

## DO NEWLY PUBLIC ACQUIRERS BENEFIT OR SUFFER FROM THEIR PRE-IPO AFFILIATIONS WITH UNDERWRITERS AND VCS?

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*We examine whether pre-IPO affiliations affect post-IPO corporate events, namely acquisitions. On the one hand, newly public acquirers may benefit from their pre-IPO affiliations through residual signaling value or/and resource-related benefits. On the other hand, newly public acquirers may suffer from those affiliations when conflicts of interests arise during the post-IPO period. Equity underwriters may have incentive to promote non-value-creating acquisitions (Type II error), and venture capitalists (VCs) may have incentive to forgo strategically important acquisitions (Type I error). Drawing on a sample of 4,029 acquisitions made by 717 newly public firms, we find that on average the announcement of an acquisition by a newly public acquirer elicits a positive response from investors. The market views more favorably the acquisitions announced by newly public acquirers associated with prestigious equity underwriters, but this reaction becomes negative when the lead underwriter is retained as the acquisition advisor. The market reacts more favorably to acquisitions announced by VC-backed newly public acquirers, but only when those VCs are committed to a longer lockup period. The effects of pre-IPO affiliations on expected returns are stronger for newly public acquirers with a high intangible resource base and persist throughout the three-year post-IPO period (across each subsequent acquisition announcement). Copyright © 2010 John Wiley & Sons, Ltd.*

### INTRODUCTION

Changing from a private to a public firm is an important milestone in the life of a company. In the corporate finance literature, the initial public offering (IPO) is a liquidity event where a private firm raises additional capital by selling partial ownership instead of issuing debt securities. The IPO is a discrete event that changes allocation of risk but does not imply a change in the firm's operating performance or underlying capabilities.

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According to accepted financial theory, the market value of a firm is determined by its earning power and the risk of its underlying assets; this value is independent of how the firm chooses to finance its investments or distribute dividends (Modigliani and Miller, 1958). Recent research in empirical finance has emphasized that an IPO is also strongly motivated by the firm's desire to grow, notably through acquisitions (Brau and Fawcett, 2006).

In the field of corporate strategy, we still know little about how the IPO process affects the firm's subsequent corporate development activities such as acquisitions, divestitures, and alliances. Independently of its impact on the firm's capital structure, does an IPO imprint post-IPO corporate life and affect the firm's corporate capabilities—and ultimately its post-IPO value? Scholars

in information economics and network theory view the IPO as a process through which the IPOed firm forms affiliations with critical partners, such as the lead underwriter or venture capitalists (VCs). Several empirical studies show that affiliations shape perceptions of value at the time of the IPO (Stuart, Hoang, and Hybels, 1999; Gulati and Higgins, 2003, 2006; Sanders and Boivie, 2004), but we don't know whether those pre-IPO affiliations have persistent performance effects beyond their value at the time of the IPO. So far, the literature has been agnostic regarding how tightly the *signal* of quality conveyed by pre-IPO affiliations is coupled to actual differences in firm quality and their impact on post-IPO value (Stuart *et al.*, 1999).

In this paper, we examine whether affiliations with equity underwriters and VCs that are formed before the firm becomes public (i.e., pre-IPO affiliations) continue to have an impact after the IPO. We develop our arguments in the context of acquisitions announced by IPOed firms following the IPO. We argue that pre-IPO affiliations can produce multifaceted persistent performance effects. On the one hand, pre-IPO affiliations may continue to be beneficial after the IPO through positive spillover effects or through reactivation—during the merger and acquisition (M&A) process—of the relationship with the pre-IPO partners. On the other hand, pre-IPO affiliations may become harmful when conflicts of interest arise between the newly public firm and its pre-IPO partners during the post-IPO period. We argue that, during the post-IPO period, equity underwriters may have incentive to promote acquisition deals that are not value creating for the IPOed firm (Type II error) in order to increase their fees; also, VCs may have incentive to walk away from sound acquisition deals (Type I error) in order to avoid changing the business fundamentals and risk profile of the newly public firm and, ultimately, to be able to cash out quickly.

