

The Role of Venture Capitalists in the Acquisition of Private Companies

Paul A. Gompers and Yuhai Xuan*

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In this paper, we examine the characteristics of acquisition of private firms by public companies and explore the impact that venture capital-backing has on the acquirer's characteristics, form of payment, announcement returns, as well as long-run stock price and operating performance. We find that compared to the acquirers of other private companies, those firms that acquire private venture capital-backed companies tend to be larger, have higher Tobin's Q, and are more likely to use equity in the transaction and buy companies in a related industry. The market tends to react more negative to announcement of the acquisition of a venture capital-backed company, but the long-run stock market and operating performance is superior than other private acquisitions. We find that the use of stock and related transaction predicts better long-run performance. Our results suggest that the acquirers of private venture capital-backed companies do not suffer any adverse selection problem and continue to have superior performance in the long run.

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I. Introduction

The motivation for and the performance implications of acquisitions have been important areas for corporate finance researchers. We explore the characteristics of one particular type of acquisition, the acquisition of venture capital-backed private companies. Unlike other companies, young, private venture capital-backed companies have values that are primarily based upon real options, i.e., future investment opportunities. For most companies, their values may be determined more by assets in place. Venture capital-backed companies, on the other hand, are generally small with relatively minor sales, but substantial technology and intellectual property. Large, public companies may be motivated to purchase these companies because they represent potential future investment opportunities for them or because the young start-up may be a future competitor of the firm. As such, we expect that the characteristics of acquirers of venture capital-backed private companies as well as the market's reaction to their announcement and long-run performance may differ from other types of public or private acquisitions.

Prior research on acquisitions (Jensen and Ruback, 1983) has shown that announcement period event returns for acquiring firm shareholders tend to be insignificant or slightly negative. Cash mergers have consistently higher announcement period abnormal returns than those financed with stock. Moeller, Schlingemann, and Stulz (2003) find that shareholders of small acquirers gain from acquisition announcements and those of large acquirers suffer losses. In addition, acquirer announcement period returns for private targets are typically higher than those for public targets. Within the sample of acquisitions for private firms, stock offers typically

experience higher abnormal returns than cash offers while both enjoy non-negative abnormal returns at merger announcements. In addition to announcement period event studies, Loughran and Vijh (1997) find that acquirers in cash mergers earn positive five-year post-merger abnormal returns and acquirers in stock deals earn negative long-run abnormal returns, although the results are somewhat sensitive to the estimation methodology. Finally, other research that focuses on the pre-merger and post-merger accounting performance of the event firms (Healy, Palepu, and Ruback, 1992) finds that while the acquirers show no evidence of superior industry-adjusted pretax operating cash flow returns prior to the mergers, their post-merger operating performance improves relative to the industry benchmarks.

Our focus on acquisition of venture capital-backed private companies highlights many differences from these prior results. First, when the characteristics of acquirers of venture capital-backed companies are compared to the characteristics of the acquirers of nonventure capital-backed companies, they are typically larger and have higher Tobin's Q. The acquirers of venture capital-backed companies are more likely to buy firms in related industries and use stock transactions.

Our event study analysis of announcement period returns shows that the market reacts more negatively to the announcement of an acquisition of a venture capital-backed company as compared to other private company acquisitions. Within the sample of venture capital-backed acquisitions, stock deals and related deals tend to have more negative announcement period returns. Our results indicate that at the time of the announcement, the market potentially views venture capitalists as being particularly good at negotiating high prices for their companies in acquisitions or that the adverse selection

problem of buying real options due to greater asymmetric information and uncertainty is quite high.

When we examine long-run stock market and operating performance, however, the results differ substantially from both the short-run stock price reaction and the existing literature on acquisitions. First, acquirers of nonventure capital-backed companies have universally negative stock market performance while acquirers of venture capital-backed companies have positive risk-adjusted stock returns over the three-year period following acquisition. In addition, acquisitions with stock and of firms in related industries perform significantly better on average. Finally, acquirers of private companies have positive industry-adjusted pre-merger and post-merger operating performance. Acquirers of venture capital-backed companies, in particular, continue to have high industry-adjusted capital expenditure and Tobin's Q indicating that these firms continue to have significant investment opportunities that they are exploiting. Overall, the results suggest acquirers of venture capital-backed private companies are superior performing, high investing firms that continue to invest and perform well even after the acquisition. In addition, the use of stock to potentially motivate management of the acquiring company is potentially an important part of the acquisition process and the use of equity in the acquisition appears to not be a signal of overvaluation.

The rest of the paper is organized as follows. Section II highlights the venture capital industry and the usefulness of focusing on private venture capital-backed companies as real options that large public companies seek to acquire. Section III reviews the literature on acquisitions and outlines our research design. Section IV describes our data while Section V presents our analyses. Section VI concludes.

II. Venture Capital Investors and Private Companies

A. *The Role of Venture Capital Investors*

Venture capital firms specialize in collecting and evaluating information on start-up and growth companies. These types of companies are prone to information gaps—due to the highly specialized nature of their products and their early stage of development—and capital constraints are likely to be a significant problem. These firms are primarily composed of future investment and growth opportunities, have few assets in place, and have little history of revenues and cash flows. Because the intensive involvement of the venture capitalist alleviates some of the information gaps, these firms are likely to be better organized and perform better while still private than similar firms financed with other sources of capital.

One of the most common features of venture capital is the meting out of financing in discrete stages over time. Sahlman (1990) notes that staged capital infusion is the most potent control mechanism a venture capitalist can employ. Prospects for the firm are periodically reevaluated. Staged capital infusion keeps the owner/manager on a "tight leash" and reduces potential losses from bad decisions.¹ Gompers (1995) examines the staging of venture capital and finds that it is utilized to alleviate moral hazard and asymmetric information problem. Consistent evidence regarding the strength of

¹Two related types of agency costs exist in entrepreneurial firms. Both agency costs result from the large information asymmetries that affect young, growth companies in need of financing. First, entrepreneurs might invest in strategies, research, or projects that have high personal returns but low expected monetary payoffs to shareholders. For example, a biotechnology company founder may choose to invest in a certain type of research that brings him/her great recognition in the scientific community but provides little return for the venture capitalist. Similarly, entrepreneurs may receive initial results from market trials indicating little demand for a new product, but may want to keep the company going because they receive significant private benefits from managing their own firm. Second, because entrepreneurs' equity stakes are

contractual terms in these agreements is found in Kaplan and Stromberg's (2003) analysis of 130 venture investment agreements.

In addition to the staged capital infusions, venture capitalists will usually make investments with other investors. One venture firm will originate the deal and look to bring in other venture capital firms. This syndication serves multiple purposes. For example, it allows the venture capital firm to gain additional insights and advice about the firm. The syndication of investment also allows the venture capitalist to diversify his portfolio across a greater number of investments.

A third mechanism utilized by venture capitalists to avoid conflicts is the widespread use of stock grants and stock options. Managers and critical employees within a firm receive a substantial fraction of their compensation in the form of equity or options. This tends to align the incentives of managers and investors. Baker and Gompers (2003a,b) examine the role that venture capitalists play in setting compensation and incentives of entrepreneurs. They find that venture capitalists increases the sensitivity of management's compensation to the firm's performance relative to similar nonventure capital-financed companies. Fixed salaries are lower and the size of the equity stake held is higher for venture capital-backed CEOs.

In addition to the control mechanisms employed, venture capitalists are value-added investors. The advice and recruiting network that venture capitalists maintain add considerably to a company's value. The venture capitalists put better boards of directors into place and align the incentives of management (Baker and Gompers, 2003a). Similarly, a recent paper by Sorenson (2003) examines whether specific venture

essentially call options, they have incentives to pursue highly volatile strategies, such as rushing a product to market when further testing may be warranted.

capitalists are value-added to the firm. He shows that there are identifiable value-added effects of having seasoned venture capitalists involved with a company.

B. Venture Capital-Backing: Importance to the Acquirer

Two critical distinguishing features motivate our use of venture capital-backed acquisitions by public companies. First, as mentioned above, the value of a venture capital-backed startup is typically composed primarily future growth opportunities, not current revenues or cash flow. Cash flows at the time of acquisition are likely to be rather low. The future value is highly dependent upon the successful execution of these growth options. As such, the characteristics of the acquisition as well as the long-run performance implications of the purchase may be substantially different from the purchase of other private companies whose value is largely dependent upon existing assets in place.

A second, related feature of the value of venture capital-backed acquisitions is the importance of human capital to the future value of the opportunity. Because, many times, the market or product will not be proven and because of the importance of the entrepreneur who developed the idea, the skills and experiences of the people associated with the venture capital-backed company will be critical to its future success at the acquirer. Their management of the future investment opportunities may be required to ensure success. Similarly, the acquirer would not want the entrepreneur to start a competing firm. This might influence the structure of the purchase transaction as we discuss in the next section.

