653	0.0820	0.0183
	NVC	0.1229	0.0325	0.0735	0.0559
	Diff	*0.0870*	*0.0328*	*0.0084*	*-0.0376*
	z-score	*(0.000)*	*(0.073)*	*(0.447)*	*(0.140)*
Cohort 3:	VC	0.1936	0.0670	0.0545	**ins. obs**
	NVC	0.1374	0.0566	0.0609	**ins. obs**
	Diff	*0.0562*	*0.0104*	*-0.0064*	
	z-score	*(0.000)*	*(0.352)*	*(0.690)*	
Cohort 4:	VC	0.1665	0.0298	**ins. obs**	**no obs**
	NVC	0.1352	0.0295	**ins. obs**	**no obs**
	Diff	*0.0313*	*0.0003*		
	z-score	*(0.004)*	*(1.000)*		
B: High Tech ONLY					
Cohort 1:	VC	0.1766	0.1776	0.1036	0.0500
	NVC	0.1081	0.1059	0.0912	0.0712
	Diff	*0.0685*	*0.0717*	*0.0124*	*-0.0213*
	z-score	*(0.009)*	*(0.062)*	*(0.955)*	*(0.794)*
Cohort 2:	VC	0.2221	0.0672	0.0810	0.0177
	NVC	0.1331	0.0393	0.0784	0.0553
	Diff	*0.0890*	*0.0279*	*0.0026*	*-0.0376*
	z-score	*(0.000)*	*(0.099)*	*(0.852)*	*(0.115)*
Cohort 3:	VC	0.2081	0.0755	0.0587	**ins. obs**
	NVC	0.1955	0.0627	0.0599	**ins. obs**
	Diff	*0.0126*	*0.0128*	*-0.0012*	
	z-score	*(0.644)*	*(0.525)*	*(0.954)*	
Cohort 4:	VC	0.1704	0.0252	**ins. obs**	**no obs**
	NVC	0.1650	0.0341	**ins. obs**	**no obs**
	Diff	*0.0053*	*-0.0089*		
	z-score	*(0.799)*	*(0.689)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.1135	0.1116	0.1588	0.1873
	NVC	0.0860	0.0374	0.0625	0.0379
	Diff	*0.0275*	*0.0743*	*0.0964*	*0.1494*
	z-score	*(0.773)*	*(0.300)*	*(0.062)*	*(0.082)*
Cohort 2:	VC	0.1580	0.0441	0.0997	0.0378
	NVC	0.0941	0.0152	0.0313	0.0691
	Diff	*0.0640*	*0.0289*	*0.0684*	*-0.0314*
	z-score	*(0.155)*	*(0.297)*	*(0.353)*	*(0.618)*
Cohort 3:	VC	0.1220	0.0220	0.0250	**ins. obs**
	NVC	0.0927	0.0497	0.0668	**ins. obs**
	Diff	*0.0293*	*-0.0277*	*-0.0418*	
	z-score	*(0.205)*	*(0.095)*	*(0.231)*	
Cohort 4:	VC	0.1506	0.0537	**ins. obs**	**no obs**
	NVC	0.0794	0.0197	**ins. obs**	**no obs**
	Diff	*0.0712*	*0.0340*		
	z-score	(0.005)	(0.307)		

Table 9: Operating Return on Assets (ROA)

This table is structured just like Tables 7 and 8, showing how the level of operating return on assets changes for IPOs from cohorts between 1970 and 2001 and how the ROA changes in the twenty years following the IPO date.