We test our hypotheses by examining the effects of pre-IPO affiliations with lead underwriter and VCs on the newly public acquiring firm's expected returns from post-IPO acquisition announcements. Drawing on a sample of 4,029 acquisitions made by 717 newly public firms, we find that, on average, the announcement of an acquisition by a newly public acquirer elicits a positive response from investors. We find that the market views more favorably the acquisitions announced by newly public acquirers associated with prestigious equity

underwriters, but this reaction becomes negative when the lead underwriter is retained as the acquisition advisor. We find that the market reacts more favorably to acquisitions announced by VC-backed newly public acquirers, but only when those VCs are committed to a longer lockup period. We find that the effects of pre-IPO affiliations on expected returns are stronger for newly public acquirers with a high intangible resource base. Lastly, we find that those effects persist throughout the three-year post-IPO period (across each subsequent acquisition announcement); this suggests that there is more than a 'residual signaling' story and that some resource-related benefits provided by pre-IPO partners (e.g., reputation, knowledge, connections) remain with the firm after the IPO and become part of its stock of resources. Our results hold after controlling for focal firm's quality, target firm's quality, likelihood of pursuing M&As, and lead underwriter and VC selectivity.

Our study contributes to the corporate strategy literature. It is a first step toward understanding how the process by which a firm becomes publicly traded (i.e., via an IPO) can influence its corporate strategy and value. In the context of an IPO, the very process of going public influences the value of the firm not only at the time of the IPO but also beyond that event. In addition to the positive value that remains attached to the pre-IPO affiliations in the post-IPO context as just described, our findings also show that beneficial affiliations at a specific time in the firm's corporate strategy may turn out to be detrimental for later corporate events, as when the market suspects conflicts of interest. Our study also contributes to the M&A literature that has mainly focused on the performance drivers of mature public acquirers. Examining the performance drivers of newly public acquirers reveals interesting variations along social and governance dimensions that have not yet been studied in M&A research. Building on this last point, our study potentially contributes to the social network literature by stressing the dual persistent effects of pre-IPO affiliations on post-IPO value.

## BACKGROUND AND HYPOTHESES

### Pre-IPO affiliations and IPO success

Whereas finance scholars see the IPO as a liquidity event, scholars in sociology and management view

it also as a social process during which the IPOed firm forms new relationships with critical partners who may have a crucial impact on its subsequent strategy and survival. There is an extensive literature showing that pre-IPO affiliations increase the likelihood of the IPO's success, notably in contexts with high uncertainty (Stuart *et al.*, 1999; Gulati and Higgins, 2003; Sanders and Boivie, 2004). We define *affiliation* much as in the 'WordNet book' dictionary: (1) a social or business relationship; (2) the act of becoming formally connected or joined. In the context of the IPO process, both facets of the definition are relevant. Affiliating with an investment banker or a VC represents a business relationship intended to accomplish specific business tasks—in this case, underwriting equity and securing the financing for new ventures. At the same time, the IPO firm becomes 'formally connected' with those critical IPO partners whose presence and reputation play an important role in the IPO process.

Pre-IPO partners bring signaling and resource-related benefits during the pre-IPO period. Drawing on the signaling literature, multiple studies have shown that affiliations with prominent third parties, and in particular equity underwriters and VCs, can serve as endorsements that shape investors' perceptions of the quality of IPO candidates. One economically important role of the investment bank is that of information provider and broker, using the bank's reputation to convey this information to investors in the IPO market (Chemmanur, 1993; Chemmanur and Fulghieri, 1999). Issuing firms can try to reduce investor uncertainty about the value of the securities that the firm is offering by using prestigious underwriters. High-prestige investment bankers, with valuable reputation capital at risk and superior information regarding the issuing firm's prospects, can credibly certify the value of issues that they underwrite (Chemmanur and Fulghieri, 1999). Prior research has generally found that investment banker reputation is significantly related to IPO firm performance (Carter and Manaster, 1990; Stuart *et al.*, 1999; Gulati and Higgins, 2003). Similarly, studies support an important information/certification role for VCs in IPOs. It has been documented that VC-backed IPOs are less often mispriced than other IPOs (Barry and Jennings, 1993) and are associated with increased perceived probability of success (Megginson and Weiss, 1991) and survival (Jain and Kini, 2000).