III. Mergers and Acquisitions, Real Options and Some Empirical Predictions

The traditional literature on mergers suggests that acquisitions often take place for efficiency-related reasons. Mitchell and Mulherin (1996) document that mergers occur in waves and strongly cluster by industry. Mergers are seen a response to industry shocks. Andrade, Mitchell and Stafford (2001) show that merger activity in the 1990s was largely driven by deregulation. Another category of theories of mergers focuses on the behavior of managers. Mergers offer an opportunity for managers pursuing self-interest to build up their own empires with private benefits of control (Jensen and Meckling, 1976; Jensen, 1986). Managers affected by hubris are likely to over-estimate their ability to run the targets and thus make expensive and unnecessary acquisitions (Roll, 1986; Heaton, 2002). In addition, bad managers can entrench themselves through manager-specific acquisitions to improve their job security (Shleifer and Vishny, 1989). A recent theory based on inefficient markets and rational managers (Shleifer and Vishny, 2003) sees mergers as a form of arbitrage by which managers take advantage of the stock market's misvaluation of the acquiring firm's stock and its perception of resulting synergies.

A particular type of acquisition we focus in this paper is the acquisition of real options (or growth options). Rather than acquiring assets in place or existing sales as in more traditional takeovers, acquisition of real options are strategic investments that afford acquirers the opportunity to develop capabilities and the flexibility to make larger subsequent investments, increase the scale, or widen the scope of operations in the future when and if new market conditions warrant the desirability and timing of such expenditures. Values of these real options are typically accounted for not by current operations and cash flows, but by future growth and investment opportunities. This type

of acquisition is very likely more prevalent for venture capital-backed private targets. Such targets are typically young startups in high-tech industries with limited sales or earnings track records yet high future growth opportunities.

The characteristics of real options and venture capitalists' typical involvement in such companies suggest that venture capital backing may have an effect on the structure of the acquisition of private targets by public acquirers. As with financial options, real options have great uncertainties about their future payoffs. Assets in place generate current cash flow that can be better estimated whereas future cash flows and contingent investment for real options entail a great deal of uncertainty. When facing high uncertainties for the target's value, an acquirer would prefer to make stock offers because any cost of overpayment due to the difficulties in target valuation would be partially borne by the target shareholders themselves, referred to as the "contingency pricing effect" of stock offers by Hansen (1987). Moreover, because human capital may be important to these growth options, an acquirer is more likely to want to tie managers of the private firm to the public company. Typically, such "tying in" is done by buying the firm with stock rather than cash in order to align the incentives of the target managers, with those of the acquirer, and to tie the target managers' future personal returns to their abilities to generate future payoffs.

Additionally, because of the greater uncertainties and the importance of human capital associated with real options, an acquirer might find it less daunting to estimate the target's value and manage the acquired personnel in the future if the target is in a line of business related to the acquirer. Therefore, if we believe young venture capital-backed

startups are more likely to be growth options, we would expect such acquisitions to be more likely in the form of stock and to come from acquisitions in a related industry.

Merger research has also focused on determining shareholder value gains or losses resulting from mergers and its distribution between stockholders of the acquirers and those of the targets. Researchers (Jensen and Ruback, 1983; Andrade, Mitchell and Stafford, 2001) conducting announcement period short-term event studies show that target firm shareholders normally enjoy significantly positive announcement period abnormal returns from merger transactions while acquiring firm shareholders tend not to gain from mergers. Form of payment in the financing of the merger transactions is found to make a significant difference in stock market reaction, with mergers financed without any stock earning consistently higher announcement period abnormal returns than those financed with stock. Moeller, Schlingemann, and Stulz (2003) find firm size to be a key factor in determining acquirer returns, with shareholders of small acquirers gaining from acquisition announcements and those of large acquirers suffering losses. This size effect remains after controlling for the organizational form of the acquired assets (public, private, or subsidiary) and the method of payment and seems to play a more important role in affecting abnormal returns than the other determinants of acquirer returns.

When acquisitions of private firms alone are examined, however, the above results for value implications associated with mergers do not generally hold (Hansen and Lott, 1996; Chang, 1998; Fuller, Netter, and Stegemoller, 2002). In particular, acquirer announcement period returns for private targets are typically higher than those for public targets. Additionally, within the sample of acquisitions for private firms, stock offers typically experience higher abnormal returns than cash offers while both enjoy non-

negative abnormal returns at merger announcements. The positive wealth effect associated with acquisitions of private firms is often attributed to a price discount captured by the acquirers for purchasing such firms resulting from the limited competition in the acquisition market for private targets and their relative illiquidity compared to publicly-traded firms. In addition, monitoring activities by large blockholders created from the target shareholders, reduced information asymmetries, and favorable tax effects together contribute to the higher abnormal returns for stock-financed acquisitions compared with cash transactions when privately-held firms are targets.

Acquisitions of real options, however, might be a distinct group among acquisitions of private target in terms of the price reaction to the acquisition announcement. The greater uncertainties associated with real options, coupled with the fact that many such targets are less mature companies without much prior record, make an accurate valuation of the target by the acquirer and by the market at the time of the merger announcement more difficult than in acquisitions of assets in place. Moreover, when the level of uncertainty is high, leading to a high level of perceived heterogeneity in the target's value, the winner's curse problem is aggravated. Thus, a buyer in an auction of a venture capital-backed private company may be more susceptible to adverse selection problems. If they win the bid for the private company, it is more likely that they overpaid for the firm than it would be if they were buying another private firm with a long history of revenues and cash flows. Furthermore, if most of the acquisitions for real options are venture capital-backed targets, the market might expect the venture

capitalists to negotiate better-priced deals for the targets with the acquirers.² All these factors imply that acquirers of venture capital-backed startups would likely experience larger price declines at announcement than acquirers of other, nonventure capital-backed startups. In particular, if such an acquisition is financed by stock, the market might take it as a signal that the value of the target is of greater uncertainty as suggested before. If such an acquisition is related, the target might be more certain of its value to the acquirer and demand a higher offer price thus minimizing the price discount. Moreover, the market might perceive such a related acquisition as a sign that the acquirer is running out of its own internal growth opportunities and/or that it is overpaying to pre-empt future competition. If these are the cases, we would expect venture capital-backed acquisitions that are stock-financed and/or related to have even lower announcement period returns.

In the long run, if the real options prove to be strategically valuable to the long-term development and thriving of business (and the market incorrectly incorporates these benefits into the stock price), we would expect to see strong relative stock performance of the acquiring companies. In particular, if related acquisitions turn out to provide helpful R&D capabilities, complementary technologies, and competitive strengths, and if stock-financed deals show their advantages in human capital management as discussed earlier, one would expect to see a positive drift in the long-run stock price of companies undertaking venture capital-backed transactions.

Instead of relying on abnormal returns to measure the value effect of mergers, some researchers have directly examined the pre-merger and post-merger accounting

² Venture capitalists specialize in exiting private investments. Many venture capitalists will have sold numerous private companies and hence may have better negotiating skills and an ability to extract higher prices.

performance of the event firms to see whether mergers lead to improvements in asset productivity relative to their industry peers. Healy, Palepu, and Ruback (1992) find that while the acquirers show no evidence of superior industry-adjusted pretax operating cash flow returns prior to the mergers, their post-merger operating performance improves relative to the industry benchmarks. Similarly, Andrade, Mitchell, and Stafford (2001) show that cash flow-to-sales for the sales-weighted average of the target and the acquirer outperforms the industry peers before the merger and cash flow-to-sales for the acquirer improves slightly relative to the industry benchmark after the merger.

We expect similar results for the acquirers of real options. Before acquisitions, such acquirers are most likely leaders in their respective industries, with better than average operating performance. Because of the great amount of uncertainty involved in acquisitions of real options, one would expect that only relatively strong performers that have the necessary experience and capability are willing and able to take part in such transactions. Thus, a typical acquirer of venture capital-backed private companies is likely to be an industry leader that not only regularly undertakes a great number of investments but also has considerable growth capabilities so that it can fully take advantage of the real options acquired once the opportunities arise in the future.

IV. Data

We identify a sample of mergers and acquisitions for which the targets are venture capital-backed U.S. private companies obtained from Venture Economics and Securities Data Corporation. We consider only transactions in which the acquiring firm is a U.S. public company listed on CRSP and Compustat during the event window. This

dataset, which is our primary sample for analysis, includes 1,234 transactions, with announcement dates between 1976 and 2001, the majority of which, approximately 97%, occur between 1990 and 2001. For comparison purposes, we also gather a second sample of mergers and acquisitions from the Securities Data Company's U.S. Mergers and Acquisitions Database. We select the sample of transactions with announcement dates between 1990 and 2001 in which the target is a private company and the acquirer is a U.S. public company listed on CRSP and Compustat during the event window. We then exclude from this sample all the observations by the same company within the one-year window (six months before and six months after) of the announcement date of any transactions in the primary sample. This gives us our sample of acquisitions of nonventure capital-backed private targets, consisting of 10,178 transactions.