Return on Assets (roa_w) Winsorized Means (1%)

MEAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1755	0.1611	0.1321	0.1237
	NVC	0.1559	0.1396	0.1275	0.1187
	Diff	*0.0196*	*0.0216*	*0.0046*	*0.0050*
	p-value	*(0.022)*	*(0.008)*	*(0.682)*	*(0.726)*
Cohort 2:	VC	0.0371	0.0418	0.0519	0.0141
	NVC	0.0200	0.0540	0.0624	0.0153
	Diff	*0.0170*	*-0.0122*	*-0.0105*	*-0.0013*
	p-value	*(0.034)*	*(0.169)*	*(0.336)*	*(0.943)*
Cohort 3:	VC	0.0021	0.0044	-0.0062	**ins. obs**
	NVC	-0.0039	0.0139	0.0010	**ins. obs**
	Diff	*0.0060*	*-0.0095*	*-0.0072*	
	p-value	*(0.399)*	*(0.304)*	*(0.582)*	
Cohort 4:	VC	-0.1042	-0.0660	**ins. obs**	**no obs**
	NVC	-0.0362	-0.0283	**ins. obs**	**no obs**
	Diff	*-0.0681*	*-0.0377*		
	p-value	*(0.000)*	*(0.001)*		
B: High Tech ONLY					
Cohort 1:	VC	0.1853	0.1525	0.1129	0.1130
	NVC	0.1384	0.1417	0.0895	0.0389
	Diff	*0.0469*	*0.0108*	*0.0233*	*0.0740*
	p-value	*(0.002)*	*(0.534)*	*(0.211)*	*(0.027)*
Cohort 2:	VC	0.0143	0.0156	0.0203	-0.0262
	NVC	-0.0677	0.0116	0.0178	-0.0579
	Diff	*0.0820*	*0.0040*	*0.0026*	*0.0317*
	p-value	*(0.000)*	*(0.792)*	*(0.888)*	*(0.242)*
Cohort 3:	VC	-0.0592	-0.0484	-0.0566	**ins. obs**
	NVC	-0.1762	-0.1633	-0.1790	**ins. obs**
	Diff	*0.1171*	*0.1149*	*0.1223*	
	p-value	*(0.000)*	*(0.000)*	*(0.000)*	
Cohort 4:	VC	-0.1511	-0.1148	**ins. obs**	**no obs**
	NVC	-0.1870	-0.2026	**ins. obs**	**no obs**
	Diff	*0.0359*	*0.0879*		
	p-value	*(0.000)*	*(0.000)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.1541	0.1764	0.1644	0.1444
	NVC	0.1589	0.1392	0.1363	0.1378
	Diff	*-0.0047*	*0.0371*	*0.0281*	*0.0066*
	p-value	*(0.726)*	*(0.001)*	*(0.092)*	*(0.633)*
Cohort 2:	VC	0.0789	0.0911	0.1110	0.0844
	NVC	0.0644	0.0769	0.0881	0.0603
	Diff	*0.0145*	*0.0143*	*0.0228*	*0.0241*
	p-value	*(0.148)*	*(0.171)*	*(0.080)*	*(0.300)*
Cohort 3:	VC	0.0959	0.0891	0.0721	**ins. obs**
	NVC	0.0530	0.0785	0.0761	**ins. obs**
	Diff	*0.0429*	*0.0106*	*-0.0040*	
	p-value	*(0.000)*	*(0.293)*	*(0.794)*	
Cohort 4:	VC	0.0133	0.0517	**ins. obs**	**no obs**
	NVC	0.0550	0.0736	**ins. obs**	**no obs**
	Diff	*-0.0417*	*-0.0218*		
	p-value	(0.000)	(0.070)		