Pre-IPO partners also provide substantive resources during the IPO process. Investment bankers can play many roles in the underwriting of security issues: producing and certifying information via due diligence, providing interim capital, and/or supplying distribution and marketing skills (Shipilov, 2005, 2006). When choosing an investment bank, IPO candidates naturally consider the likely effectiveness of underwriter services not only at the time of the IPO but also during the post-IPO period. Brau and Fawcett (2006) determine that—when selecting an investment bank as underwriter—chief financial officers of privately held companies value the research services (e.g., analyst reports about relevant industries, firms, and investment tools) available to clients,<sup>1</sup> industry expertise, post-IPO trading-desk services and market-making capabilities, and the bank's base of institutional investors. In particular, the research services of the investment bank selected as underwriter would be useful when the focal firm considers making acquisitions with the IPO proceeds. Hence the selection of an underwriter depends upon an assessment of the bank in terms of its IPO-related services as well as other services that might be important in the post-IPO period.

Similarly, VCs can also play many roles before and during the IPO process (Brav and Gompers, 1997; Amit, Brander, and Zott, 1998). VCs not only provide financial resources for the entrepreneurial firm, they also are typically involved in managing and governing the ventures that they finance in both formal and informal ways. Formal monitoring includes their participation as members of the board of directors, where they serve as active monitors. VC involvement often tilts

<sup>1</sup> For example, Barclays Capital describes its research service, which is available only to its clients, as follows: 'We provide in-depth analysis of companies and macro coverage across asset classes, markets and the world's economies. We have a highly quantitative approach and our research is underpinned by sophisticated analytics. Combined, these provide clients with the tools and insights necessary for successful risk management and financing.' Barclays Capital states explicitly that the research services of the firm are independent of its activities related to investment banking, such as the 'road shows' and book building for prospective IPO firms. The research services are separated both physically and procedurally, and there is no information exchange between the research department and the trading and investment banking units prior to the research reports being made available to customers (<http://www.barcap.com/Client+offering/Research>).

the board structure away from insider (and affiliated) directors and toward independent directors (Baker and Gompers, 2003; Hochberg, 2008). Less formal ways include the recruiting of talented professionals, setting up compensation systems, formulating strategy, being involved in key corporate decisions such as M&As, assisting in the IPO process, and sharing networks of relationships (Gompers, 1995; Hellmann and Puri, 2002; Hochberg, 2008). Furthermore, young firms generally have weaker corporate development skills as well as weaker external relationships than established firms (Leiblein and Reuer, 2004; Carter *et al.*, 2004). VCs can provide those skills such as M&A expertise, as is illustrated in the following quotation from a U.S. VC whom we interviewed.

If not venture backed, it is very hard for these firms to manage acquisitions. What are the right due diligence questions to ask? Unless the entrepreneur has been with a company before, they don't have this skill set. When you see acquisitions that come along, we provide them with a standard due diligence check list. We set up meetings to review these documents, and we provide analysis of financing structure that looks at specifically [how] the shareholders [of the acquiring firm] would benefit from the deal. The CEO [chief executive officer] with a board that has VC guys would complain because we keep the bar very high in selecting deals. We look for strategic benefits and ask whether the owner should be diluting his/her focus now. But at the right price, with solid strategic benefits, we provide details and oversight around due diligence and show how to structure the deal. In fact, structuring these deals become very complicated because most acquisition deals at this stage are done as private stock exchange deals and stakeholders' claims are very hard to quantify in terms of expected dollars.