Table 1 shows the number of acquisitions by year for both samples. The total number of acquisitions and the number of acquisitions of nonventure capital-backed private targets exhibit the same time pattern, mainly because the majority of transactions in a given year are nonventure capital-backed targets. The numbers increase through time (except for a dip in 1995) and peak in 1997 before declining. A similar pattern exists for the sample of acquisitions of venture capital-backed private targets, although the number of such transactions increases monotonically until it peak in 1999, which seems to suggest a lag in the decline for the acquisitions of venture capital-backed private targets.³ The percentage of all acquisitions that have venture capital-backed targets is reasonably steady around 10%, except for the beginning of the 1990s when fewer

³ This later peak in venture capital-backed acquisitions also reflects the surge in venture capital investing which increased dramatically from 1993 through 2000.

transactions involve venture capital-backed targets and in 1999 and 2000 when such transactions make up about 17% and 13% of all mergers respectively.

Table 2 reports sample summary statistics for all the acquisitions of private targets, divided according to whether the targets were venture capital-backed or not. Panel A contains the characteristics of the transactions. From Panel A, we see that the transaction values are much larger both in dollar value and as a percentage of assets (or market capitalization) for deals involving venture capital-backed private targets than for those with nonventure capital-backed private targets. The two samples also differ significantly in the method of payment. Stock is used more frequently in payment for acquisitions of venture capital-backed private companies, and cash, on the contrary, much less often. In fact, the percentage of pure equity deals is more than twice as large for acquiring venture capital-backed private companies as for acquiring nonventure capital-backed ones, and the percentage of pure cash deals is more than fifty percent smaller for acquiring venture capital-backed targets than for acquiring nonventure capital-backed ones. Finally, we focus on the relatedness of the acquisitions. A merger is classified as related if the target is acquired by a company that has the same two-digit SIC code as it does and unrelated otherwise.⁴ Our results show that an acquisition is less likely to be unrelated if the target is venture capital-backed. These results are consistent with our prediction that acquisitions of real options are more likely to be stock-financed and related. Panel B concentrates on characteristics of the acquiring firms. Acquirers of venture capital-backed private targets are much larger in both assets and market capitalization than acquirers of nonventure capital-backed private targets. Firms

⁴ The results are qualitatively similar if relatedness is defined as the acquisition being in the same four-digit SIC code.

acquiring venture capital-backed private targets are also more liquid than firms acquiring nonventure capital-backed private targets, having a much higher percentage of assets in cash and short-term investments. Note that although these companies have more cash on hand, cash is less frequently used in their acquisitions of private targets while stock is their preferred method of payment, consistent with the “contingency pricing effect” and the incentive advantage of stock financing in acquisitions of growth options as argued before. Next, acquirers of venture capital-backed targets have on average a much lower book-to-market ratio and a much higher Tobin’s Q (calculated as the sum of the market value of equity and the book value of debt, divided by assets). This suggests that the acquirers of private, venture capital-backed start-ups are higher growth companies than acquirers of nonventure capital-backed private firms. Lastly, the group of acquirers of venture capital-backed private targets has a much lower percentage of small acquirers than their counterparts in the nonventure capital-backed target group, where a small acquirer is defined to be an acquiring firm whose market capitalization in the event year is equal to or less than the smallest quartile of NYSE-listed firms.⁵

Moeller, Schlingemann, and Stulz (2003) provide summary statistics for their sample of mergers and acquisitions between 1980 and 2001, organized by the organizational form of the assets acquired. The characteristics of the deals and acquirers in our nonventure capital-backed private target group are pretty much in line with those of acquirers of private targets in their sample, except that the company size is on average larger for the acquirers in our nonventure capital-backed target group. The statistics for our main sample of acquirers of venture capital-backed targets, however, are very different from those of average acquirers of private targets in their study. In fact, except

⁵ This definition of small acquirer follows Moeller, Schlingemann, and Stulz (2003).

for Tobin's Q, acquisitions of venture capital-backed private targets look very similar to acquisitions of *public* targets in Moeller, Schlingemann, and Stulz (2003) in both deal and acquirer characteristics: they are on average bigger transactions, more often financed by equity and less likely to be unrelated. In addition, the acquirers are generally larger in size and have fewer small companies in composition. Moeller, Schlingemann and Stulz (2003) show that acquirers of public targets generally have much lower Q values than acquirers of private targets. We can see from Panel B of Table 2 that the Q of acquirers of venture capital-backed private targets is higher than average within the group of acquisitions of private targets and thus is much higher than the Q of acquirers of public targets. Overall, the summary statistics suggest that within acquisitions of private targets, those involving venture capital-backed targets are very different from those of nonventure capital-backed ones.

V. Results

A. Event-Period Abnormal Returns

In this section, we explore the market's reaction to the announcement of the acquisition of private companies, examining the relationship between the characteristics of the acquisition and the return from one day before the announcement of the acquisition until one day after the announcement of the acquisition. Announcement period abnormal returns are calculated following the standard estimation methodology for event study with daily returns as in Brown and Warner (1985). For each observation in the sample, we use days -200 through -20 relative to the event date as the estimation period. We regress the daily returns for our sample of acquirers on the value-weighted returns on the

market portfolio for this period. We require a stock to have no more than 90 missing daily returns in days -200 through $+60$ in order to be included in the estimation. From the regression results, we take the estimated factor loadings to estimate a market model predicted return for each day from -20 through day $+60$. The difference between the actual daily return and the market model prediction during the event period is the measure of abnormal performance. For the purpose of our event time analysis, we focus on the cumulative abnormal return over the three-day event window ($CAR[-1,+1]$).

Table 3 tabulates the CAR from day -1 to day $+1$ for both venture-backed and nonventure-backed targets. In addition to tabulating total sample average CARs, we tabulate average CARs based on whether the deal was pure cash or pure equity as well as if the deal was related to the acquirer's business or not. A deal is classified as related if the target and the acquirer have the same two-digit SIC code.

The results in Table 3 shows that the market has very different reactions to the announcement of an acquisition of a venture-backed company. The CAR from day -1 to day $+1$ is 0.64% for venture-backed acquisitions, significantly smaller than the 1.58% CAR for nonventure-backed acquisitions. There are also differential effects of deal structure on these two sub-samples. The abnormal return for pure cash deals is large and positive for venture capital-backed targets while it is negative for pure equity deals of venture-backed targets. Both types of deals have average positive CARs for nonventure capital-backed deals, but pure equity deals actually have a higher (more positive) abnormal return than pure cash deals. This is different from the literature on acquisition of public targets in which pure stock deals have a more negative abnormal return at announcement. The literature typically views equity acquisitions as being similar to

seasoned equity offerings and signaling overvaluation of the firm's equity. Surprisingly, the market views all equity transactions as being bad for acquirers of venture capital-backed firms, but positive for acquirers of nonventure capital-backed firms.

Relatedness appears to have a similar effect on the abnormal return of both venture-backed and nonventure-backed companies. Unrelated deals have higher, (more positive) CARs than do related deals. In particular, the acquisition of unrelated private, nonventure capital-backed companies has a positive two percent impact on the acquirer when the acquisition is announced. This suggests that, at least at the time of the acquisition, the market does not have a negative view of these acquisitions of private companies.

These results are explored in Table 4 in which we regress the event window (day -1 to day +1) on controls for the size of the acquirers the relative size of the acquisition, the acquirers book-to-market ratio, how related the acquirer and target are, whether the deal was pure cash or pure stock, and whether the target was venture capital-backed. The results show that the price reaction for larger acquirer is more negative. The effect is not driven by relative transaction size because we control for how large the acquisition was relative to the firm's market value. There are a couple of potential explanations. First, larger acquirers may be more likely to acquire firms in a competitive bidding process that would increase the adverse selection problem. Second, because the average price reaction on announcement is positive, maybe the market believes that the acquisition will have a larger positive effect on the value of the smaller acquirers.

It is also interesting that related acquisitions have a more negative announcement reaction. This is unusual because one might expect unrelated, diversifying acquisitions

would be more likely to be associated with poor future performance and hence a negative reaction at announcement. The market, however, may believe that bidders overpay for related acquisitions, even if they are better from a strategic operating perspective. This might result if the public companies is viewed as overpaying to preempt its future competition.

We find no relation between the method of payment and the price reaction at the announcement of the acquisition. On the other hand, the presence of venture capital investors in the target firm leads to lower abnormal returns for the acquirer on announcement of the acquisition. Because venture capitalists have considerable experience with selling companies (between a quarter and a third of all venture capital-backed firms are sold via an acquisition), they may be able to negotiate better terms for the seller and, hence, the market may believe that less of the value will accrue to the acquirer.

In Panel B, we examine the reaction of the market for the venture capital-backed sample of acquisitions. Much like the entire sample, larger size for the acquirer appears to be associated with lower abnormal returns. The other results appear to be less significant than they were in the full sample. The one difference is the effect of method of payment on the price reaction at the announcement of the acquisition. Pure stock deals have significantly lower announcement returns as the sorts in Table 3 demonstrated. Because the acquirers of venture capital-backed firms are typically low book-to-market growth companies, the market may view equity acquisitions as signals of market timing and overvaluation.