MEDIAN	Interval:	0 to 5	6 to 10	11 to 15	16 to 20
A: All IPOs					
Cohort 1:	VC	0.1932	0.1847	0.1418	0.1296
	NVC	0.1659	0.1504	0.1424	0.1285
	Diff	*0.0273*	*0.0342*	*-0.0007*	*0.0012*
	p-value	*(0.000)*	*(0.000)*	*(1.000)*	*(0.949)*
Cohort 2:	VC	0.0979	0.0965	0.1011	0.0816
	NVC	0.0984	0.1060	0.1160	0.1112
	Diff	*-0.0005*	*-0.0096*	*-0.0149*	*-0.0296*
	p-value	*(0.937)*	*(0.079)*	*(0.020)*	*(0.000)*
Cohort 3:	VC	0.1105	0.0915	0.0888	**ins. obs**
	NVC	0.1030	0.1063	0.1062	**ins. obs**
	Diff	*0.0075*	*-0.0149*	*-0.0175*	
	p-value	*(0.029)*	*(0.001)*	*(0.001)*	
Cohort 4:	VC	-0.0165	0.0439	**ins. obs**	**no obs**
	NVC	0.0841	0.0869	**ins. obs**	**no obs**
	Diff	*-0.1006*	*-0.0431*		
	p-value	*(0.000)*	*(0.000)*		
B: High Tech ONLY					
Cohort 1:	VC	0.2059	0.1889	0.1310	0.1404
	NVC	0.1609	0.1620	0.1292	0.1206
	Diff	*0.0451*	*0.0269*	*0.0018*	*0.0199*
	p-value	*(0.000)*	*(0.069)*	*(0.957)*	*(0.301)*
Cohort 2:	VC	0.0835	0.0894	0.0892	0.0628
	NVC	0.0550	0.0866	0.0967	0.0751
	Diff	*0.0285*	*0.0028*	*-0.0075*	*-0.0123*
	p-value	*(0.001)*	*(0.784)*	*(0.439)*	*(0.311)*
Cohort 3:	VC	0.0635	0.0357	0.0519	**ins. obs**
	NVC	-0.0241	0.0095	0.0022	**ins. obs**
	Diff	*0.0876*	*0.0262*	*0.0497*	
	p-value	*(0.000)*	*(0.033)*	*(0.010)*	
Cohort 4:	VC	-0.0859	-0.0030	**ins. obs**	**no obs**
	NVC	-0.0463	0.0041	**ins. obs**	**no obs**
	Diff	*-0.0396*	*-0.0071*		
	p-value	*(0.001)*	*(0.492)*		
C: Non-HT ONLY					
Cohort 1:	VC	0.1775	0.1777	0.1603	0.1251
	NVC	0.1662	0.1502	0.1462	0.1295
	Diff	*0.0114*	*0.0275*	*0.0141*	*-0.0044*
	p-value	*(0.149)*	*(0.019)*	*(0.295)*	*(0.439)*
Cohort 2:	VC	0.1165	0.1140	0.1261	0.1148
	NVC	0.1167	0.1124	0.1302	0.1251
	Diff	*-0.0001*	*0.0016*	*-0.0041*	*-0.0103*
	p-value	*(1.000)*	*(0.836)*	*(0.951)*	*(0.212)*
Cohort 3:	VC	0.1408	0.1307	0.1265	**ins. obs**
	NVC	0.1179	0.1191	0.1206	**ins. obs**
	Diff	*0.0229*	*0.0116*	*0.0059*	
	p-value	*(0.000)*	*(0.049)*	*(0.450)*	
Cohort 4:	VC	0.1032	0.1046	**ins. obs**	**no obs**
	NVC	0.1163	0.1031	**ins. obs**	**no obs**
	Diff	*-0.0131*	*0.0014*		
	p-value	(0.004)	(0.910)		

Table 10-A: Regular Regressions, $t \leq 20$

Tables 10-A, 10-B and 10-C each include regressions on five dependent variables to determine the impact venture capital has on various performance and efficiency indicators. In parentheses below the coefficients are standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels. The sample is restricted to observations within 20 years after a firm's IPO.

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.0548***	0.516***	-0.188***	0.186***	-0.0352***
	(0)	(0)	(0)	(0)	(0.00104)
ht	0.00572	1.155***	-0.431***	0.705***	-0.0425***
	(0.335)	(0)	(0)	(0)	(0.000112)
t	-0.0209***	-0.00784***	0.000637	-0.0312***	-0.0193***
	(0)	(3.38e-07)	(0.516)	(0)	(0)
lAGE	-0.0459***	-0.151***	0.140***	-0.0424***	0.0343***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum1	0.347***	-3.402***	0.0139	-0.170***	-1.774***
	(0)	(0)	(0.761)	(0.00647)	(0)
ipo_cat_dum2	0.332***	-3.444***	0.0651***	-0.121***	-1.969***
	(0)	(0)	(0.000111)	(2.93e-08)	(0)
ipo_cat_dum3	0.341***	-3.272***	-0.105***	0.0310	-1.943***
	(0)	(0)	(0)	(0.123)	(0)
ipo_cat_dum4	0.379***	-3.186***	-0.233***	-0.0129	-2.103***
	(0)	(0)	(0)	(0.489)	(0)
Observations	42322	22568	42733	41237	30968
R-squared	0.121	0.848	0.122	0.125	0.850