In summary, pre-IPO partners bring signaling and resource-related benefits during the pre-IPO period. We argue in what follows that the IPOed firm may still benefit from its pre-IPO relationships during the post-IPO period, but also can suffer from them when conflicts of interests arise.

### Effects of affiliations with equity underwriters on post-IPO acquisition returns

In this section, we argue that pre-IPO affiliations with equity underwriters can be beneficial during the post-IPO period through positive spillover effects of the past relationship or reactivation of the relationship for new M&A assignments. However, this relationship can become harmful when conflicts of interest arise during the post-IPO period: equity underwriters may have incentive to promote acquisition deals that are not value creating for the IPOed firm (Type II error).

#### *Positive spillover effects of pre-IPO affiliation with equity underwriters during post-IPO period*

The relationship formed with equity underwriters during the IPO process may still retain some value for the post-IPO firm. We identify two types of positive *spillover effects* that may influence investors' perceptions during the post-IPO period: (1) residual signaling value; and (2) resource-related benefits (reputation, connections, and knowledge) provided by the equity underwriter that can be redeployed to new uses such as M&As.

Investors may still attribute some residual signaling value to pre-IPO affiliations with equity underwriters during the post-IPO period because uncertainty about the IPOed firm remains high even after the IPO has been completed. Investors still face high information asymmetry, because newly public firms are in a phase of transition from private to public company (Fischer and Pollock, 2004). They typically receive less coverage from the financial press and analysts than do larger and older public firms, and insiders commonly retain strong control of the firm (Zuckerman, 2000; Poulsen and Stegemoller, 2004). Investors may thus turn to recent signals, such as pre-IPO affiliations. For instance, an affiliation with a prestigious underwriter may reflect superior quality of the firm and its management team, which in turn may be reflected in subsequent decisions such as M&As. If we assume that the equity markets can 'remember' the previous relationship (between the newly public acquirer and its equity underwriters) then, once the acquisition is announced, signals related to equity underwriters may remain in effect after the IPO (Pollock and Gulati, 2007) and may have an effect on post-IPO acquisition returns. Note

that this information cannot be reflected in the stock price on the date of the IPO because at that time there is no information about the impending acquisition.

Investors may perceive that some resource benefits brought by the equity underwriter during the IPO process may remain (at least to some extent) with the firm and may be redeployed to new uses by the IPOed firm. We detail three types of resource-related benefits: reputation, connections, and knowledge. After the IPO, the newly public firm can 'monetize' the reputation benefits of its affiliation with the equity underwriter by becoming more visible and attractive—in the market for corporate control—than newly public acquirers that do not benefit from such affiliations. Being affiliated with a prestigious equity underwriter is likely to provide the newly public acquirer with increased access to a larger and superior pool of targets and advisory firms in the M&A market (Shipilov and Li, 2008), thereby reducing its search costs and broadening its opportunity set. Also, valuable connections in the financial community brought by the equity underwriter can remain useful post-IPO: they may provide the newly public acquirer with more opportunities for finding attractive targets, securing the financing of acquisitions, and building a stable investor base (Fischer and Pollock, 2004). Investors may then perceive IPOed firms that are associated with prestigious equity underwriters as having a greater potential for learning and knowledge redeployment in a post-IPO M&A context. As we argued previously, equity underwriters bring unique knowledge—notably through the quality of their research services—that can be partly absorbed by the firm during the IPO process. This knowledge about financial techniques, capital markets, and transaction structures (see e.g., Eccles and Crane, 1988; Weber and Wilenborg, 2003) may remain with the IPOed firm and so become part of a cumulative learning process.