B. Long-run Buy-and-Hold Abnormal Returns

In this section, we explore whether or not there are long-run abnormal returns following the acquisition of private venture and nonventure capital-backed companies. For each acquirer, we calculate the firm's buy-and-hold abnormal return (BHAR). BHARs are calculated as the difference between the three-year buy-and-hold return for the event firm and the benchmark portfolios.⁶ The benchmark return is computed by calculating the buy-and-hold return on the matched portfolio from 25 value-weighted, nonrebalanced portfolios formed on size and book-to-market equity using NYSE breakpoints, as recommended by Mitchell and Stafford (2000). In forming the benchmark portfolios, we exclude all event firms but include all other stocks available on CRSP and Compustat that can be assigned to a size-book-to-market group. We first sort benchmark stocks independently into five size quintiles and five book-to-market quintiles at the end of each June based on NYSE breakpoints and then construct the benchmark portfolios by intersecting these size and book-to-market quintiles. An event firm is then matched to its benchmark based on its book-to-market equity for the last fiscal year and market capitalization as of the event date. Missing event firm returns over the three-year period are replaced by the corresponding benchmark portfolio returns in the calculation of BHARs. For all event firms, we report the mean BHAR as well as the wealth relative, calculated as the ratio of the average three-year gross returns of the event firms to the average three-year gross returns of the benchmark portfolios.

In Table 5, we tabulate the three-year buy-and-hold return for the full sample as well as the venture and nonventure capital-backed cohorts. When the full sample is

⁶ Each acquirer firm is used as the unit of observation only once within any three year event window. Multiple acquisitions by the same firm that occur within three years of the initial observation are excluded.

examined, the acquirers of private firms underperform substantially, whether the results are calculated using equal or value weighting. We use two methods of value weighting returns as in Mitchell and Stafford (2000). In the first method, we just weight by the acquiring firm's market capitalization. Standardized value weighting utilizes changes in the market index to avoid putting more weights on more recent observations. These weights are based on market capitalizations divided by the level of CRSP value-weighted market index at the event month. This result is consistent with the existing long-run post-acquisition performance literature which documents poor performance in samples of public acquisitions.

This pattern is similar when we examine the returns in the nonventure capital-backed cohort. In fact, the magnitude of underperformance is larger for the nonventure capital-backed acquirers than it was for the entire sample. Once again, value weighting appears to reduce the magnitude of underperformance.

The sample of venture capital-backed acquirers shows a very different pattern. While the equal-weighted sample shows underperformance relative to matched size and book-to-market benchmarks, value weighted acquirers of venture capital-backed companies do not underperform comparable size and book-to-market companies.

In Panel B, we examine the pattern of long-run abnormal returns in the sample of acquirers of venture capital-backed companies. When returns are equal weighted, all types of deal underperform with no clear pattern emerging within the type of payment or relatedness. When returns are value-weighted, only unrelated acquisitions show any underperformance.

Panel C tabulates the long-run performance for acquisition of nonventure capital-backed private companies. Once again, every category of acquirer for nonventure capital-backed companies shows strong underperformance. When returns are equal-weighted, there is no pattern across various types of acquisitions. For value-weighted returns, related acquisitions appear to perform more poorly than other types of acquisitions.

These patterns are examined in greater detail in Table 6 in which we examine the calendar time returns of the acquirers in our sample. For each month starting from January 1990 to December 2001, we form equal-weighted and value-weighted event portfolios by including all event firms that made an acquisition within the previous three years.⁷ We then regress monthly excess event portfolio returns (PR) on the three Fama-French (1993) factors. The excess event portfolio returns are event portfolio returns in excess of the one-month Treasury bill rate or the returns on a zero-investment event portfolio (e.g., long venture-backed portfolio and short nonventure-backed portfolio). The three Fama-French (1993) factors are: the excess market return (RM-RF), which is the value-weighted market return on all NYSE/AMEX/NASDAQ firms (RM) minus the one-month Treasury bill rate (RF); the mimicking return for the size factor (SMB), which is the difference between the returns on small firms and big firms; the mimicking return for the book-to-market equity factor (HML), which is the difference between the returns on a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks.

⁷ Each acquirer firm is used as the unit of observation only once within any three year event window. Multiple acquisitions by the same firm that occur within three years of the initial observation are excluded.

In Table 6 the equal-weighted regressions reveal that while the intercepts are negative, they are not significant. In addition, there are several differences between the coefficients on the portfolio of the acquirers of venture capital-backed companies and acquirers of nonventure capital-backed acquirers. Acquirers of venture capital-backed companies have higher factor loadings on both the market and HML, i.e., acquirers of venture capital-backed companies have returns that move more closely with low book-to-market growth firms.

Value weighting the returns gives intercepts that are now positive and significant, i.e., the acquirers of venture and nonventure capital-backed companies have positive excess returns when performance is measured relative to the Fama-French three factor model. Similarly, value weighted results increase the venture capital-backed acquirers factor loading on HML.

In Panel B, we examine the pattern of returns for the acquirers of venture capital-backed companies. When returns are equal weighted, there is no pattern in the performance of various types of acquisitions when acquirers are sorted by method of payment or whether the acquisition is related or unrelated. Value weighted returns, however, demonstrate a clear pattern in returns performance. Acquisitions that are financed by pure equity perform significantly better than pure cash acquisitions. Similarly, related acquisitions perform better than unrelated acquisitions. These patterns are opposite of the announcement return pattern that we say in Tables 3 and 4.

The results appear to indicate that the acquisition of real options is different from the acquisition of assets in place. The use of equity (potentially to align incentives) and

the importance of understanding the opportunity (when the acquisition is related) are central to the long-run performance of the acquisition.

C. Pre and Post-Acquisition Operating Performance

In this section, we explore how operating performance changes around the acquisition date. For each acquirer, we examine its operating performance relative to the industry one year prior to and one year after the acquisition.⁸ Our measures of operating performance include operating income (scaled by assets and by sales), capital expenditure (scaled by assets and by sales), sales growth, operating income growth, and Q. To arrive at industry-adjusted operating performance, we take the difference between the sample firm value and the median value in the same industry, defined by the same two-digit SIC code.

Table 7 tabulates the median industry-adjusted operating performance one year before and one year after the acquisition for the full sample as well as the venture capital-backed and nonventure capital-backed cohorts. On the whole, acquirers of private targets perform better than their industry medians both before and after the acquisitions. While sales growth and operating income growth improve subsequent to the acquisitions, operating income seems to deteriorate after the transactions, although still remaining above the industry median. When we separate the full sample into venture-backed and nonventure-backed cohorts, this pattern holds for both groups. However, we discover that venture capital-backed acquirers have significantly stronger operating performance than nonventure-capital backed acquirers relative to their industry peers both before and

⁸ Each acquirer firm is used as the unit of observation only once within any three year event window. Multiple acquisitions by the same firm that occur within three years of the initial observation are excluded.

after the acquisitions. In particular, acquirers of venture capital-backed companies have higher capital expenditures relative to the industry peers prior to and after the acquisitions while acquirers of nonventure capital-backed companies do not spend more on capital investments than industry medians at any time.

In Panel B, we examine the industry-adjusted operating performance in the venture capital-backed sample of acquisitions. Much like the entire sample, industry-adjusted operating performance appears to decline after the acquisition albeit still beating the industry peers. One thing to note is that acquirers of venture capital-backed companies carrying out pure equity deals and related deals have significantly higher Q not only compared to the industry medians but also compared to the acquirers of venture-backed companies undertaking pure cash transactions and unrelated transactions. In fact, for acquirers with pure equity deals, there is even an increase in Q after the acquisitions.

We further examine the pre- and post-acquisition industry-adjusted operating performance for the acquirers of private targets in a regression setting in Table 8. We run median regressions on all firms with valid operating performance data in Compustat each year from 1989 to 2000 for pre-acquisition operating performance analysis and from 1991 to 2002 for post-acquisition operating performance analysis, and report the averaged coefficients across the 12 years following the Fama and MacBeth (1973) methodology to account for cross-sectional correlation in performance measures due to the clustering of merger activities (Andrade, Mitchell, and Stafford, 2001). The dependent variables are industry-adjusted operating performance including operating income (scaled by assets and by sales), capital expenditure (scaled by assets and by sales), sales growth, operating income growth, and Q. We use dummy variables as

independent variables to investigate the effect of acquisition of private targets and venture capital-backing on operating performance before and after the acquisition. For pre-acquisition operating performance regressions in Panel A, we include a dummy variable that equals one if the firm makes an acquisition of a private target in the next year, and an interaction between this dummy and another dummy variable that equals one if the target in the acquisition is venture capital-backed. Similarly, for post-acquisition operating performance regressions in Panel B, we include a dummy variable that equals one if the firm makes an acquisition of private targets in the prior year, and an interaction between this dummy and another dummy variable that equals one if the target is venture capital-backed. The acquirer's log market equity and book-to-market ratio are included as control variables.