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10-B: Regular Regressions, $t \leq 20$ and $ht = 1$

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.0542***	0.396***	-0.275***	0.121***	-0.0779***
	(6.37e-08)	(0)	(0)	(0)	(3.50e-05)
t	-0.0277***	-0.0102***	0.000163	-0.0300***	-0.0261***
	(0)	(3.50e-10)	(0.923)	(0)	(0)
lAGE	-0.0813***	-0.136***	0.260***	-0.119***	0.0260**
	(0)	(0)	(0)	(0)	(0.0332)
ipo_cat_dum1	0.543***	-2.484***	-0.511***	0.913***	-1.481***
	(0)	(0)	(8.54e-10)	(0)	(0)
ipo_cat_dum2	0.451***	-2.288***	-0.381***	0.658***	-1.910***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum3	0.451***	-2.020***	-0.767***	0.961***	-1.859***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum4	0.492***	-1.948***	-0.904***	0.914***	-2.135***
	(0)	(0)	(0)	(0)	(0)
Observations	19052	16938	19289	18862	11317
R-squared	0.123	0.830	0.183	0.219	0.829

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10-C: Regular Regressions, $t \leq 20$ and $ht = 0$

Tables 10-A, 10-B and 10-C each include regressions on five dependent variables to determine the impact venture capital has on various performance and efficiency indicators. In parentheses below the coefficients are standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels. The sample is restricted to observations within 20 years after a firm's IPO.

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.0542***	0.814***	-0.0917***	0.243***	-0.00545
	(0)	(0)	(0)	(0)	(0.673)
t	-0.0157***	-0.000494	0.000328	-0.0322***	-0.0157***
	(0)	(0.892)	(0.770)	(0)	(0)
lAGE	-0.0348***	-0.153***	0.0988***	-0.0132*	0.0389***
	(0)	(0)	(0)	(0.0780)	(0)
ipo_cat_dum1	0.255***	-3.189***	-0.00499	-0.398***	-1.989***
	(0)	(0)	(0.921)	(2.98e-06)	(0)
ipo_cat_dum2	0.278***	-3.367***	-0.0251	-0.0886***	-2.018***
	(0)	(0)	(0.163)	(0.00174)	(0)
ipo_cat_dum3	0.288***	-3.476***	0.00456	-0.0734***	-2.001***
	(0)	(0)	(0.779)	(0.00413)	(0)
ipo_cat_dum4	0.324***	-3.410***	-0.107***	-0.124***	-2.100***
	(0)	(0)	(0)	(1.24e-07)	(0)
Observations	23270	5630	23444	22375	19651
R-squared	0.128	0.872	0.066	0.057	0.864

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10-D: Interaction Regressions, $t \leq 20$

Tables 10-D, 10-E and 10-F each include regressions on five dependent variables to determine the impact venture capital has on various performance and efficiency indicators. In addition, these regressions include a interaction term (*vc_t)* between the venture capital dummy and the time variable for years after the IPO date. This indicates how the venture capital effect changes over time, and if there is convergence between VC- and NVC- backed firms in the post-IPO years with respect to the various dependent variables. In parentheses below the coefficients are standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels. The sample is restricted to observations within 20 years after a firm's IPO.