The regression results in Table 8 basically confirm our findings in Table 7. In the year before the acquisition as seen from Panel A, acquirers of private targets generally perform significantly better than non-acquirers in their industry. In particular, acquirers of venture capital-backed companies have above-the-median operating performance in all our performance measures, especially in capital expenditure and Q, surpassing not only non-acquirers in the industry but also acquirers of nonventure capital-backed companies. These results hold after controlling for the fact that acquirers of venture-backed targets generally have bigger size and lower book-to-market ratio. From Panel B, we see that the evidence of continued superior performance of the acquirers into the year after the acquisition is mixed. While sales growth, operating income growth, and Q increase, operating income declines, a pattern similar for both acquirers of venture-backed targets and nonventure-backed targets.

Table 9 tabulates the post-acquisition abnormal operating performance for the acquirers. Following Healy, Palepu and Ruback (1992), post-acquisition abnormal industry-adjusted operating performance for acquirers is estimated by the intercept term from the cross-sectional regression for event firms, where the dependent variable is the industry-adjusted operating performance measure for an event firm in the year after the acquisition and the independent variable is the same measure for the same company in the year before the acquisition. This procedure controls for persistence of the performance measures in time, and a significant and positive intercept indicates an improvement in the post-acquisition operating performance.

Panel A compares the abnormal operating performance of the venture capital-backed and nonventure capital-backed cohorts. Both cohorts display an increase in capital expenditure and Q, with the venture capital-backed group posting a higher increase. While there is no significant decline in operating income for acquirers of venture capital-backed targets, acquirers of nonventure capital-backed targets experience a significant weakening in operating income following the acquisition.

From Panel B, we see that within the venture capital-backed group, there is a post-acquisition increase in capital expenditure and Q only for acquirers undertaking pure equity deals and related deals. Acquirers with pure cash deals and unrelated deals in general experience no significant improvement or decline in any performance measures.

These results are somewhat different from the existing literature on post-acquisition operating performance for acquirers of public companies which documents statistically significant improvements in operating performance following the merger (Healy, Palepu and Ruback, 1992; Andrade, Mitchell, and Stafford, 2001). The operating

performance of acquirers of private companies, especially nonventure capital-backed ones, generally declines relative to the industry peers one year after the acquisition. This seems to be inconsistent with the on-average positive announcement period stock market reaction. One possible explanation is that private companies are operated quite differently than public companies before being acquired. Thus, it might take some time for the acquirers to adjust and integrate the operations of the acquired private targets into those of their own and make an improvement upon overall performance, especially when the targets are less mature companies consisting mainly of future growth options. Moreover, if mergers cluster in industries and occur as a response to industry shocks as Mitchell and Mulherin (1996) point out, the industry peers might themselves be responding to industry shocks by taking on mergers and internal restructuring at the same time these acquisition of private targets take place (Andrade, Mitchell, and Stafford, 2001). Within the sample of acquirers of private companies, the venture capital-backed cohort has stronger performance than the nonventure capital-backed cohort both before and after the acquisition. A typical acquirer of venture capital-backed private companies, especially in pure equity and related deals, appears to be an outperformer in its industry with high growth opportunities who consistently takes on a significantly higher-than-average amount of investment.

VI. Conclusions

The value of venture capital-backed start-ups is typically dependent primarily upon real options, i.e., future investment opportunities. Examination of the characteristics of acquirers of private, venture capital-backed companies provides an

opportunity to explore how the acquisition of real options by public companies differs from acquisition of assets in place. We find that acquirers of private venture capital-backed companies tend to be larger and have higher Tobin's Q than do acquirers of other private companies. In addition, acquirers of venture capital-backed companies are more likely to use pure equity transactions and to purchase companies in related industries.

Upon announcement of the purchases of private companies the acquiring firms experience a positive announcement period return on average, but the market reacts more negatively to the purchase of venture capital-backed companies. Similarly, the use of equity and purchase of related firms by acquirers of venture capital-backed companies lowers the announcement period returns. The results seem to indicate that the market either believes that venture capitalists are better at negotiating higher prices for their companies in the public market or that the adverse selection problem from purchasing real options is higher than for purchasing assets in place. Similarly, the use of equity in the purchase of venture capital-backed companies is not seen as positive attribute.

The long-run performance of these acquisitions, however, is quite different from the announcement period returns. Long-run buy-and-hold abnormal returns are very negative for acquisition of private nonventure capital-backed companies. These acquirers appear to not be able to meet market expectations for further improvements in performance for these existing assets in place although operating performance remains above industry peer performance both prior to and after the acquisition. On the other hand, acquirers of venture capital-backed companies appear to have substantially better performance. The use of stock in the purchase and the acquisition of related companies predicts superior long-run performance.

Finally, industry-adjusted operating performance both pre-merger and post-merger is positive. In particular, the acquirers of venture capital-backed firms have high Tobin's Q and high investment both prior to and after the acquisition. Industry-adjusted Tobin's Q actually increases for the acquirers of venture capital-backed companies.

Overall, our results suggest that the acquirers of venture capital-backed companies are high performing, high growth opportunity, and high investment companies both prior to the acquisition and after. At the time of the acquisition announcement, the market views these acquisitions less favorably, particularly if they are purchased with stock indicating that there is the perception that an adverse selection problem exists and/or the acquirer's stock is overvalued. The superior long-run performance for stock acquisitions indicates that the human capital may be critical to the performance of real options and providing incentives to existing management may be important. Similarly, firms that "stay close to home" by buying companies in related industries may be able to utilize their expertise to enhance the value of the investment opportunities.

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Table 1

Number of Acquisitions of Private Companies by Year

The table indicates by year the number of observations in the two samples of acquisitions of private companies for the period 1990 - 2001. The acquirers are U.S. public companies. The targets are U.S. private companies, differentiated by whether or not they are venture-backed.

Year	VC-backed targets	Non-VC-backed targets	Total	VC-backed/Total
1990	11	237	248	4.44%
1991	18	323	341	5.28%
1992	59	495	554	10.65%
1993	75	700	775	9.68%
1994	78	914	992	7.86%
1995	99	805	904	10.95%
1996	133	1062	1195	11.13%
1997	141	1583	1724	8.18%
1998	172	1512	1684	10.21%
1999	214	1071	1285	16.65%
2000	148	970	1118	13.24%
2001	48	506	554	8.66%
Total	1196	10178	11374	10.52%

Table 2**Sample Summary Statistics for Acquisitions of Private Companies**

The sample is acquisitions of private companies (mainly for the period 1990 - 2001), where the acquirers are U.S. public companies and the targets are U.S. private companies, differentiated by whether or not they are venture-backed. The first panel presents the characteristics of the transactions. A deal is classified as related if the target and the acquirer have the same two-digit SIC code. The second panel reports the characteristics of the acquirers. Cash includes cash and short-term investments. Q is calculated as the sum of the market value of equity and the book value of debt, divided by assets. A small acquirer is defined to be an acquiring firm whose market capitalization in the event year is equal to or less than the smallest quartile of NYSE-listed firms.

	VC-backed targets		Non-VC-backed targets	
	mean	median	mean	median
Panel A: Deal Characteristics				
Transaction value (TV) (\$ millions)	397.173	75.000	44.423	11.500
TV/Assets	0.339	0.128	0.327	0.052
TV/Market capitalization	0.286	0.081	0.276	0.060
Cash in payment (%)	34.05%		68.29%	
Stock in payment (%)	70.84%		45.74%	
Pure cash deals (%)	20.84%		42.94%	
Pure equity deals (%)	57.63%		26.47%	
Related deals (%)	64.83%		57.20%	
Panel B: Acquirer Characteristics				
Assets (\$ millions)	6018.270	674.416	2779.710	267.293
Market capitalization (\$ millions)	13890.026	930.686	1485.263	202.971
Cash/Assets	0.226	0.154	0.132	0.058
Book to market equity	0.426	0.271	1.246	0.440
Q	2.920	1.832	1.704	1.164
Small Acquirer (%)	25.65%		55.08%	

Table 3**Announcement Period Abnormal Returns for Acquirers**

The sample is acquisitions of private companies (mainly for the period 1990 - 2001), where the acquirers are U.S. public companies and the targets are U.S. private companies, differentiated by whether or not they are venture-backed. Announcement period abnormal returns are calculated following the standard estimation methodology for event study with daily returns as in Brown and Warner (1985). For each observation in the sample, we use days -200 through -20 relative to the event date as the estimation period where we regress the daily returns on the value-weighted returns on the market portfolio. We require a stock to have no more than 90 missing daily returns in days -200 through $+60$ in order to be included in the estimation. The difference between the daily return and the market model prediction during the event period is the measure of abnormal performance, and we focus on the cumulative abnormal return over the three-day event window (CAR $[-1,+1]$). A deal is classified as related if the target and the acquirer have the same two-digit SIC code. N is the number of observations.

	VC-backed targets			Non-VC-backed targets		
	CAR $[-1,+1]$	t-statistic	N	CAR $[-1,+1]$	t-statistic	N
Full sample	0.64%	2.62	1120	1.58%	13.13	8960
Pure cash deals	1.73%	4.32	202	1.15%	8.09	3845
Pure equity deals	-0.58%	-1.60	531	1.96%	9.60	2436
Related deals	0.40%	1.24	723	1.23%	8.92	5110
Unrelated deals	1.06%	2.96	397	2.09%	12.42	3850

Table 4

Regressions for Acquirer Announcement Period Abnormal Return Controlling for Firm and Deal Characteristics

The sample is acquisitions of private companies (mainly for the period 1990 - 2001), where the acquirers are U.S. public companies and the targets are U.S. private companies. Panel A includes both venture-backed and nonventure-backed targets, and Panel B includes only venture-backed targets. The dependent variable is the cumulative abnormal return (CAR) over the three-day even window, calculated following the standard estimation methodology for event study with daily returns as in Brown and Warner (1985). The independent variables include a dummy variable (Small) that equals one if the acquirer's market capitalization in the event year is equal to or less than the smallest quartile of NYSE-listed firms, dummy variables that equal one if the acquirer has the same two-digit or four-digit SIC code as the target, a dummy variable that equals one if the transaction is a pure cash deal, a dummy variable that equals one if the transaction is a pure equity deal, and a dummy variable that equals one if the target is venture-backed. The other independent variables are the logarithm of the acquirer's market equity, the acquirer's book-to-market ratio, and the ratio of the transaction value to the acquirer's size (relative size). Year fixed effects are also included.

Panel A: Venture-backed and nonventure-backed targets

Independent variables	Dependent variable: CAR in event window [-1,+1]					
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Logarithm of acquirer's size (market equity)	-0.0061	-9.59	-0.0061	-9.69		
Small?			0.0156	6.63	0.0157	6.69
Relative size (transaction value/size of acquirer)	0.0003	0.71	0.0003	0.72	0.0006	1.42
Acquirer's book to market ratio	-0.0001	-1.35	-0.0001	-1.37	-0.0001	-1.08
Related on the 2 digit level?	-0.0067	-2.88	-0.0075	-3.24		
Related on the 4 digit level?			-0.0048	-2.01	-0.0054	-2.25
Pure cash deal?	-0.0013	-0.45	-0.0010	-0.37	-0.0027	-0.98
Pure stock deal?	0.0028	0.92	0.0023	0.76	0.0007	0.23
Venture-backed?	-0.0034	-0.84	-0.0034	-0.85	-0.0087	-2.20
Constant	0.0857	8.19	0.0842	8.06	0.0071	0.89
Adjusted R ²	0.016		0.016		0.010	
Number of observations	8693		8693		8693	

Table 4 (Continued)

Panel B: Venture-backed targets only		Dependent variable: CAR in event window [-1,+1]							
Independent variables	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	
Logarithm of acquirer's size (market equity)	-0.0031	-1.62	-0.0030	-1.54					
Small?					0.0356	3.93	0.0357	3.93	
Relative size (transaction value/size of acquirer)	0.0011	0.20	0.0014	0.26	-0.0015	-0.27	-0.0012	-0.23	
Acquirer's book to market ratio	0.0003	0.11	0.0001	0.02	0.0002	0.07	-0.0001	-0.04	
Related on the 2 digit level?	-0.0106	-1.32			-0.0104	-1.30			
Related on the 4 digit level?			0.0068	0.91			0.0075	1.02	
Pure cash deal?	-0.0016	-0.14	-0.0008	-0.07	0.0001	0.01	0.0010	0.09	
Pure stock deal?	-0.0226	-2.38	-0.0229	-2.41	-0.0197	-2.11	-0.0199	-2.12	
Constant	0.0324	0.29	0.0307	0.28	-0.0168	-0.16	-0.0164	-0.16	
Adjusted R ²	0.016		0.015		0.031		0.030		
Number of observations	868		868		868		868		

Table 5

Three-Year Buy-and-Hold Abnormal Returns (BHARs) for Acquirer

The sample is acquisitions of private companies (mainly for the period 1990 - 2001), where the acquirers are U.S. public companies and the targets are U.S. private companies (venture-backed and nonventure-backed). Multiple observations on the same firm that occur within three years of the initial observation are excluded. BHARs are calculated as the difference between the average three-year returns for the event firms and the benchmark portfolios. Wealth relatives are calculated as the ratio of the average three-year gross returns of the event firms to the average three-year gross returns of the benchmark portfolios. The expected return benchmarks are 25 value-weighted, nonrebalanced portfolios formed on size and book-to-market equity using NYSE breakpoints. Event firms are excluded from benchmark portfolios. Missing sample firm returns over the three-year period are replaced by corresponding benchmark portfolio returns. Equal-weighted and value-weighted (unstandardized and standardized) averages are reported. Standardized value weights are based on market capitalizations at the event month, divided by the level of CRSP value-weighted market index. Panel A reports BHAR results for the entire sample. Panel B and Panel C focus on the subcategories in the samples of venture-backed targets and nonventure-backed targets, respectively. A deal is classified as related if the target and the acquirer have the same two-digit SIC code. N is the number of observations.

Panel A			Wealth			
	Sample	Benchmark	Relative	BHAR	t-statistic	N
Equal-weight						
Full sample	0.5135	2.1602	0.4789	-1.6467	-45.72	4788
Venture-backed	0.5254	1.8013	0.5445	-1.2759	-15.03	659
Nonventure-backed	0.5116	2.2175	0.4698	-1.7059	-43.26	4129
Value-weight (unstandardized)						
Full sample	0.4901	0.8994	0.7845	-0.4094	-10.18	4788
Venture-backed	0.5907	0.7707	0.8984	-0.1800	-1.89	659
Nonventure-backed	0.4113	1.0001	0.7056	-0.5888	-13.66	4129
Value-weight (standardized)						
Full sample	0.6315	0.9166	0.8513	-0.2850	-6.94	4788
Venture-backed	0.8230	0.8451	0.9880	-0.0221	-0.23	659
Nonventure-backed	0.4950	0.9675	0.7598	-0.4726	-10.78	4129

Table 5 (Continued)

Panel B: Venture-backed targets	Wealth					
	Sample	Benchmark	Relative	BHAR	t-statistic	N
Equal-weight						
Full sample	0.5254	1.8013	0.5445	-1.2759	-15.03	659
Pure cash deals	0.5323	1.5403	0.6032	-1.0080	-5.97	125
Pure stock deals	0.4586	1.7788	0.5249	-1.3203	-9.74	286
Related deals	0.5755	1.8789	0.5472	-1.3035	-11.17	405
Unrelated deals	0.4456	1.6775	0.5399	-1.2319	-10.44	254
Value-weight (unstandardized)						
Full sample	0.5907	0.7707	0.8984	-0.1800	-1.89	659
Pure cash deals	0.6397	0.8049	0.9084	-0.1653	-0.89	125
Pure stock deals	0.7081	0.8163	0.9404	-0.1083	-0.71	286
Related deals	0.6330	0.7546	0.9307	-0.1216	-0.93	405
Unrelated deals	0.5030	0.8041	0.8331	-0.3011	-2.29	254
Value-weight (standardized)						
Full sample	0.8230	0.8451	0.9880	-0.0221	-0.23	659
Pure cash deals	0.8544	0.8716	0.9908	-0.0172	-0.09	125
Pure stock deals	0.9804	0.9045	1.0399	0.0760	0.48	286
Related deals	0.9471	0.8334	1.0620	0.1136	0.83	405
Unrelated deals	0.6579	0.8606	0.8910	-0.2027	-1.51	254

Table 5 (Continued)

Panel C: Nonventure-backed targets	Wealth					
	Sample	Benchmark	Relative	BHAR	t-statistic	N
Equal-weight						
Full sample	0.5116	2.2175	0.4698	-1.7059	-43.26	4129
Pure cash deals	0.6593	2.1495	0.5269	-1.4902	-23.36	1642
Pure stock deals	0.4924	2.1653	0.4715	-1.6729	-22.27	1145
Related deals	0.5818	2.2469	0.4872	-1.6652	-31.41	2381
Unrelated deals	0.4161	2.1775	0.4457	-1.7613	-29.94	1748
Value-weight (unstandardized)						
Full sample	0.4113	1.0001	0.7056	-0.5888	-13.66	4129
Pure cash deals	0.4635	0.9814	0.7386	-0.5179	-7.60	1642
Pure stock deals	0.4224	0.9927	0.7138	-0.5702	-6.96	1145
Related deals	0.3963	1.0450	0.6828	-0.6486	-11.39	2381
Unrelated deals	0.4289	0.9473	0.7338	-0.5184	-7.86	1748
Value-weight (standardized)						
Full sample	0.4950	0.9675	0.7598	-0.4726	-10.78	4129
Pure cash deals	0.5265	0.9333	0.7896	-0.4068	-5.88	1642
Pure stock deals	0.5283	0.9410	0.7874	-0.4127	-4.92	1145
Related deals	0.5233	1.0600	0.7395	-0.5367	-9.28	2381
Unrelated deals	0.4659	0.8727	0.7828	-0.4068	-6.06	1748