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.131***	0.596***	-0.228***	0.186***	-0.0327**
	(0)	(0)	(0)	(0)	(0.0388)
vc_t	-0.0137***	-0.0139***	0.00738***	-8.97e-05	-0.000425
	(0)	(1.69e-06)	(7.70e-05)	(0.971)	(0.833)
ht	0.00479	1.154***	-0.430***	0.705***	-0.0425***
	(0.418)	(0)	(0)	(0)	(0.000112)
t	-0.0151***	-9.42e-05	-0.00246**	-0.0311***	-0.0191***
	(0)	(0.966)	(0.0497)	(0)	(0)
lAGE	-0.0464***	-0.151***	0.140***	-0.0424***	0.0343***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum1	0.313***	-3.456***	0.0325	-0.170***	-1.775***
	(0)	(0)	(0.479)	(0.00671)	(0)
ipo_cat_dum2	0.303***	-3.488***	0.0804***	-0.121***	-1.969***
	(0)	(0)	(3.28e-06)	(6.96e-08)	(0)
ipo_cat_dum3	0.310***	-3.318***	-0.0885***	0.0308	-1.943***
	(0)	(0)	(4.07e-08)	(0.141)	(0)
ipo_cat_dum4	0.347***	-3.234***	-0.216***	-0.0131	-2.104***
	(0)	(0)	(0)	(0.503)	(0)
Observations	42322	22568	42733	41237	30968
R-squared	0.124	0.848	0.123	0.125	0.850

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10-E: Interaction Regressions, $t \leq 20$ and $ht = 1$

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.129***	0.483***	-0.282***	0.158***	-0.0713**
	(0)	(0)	(0)	(1.53e-09)	(0.0136)
vc_t	-0.0132***	-0.0149***	0.00117	-0.00651*	-0.00110
	(0)	(2.52e-06)	(0.717)	(0.0596)	(0.762)
t	-0.0195***	-0.000505	-0.000558	-0.0259***	-0.0255***
	(0)	(0.846)	(0.830)	(0)	(0)
lAGE	-0.0818***	-0.136***	0.260***	-0.120***	0.0259**
	(0)	(0)	(0)	(0)	(0.0339)
ipo_cat_dum1	0.477***	-2.559***	-0.506***	0.878***	-1.486***
	(0)	(0)	(2.51e-09)	(0)	(0)
ipo_cat_dum2	0.406***	-2.344***	-0.377***	0.635***	-1.914***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum3	0.405***	-2.078***	-0.763***	0.937***	-1.863***
	(0)	(0)	(0)	(0)	(0)
ipo_cat_dum4	0.445***	-2.006***	-0.900***	0.891***	-2.138***
	(0)	(0)	(0)	(0)	(0)
Observations	19052	16938	19289	18862	11317
R-squared	0.125	0.831	0.183	0.219	0.829

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10-F: Interaction Regressions, $t \leq 20$ and $ht = 0$

VARIABLES	(1) lnsgrowth	(2) lrd_ta	(3) lsales_ta	(4) lq	(5) lroa
vcdumA	0.102***	0.815***	-0.142***	0.190***	-0.0326*
	(0)	(0)	(0)	(0)	(0.0948)
vc_t	-0.00862***	-0.000202	0.00922***	0.00932**	0.00483*
	(2.11e-10)	(0.978)	(0.000122)	(0.0167)	(0.0633)
t	-0.0134***	-0.000430	-0.00216*	-0.0348***	-0.0169***
	(0)	(0.921)	(0.0961)	(0)	(0)
lAGE	-0.0350***	-0.153***	0.0991***	-0.0128*	0.0391***
	(0)	(0)	(0)	(0.0883)	(0)
ipo_cat_dum1	0.244***	-3.190***	0.00607	-0.387***	-1.984***
	(0)	(0)	(0.904)	(5.90e-06)	(0)
ipo_cat_dum2	0.267***	-3.367***	-0.0132	-0.0757***	-2.012***
	(0)	(0)	(0.469)	(0.00856)	(0)
ipo_cat_dum3	0.276***	-3.476***	0.0179	-0.0592**	-1.994***
	(0)	(0)	(0.280)	(0.0242)	(0)
ipo_cat_dum4	0.311***	-3.410***	-0.0929***	-0.109***	-2.093***
	(0)	(0)	(9.94e-10)	(6.53e-06)	(0)
Observations	23270	5630	23444	22375	19651
R-squared	0.129	0.872	0.067	0.057	0.864

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1