Table 6

Calendar-Time Fama-French (1993) Three-Factor Model Portfolio Regressions of Acquirers

The sample is acquisitions of private companies from 1990 through 2001, where the acquirers are U.S. public companies and the targets are U.S. private companies (venture-backed and nonventure-backed). Multiple observations on the same firm that occur within three years of the initial observation are excluded. Equal-weighted and value-weighted event portfolios are formed by including all sample firms that made an acquisition within the previous three years, and are rebalanced monthly. The dependent variable is excess event portfolio return (PR), the event portfolio return in excess of the one-month Treasury bill rate or the return on a zero-investment event portfolio. The independent variables include the excess market return (RM-RF), which is the value-weighted market return on all NYSE/AMEX/NASDAQ firms (RM) minus the one-month Treasury bill rate (RF); the mimicking return for the size factor (SMB), which is the difference between the returns on small firms and big firms; the mimicking return for the book-to-market equity factor (HML), which is the difference between the returns on a portfolio of high book-to-market stocks and a portfolio of low book-to-market stocks. All regressions are for January 1990 through December 2001 for a total of 144 observations. Panel A reports regression results for the sample of venture-backed targets versus the sample of nonventure-backed targets. Panel B focuses on the subcategories within the sample of venture-backed targets. A deal is defined as related if the target and the acquirer have the same two-digit SIC code.

$$PR(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$$

Panel A: Venture-backed vs. nonventure-backed

	a	t(a)	b	t(b)	s	t(s)	h	t(h)	Adj. R ²
Equal-Weighted									
VC-backed	-0.0018	-0.63	1.3243	17.47	0.8736	11.02	-0.2567	-2.60	0.8583
Non-VC-backed	-0.0020	-0.85	1.0425	15.93	0.8008	11.90	0.0824	0.98	0.8155
Long VC-backed - Short Non-VC-backed	-0.0007	-0.31	0.3197	5.56	0.0834	1.39	-0.3115	-4.15	0.4861
Value-Weighted									
VC-backed	0.0134	5.66	1.0760	16.72	-0.0301	-0.45	-0.5699	-6.79	0.8303
Non-VC-backed	0.0098	6.55	1.1030	26.93	0.1608	3.82	-0.0632	-1.20	0.8960
Long VC-backed - Short Non-VC-backed	0.0029	1.02	0.0044	0.06	-0.1820	-2.30	-0.4839	-4.90	0.1830

Table 6 (Continued)

Panel B: Venture-backed targets									
	a	t(a)	b	t(b)	s	t(s)	h	t(h)	Adj. R ²
Equal-Weighted									
Pure cash deals	-0.0050	-1.29	1.1234	10.56	0.5861	5.27	0.2377	1.71	0.5667
Pure equity deals	-0.0008	-0.23	1.3684	13.79	0.8998	8.67	-0.7090	-5.48	0.8354
Long Cash - Short Stock	-0.0042	-0.88	-0.2450	-1.90	-0.3137	-2.32	0.9467	5.63	0.4462
Related deals	-0.0013	-0.41	1.3919	15.64	0.9228	10.65	-0.3458	-3.15	0.8676
Unrelated deals	-0.0027	-0.74	1.3310	13.56	0.7562	7.37	-0.0413	-0.32	0.7415
Long Related - Short Unrelated	0.0038	0.90	-0.2963	-2.61	0.0110	0.09	-0.5281	-3.57	0.0924
Value-Weighted									
Pure cash deals	0.0074	1.71	1.1326	9.57	-0.0724	-0.59	-0.2189	-1.42	0.5233
Pure equity deals	0.0212	6.25	1.0838	11.73	-0.0453	-0.47	-0.7835	-6.51	0.7440
Long Cash - Short Stock	-0.0138	-2.43	0.0488	0.32	-0.0271	-0.17	0.5646	2.80	0.0736
Related deals	0.0203	5.21	1.0648	9.72	-0.0703	-0.66	-0.7429	-5.50	0.7156
Unrelated deals	0.0129	4.21	1.1106	13.35	-0.0485	-0.56	-0.4794	-4.42	0.7361
Long Related - Short Unrelated	0.0049	1.02	-0.2470	-1.91	-0.0528	-0.39	-0.3131	-1.86	0.0124

Table 7
Pre- and Post-Acquisition Median Industry-Adjusted Operating Performance

The sample is acquisitions of private companies from 1990 through 2001, where the acquirers are U.S. public companies and the targets are U.S. private companies (venture-backed and nonventure-backed). Multiple observations on the same firm that occur within three years of the initial observation are excluded. Industry-adjusted measures of operating performance, pre- ($t - 1$) and post- ($t + 1$) acquisition, include operating income, capital expenditure, sales growth, operating income growth, and Q (calculated as the sum of the market value of equity and the book value of debt, divided by assets). Industry-adjusted operating performance is calculated as the difference between the sample firm values and the median values in the same industry, defined by the same two-digit SIC code. Panel A focuses on the sample of venture-backed targets versus the sample of nonventure-backed targets. Panel B focuses on the subcategories within the sample of venture-backed targets. A deal is defined as related if the target and the acquirer have the same two-digit SIC code.

^a Significantly different from zero at the 1% level, using a two-tailed test.

^b Significantly different from zero at the 5% level, using a two-tailed test.

^c Significantly different from zero at the 10% level, using a two-tailed test.

^d Significantly different from the corresponding subcategory for the same time period (i.e. VC-backed vs. non-VC-backed, pure cash deals vs. pure stock deals, and related deals vs. unrelated deals), at the 1% level.

^e Significantly different from the corresponding subcategory for the same time period (i.e. VC-backed vs. non-VC-backed, pure cash deals vs. pure stock deals, and related deals vs. unrelated deals), at the 5% level.

^f Significantly different from the corresponding subcategory for the same time period (i.e. VC-backed vs. non-VC-backed, pure cash deals vs. pure stock deals, and related deals vs. unrelated deals), at the 10% level.

Table 7 (continued)

Panel A: Venture-backed vs. nonventure-backed targets							
Median Industry-Adjusted Operating Performance Measures							
	Operating Income (over assets)	Capital Expenditure (over assets)	Operating Income (over sales)	Capital Expenditure (over sales)	Sales Growth	Operating Income Growth	Q
Full sample							
t - 1	0.0115 ^a	0.0000	0.0237 ^a	0.0000	0.0596 ^a	0.1024 ^a	0.1314 ^a
t + 1	0.0042 ^a	0.0000	0.0118 ^a	0.0007 ^a	0.1470 ^a	0.1248 ^a	0.1192 ^a
VC-backed							
t - 1	0.0421 ^{a, d}	0.0090 ^{a, d}	0.0501 ^{a, d}	0.0137 ^{a, d}	0.0832 ^a	0.1498 ^a	0.4641 ^{a, d}
t + 1	0.0120 ^{a, d}	0.0050 ^{a, d}	0.0252 ^{a, d}	0.0110 ^{a, d}	0.1296 ^a	0.1026 ^a	0.3872 ^{a, d}
Non-VC-backed							
t - 1	0.0090 ^a	0.0000	0.0201 ^a	0.0000	0.0557 ^a	0.0971 ^a	0.1016 ^a
t + 1	0.0035 ^a	0.0000	0.0102 ^a	0.0000	0.1490 ^a	0.1276 ^a	0.1003 ^a

Table 7 (continued)

Panel B: Venture-backed targets							
Median Industry-Adjusted Operating Performance Measures							
	Operating Income (over assets)	Capital Expenditure (over assets)	Operating Income (over sales)	Capital Expenditure (over sales)	Sales Growth	Operating Income Growth	Q
Pure cash deals							
t - 1	0.0691 ^{a, f}	0.0104 ^a	0.0767 ^{a, e}	0.0078 ^{c, d}	0.0685 ^{a, d}	0.1807 ^a	0.2391 ^{a, d}
t + 1	0.0330 ^{a, d}	0.0011 ^e	0.0628 ^{a, d}	0.0016 ^d	0.0808 ^{a, e}	0.0777 ^b	0.1160 ^{b, d}
Pure equity deals							
t - 1	0.0413 ^a	0.0166 ^a	0.0464 ^a	0.0245 ^a	0.1729 ^a	0.2359 ^a	0.7593 ^a
t + 1	0.0052	0.0099 ^a	0.0048	0.0230 ^a	0.1942 ^a	0.0947 ^b	0.8182 ^a
Related deals							
t - 1	0.0473 ^a	0.0092 ^a	0.0554 ^a	0.0179 ^{a, d}	0.0921 ^a	0.1775 ^{a, f}	0.5299 ^{a, e}
t + 1	0.0114 ^a	0.0059 ^a	0.0183 ^b	0.0146 ^{a, e}	0.1379 ^a	0.1005 ^a	0.4797 ^{a, d}
Unrelated deals							
t - 1	0.0368 ^a	0.0083 ^b	0.0452 ^c	0.0050 ^a	0.0596 ^a	0.1073 ^a	0.2967 ^a
t + 1	0.0139 ^a	0.0034	0.0301 ^a	0.0037	0.1145 ^a	0.1108 ^a	0.2297 ^a

Table 8

Regressions for Pre- and Post-Acquisition Industry-Adjusted Operating Performance

The dependent variables are industry-adjusted measures of operating performance including operating income, capital expenditure, sales growth, operating income growth, and Q (calculated as the sum of the market value of equity and the book value of debt, divided by assets). Industry-adjusted operating performance is calculated as the difference between the sample firm values and the median values in the same industry, defined by the same two-digit SIC code. The independent variables in Panel A include a dummy variable that equals one if the firm is to make an acquisition of private targets in the year after and an interaction between this dummy and another dummy variable that equals one if the target in the acquisition is venture-backed. The independent variables in Panel B include a dummy variable that equals one if the firm made an acquisition of private targets in the year before and an interaction between this dummy and another dummy variable that equals one if the target in the acquisition is venture-backed. The other independent variables are the logarithm of the acquirer's size (market equity), and the acquirer's book-to-market ratio. Fama-Macbeth (1973) methodology is employed where cross-section median regressions are run on all firms with valid data in Compustat each year from 1989 to 2000 for Panel A and from 1991 to 2002 for Panel B and coefficients are averaged across the 12 years. Panel A reports results for pre-acquisition operating performance and Panel B reports results for post-acquisition operating performance.

Table 8 (Continued)

Panel A: Pre-Acquisition Operating Performance

Independent variables	Dependent variable							
	Operating Income (over assets)		Capital Expenditure (over assets)		Operating Income (over sales)		Capital Expenditure (over sales)	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Logarithm of firm size	0.0121	25.19	0.0025	11.67	0.0194	48.77	0.0029	19.81
Acquirer's book to market ratio	1.2E-05	1.63	3.8E-06	1.69	4.4E-05	3.89	3.2E-05	4.25
Acquisition next year?	0.0064	3.80	-0.0017	-2.99	0.0123	5.85	-0.0011	-1.28
(Venture-backed?)*(Acquisition next year?)	0.0160	2.09	0.0063	2.80	0.0070	1.24	0.0096	2.95
Constant	-0.1387	-25.11	-0.0281	-14.77	-0.2206	-38.35	-0.0327	-26.15

Independent variables	Dependent variable					
	Operating Income					
	Sales Growth		Growth		Q	
Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	
Logarithm of firm size	0.0079	5.39	0.0137	7.41	0.0590	8.89
Acquirer's book to market ratio	-2.0E-05	-0.71	-1.2E-05	-0.29	-0.0005	-3.68
Acquisition next year?	0.0427	6.66	0.0738	7.32	0.0692	3.30
(Venture-backed?)*(Acquisition next year?)	0.0453	1.86	0.0726	1.75	0.2992	5.70
Constant	-0.0800	-4.62	-0.1483	-6.28	-0.6576	-8.19

Table 8 (Continued)

Panel B: Post-Acquisition Operation Performance

Independent variables	Dependent variable							
	Operating Income (over assets)		Capital Expenditure (over assets)		Operating Income (over sales)		Capital Expenditure (over sales)	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Logarithm of firm size	0.0115	23.99	0.0021	11.00	0.0197	45.65	0.0027	18.75
Acquirer's book to market ratio	4.7E-06	1.09	3.3E-06	1.13	3.4E-05	3.31	2.2E-05	3.59
Acquisition last year?	-0.0060	-3.35	0.0002	0.36	-0.0013	-0.46	0.0011	1.64
(Venture-backed?)*(Acquisition last year?)	-0.0005	-0.07	0.0005	0.16	-0.0115	-0.98	0.0054	1.90
Constant	-0.1320	-23.88	-0.0248	-13.58	-0.2266	-37.00	-0.0313	-24.35

Independent variables	Dependent variable					
	Operating Income					
	Sales Growth		Growth		Q	
Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	
Logarithm of firm size	0.0083	6.65	0.0139	7.24	0.0686	10.54
Acquirer's book to market ratio	-1.1E-05	-0.47	-2.0E-05	-0.59	-0.0004	-2.74
Acquisition last year?	0.1356	10.34	0.1057	7.04	0.0545	3.90
(Venture-backed?)*(Acquisition last year?)	-0.0421	-1.85	-0.0614	-2.50	0.1505	2.14
Constant	-0.0894	-5.66	-0.1554	-6.33	-0.7761	-9.74

Table 9

Abnormal Post-Acquisition Industry-Adjusted Operating Performance for Acquirers

The sample is acquisitions of private companies from 1990 through 2001, where the acquirers are U.S. public companies and the targets are U.S. private companies (venture-backed and nonventure-backed). Following Healy, Palepu and Ruback (1992), abnormal post-acquisition industry-adjusted operating performance for acquirers is estimated by the intercept term from the cross-sectional regression on event firms, where the dependent variable is the industry-adjusted operating performance measure for an event firm in the year after the acquisition and the independent variable is the same measure for the same company in the year before the acquisition. Measures of operating performance for the event firms include operating income, capital expenditure, sales growth, operating income growth, and Q (calculated as the sum of the market value of equity and the book value of debt, divided by assets). Industry-adjusted operating performance is calculated as the difference between the sample firm values and the median values in the same industry, defined by the same two-digit SIC code. Panel A reports results for the sample of venture-backed targets versus the sample of nonventure-backed targets. Panel B focuses on the subcategories within the sample of venture-backed targets. A deal is defined as related if the target and the acquirer have the same two-digit SIC code. t-statistics are reported below the coefficients in bold.

$$AOP_{post, i} = a + b * AOP_{pre, i} + e_i$$

Panel A: Venture-backed vs. nonventure-backed

	Dependent Variable						
	Operating Income (over assets)	Capital Expenditure (over assets)	Operating Income (over sales)	Capital Expenditure (over sales)	Sales Growth	Operating Income Growth	Q
Venture-backed targets							
a	0.0018	0.0051	-0.3166	0.0538	0.2377	0.0676	0.7316
	0.24	2.63	-1.23	2.69	3.08	0.94	3.97
b	0.4373	0.5416	0.0721	0.0370	0.0646	-0.0652	0.5095
	15.97	15.15	3.83	1.05	1.76	-3.19	7.08
Nonventure-backed targets							
a	-0.0184	0.0046	-0.3320	0.0431	3.7746	0.1444	0.2450
	-2.26	4.28	-2.57	2.79	1.18	1.26	5.82
b	0.6992	0.4759	0.0082	0.3848	-0.0533	0.0088	0.4942
	17.13	34.73	3.81	16.08	-0.08	0.29	21.91

Table 9 (Continued)

		Dependent Variable						Q
		Operating Income (over assets)	Capital Expenditure (over assets)	Operating Income (over sales)	Capital Expenditure (over sales)	Sales Growth	Operating Income Growth	
Panel B: Venture-backed targets								
Pure cash deals								
a	-0.0105	0.0015	-0.0155	0.0047	0.1060	-0.0654	0.0502	
	-0.90	0.38	-1.24	0.84	3.07	-0.75	0.16	
b	0.8186	0.5999	1.0731	0.3481	0.2549	0.4940	1.2215	
	9.75	7.22	15.01	4.42	2.39	3.57	6.91	
Pure equity deals								
a	-0.0069	0.0070	-0.5926	0.0918	0.2320	-0.0025	1.2134	
	-0.51	2.31	-1.01	2.08	5.23	-0.01	3.10	
b	0.4577	0.5765	0.2585	0.0579	0.0627	-0.1178	0.5241	
	10.32	11.39	2.03	0.75	4.38	-0.71	3.95	
Related deals								
a	-0.0013	0.0075	-0.5192	0.0770	0.2363	0.0152	1.0604	
	-0.11	2.93	-1.26	2.50	1.88	0.14	3.72	
b	0.3934	0.4940	0.0707	0.0307	0.2547	-0.0682	0.4334	
	11.79	11.57	2.96	0.70	2.29	-2.87	4.20	
Unrelated deals								
a	-0.0096	0.0008	0.0131	0.0038	0.1558	0.1128	0.2299	
	-1.32	0.27	1.01	0.84	5.32	1.32	1.55	
b	0.8278	0.6909	0.5690	0.3564	0.0267	0.0767	0.6538	
	16.80	10.31	19.51	7.41	2.81	0.87	9.63	