In summary, affiliations with prestigious underwriters during the IPO process may generate some positive spillover effects during the post-IPO period, and we expect investors to view more positively those acquisitions announced post-IPO by newly public acquirers that have been affiliated with a prestigious lead underwriter than those that have not benefited from a similar affiliation. Accordingly, we predict as follows.

*Hypothesis 1: Expected returns to newly public acquiring firms are positively associated with their affiliation with a prestigious lead underwriter of their IPO.*

*Dual effects of reactivating the relationship with equity underwriter during the post-IPO period*

Reactivating a relationship with equity underwriters during the post-IPO period may yield benefits to the firm. Exchanges with investment bankers during the pre-IPO period are seldom limited to those of a discrete, 'transactional' nature; rather, such exchanges are long in duration and reflect the ongoing process of developing a working relationship (Macneil, 1980). Going through an IPO is a unique and significant event in the life of a company. It is likely that the relationships formed during that process, which involves extensive collaboration and sharing of information, are not rapidly dissolved. The exchange of information is probably customized to a certain extent, since the lead underwriter is knowledgeable about the firm's resources and capital structure. These exchanges can be viewed as 'relational resources,' which are rare and hard to replicate (Barney, 1991) and which yield benefits when leveraged into new uses beyond their IPO context. Relational resources have the potential of generating 'relational rents' through the exchange of customized and market information and through access to complementary managerial and financial skills on a repeated basis (Dyer and Singh, 1998). The literature on embeddedness shows that repeated exchange with the same partners reduces uncertainty about the quality of the partners and encourages subsequent exchange by enabling fine-grained information sharing (Larson, 1992; Reagans and McEvily, 2003), facilitating joint problem solving (Uzzi, 1997; McEvily and Marcus, 2005), and improving cooperation (Coleman, 1990). The facilitating effect of embeddedness on exchange is particularly salient in professional sectors such as financial services (Eccles and Crane, 1988; Seabright, Levinthal, and Fichman, 1992; Shipilov and Li, 2008).

We have already mentioned that, in the post-IPO acquisition context, such repeated exchange could be accomplished via (i) accessing the underwriter's knowledge base by utilizing its clients-only research services and (ii) reactivating the firm's relationship with its lead underwriter by

retaining the latter as its lead acquisition advisor. Retaining the lead equity underwriter as acquisition advisor may help the newly public acquirer to handle the acquisition process more effectively than if it consulted a different investment bank for M&A advice. Typically, the lead equity underwriter has already invested substantial time and resources into the IPOed firm and is more knowledgeable about that firm than are other advisors in the market. In particular, the lead underwriter can: (1) further reduce search costs when matching the newly public acquirer with target firms; (2) reduce information asymmetry between the newly public acquirer and the target firm; and (3) provide superior technical and financial expertise in merger negotiations (Kesner, Shapiro, and Sharma, 1994) because of its superior knowledge of the firm, access to private information, and close relationships with insiders and board members of the IPOed firm. Overall, the equity underwriter's superior knowledge and its early collaboration with the IPOed firm may provide benefits of speed, cost savings, superior quality of advice, and superior effectiveness in subsequent collaborations between the IPOed firm and its acquisition advisor. We thus expect that IPOed firms that retain their equity underwriters as lead advisor for acquisitions during the post-IPO period will be positively viewed by the market.

*Hypothesis 2a: Expected returns to newly public acquiring firms are positively affected when the lead underwriter of their IPO is retained as the acquisition advisor.*

At the same time, reactivating the relationship with equity underwriters after an IPO may also produce negative effects. Both social network and learning scholars have argued that repeated exchange can restrict the flow of novel information, limit the formation of new relationships, and impede new learning (Uzzi, 1997; Hansen, 1999; Beckman and Haunschild, 2002). Furthermore, issues of small numbers and bargaining power make double sourcing a more favorable choice than single sourcing for financial services (Williamson, 1975).

Finance scholars have drawn on agency theory to document mounting evidence of conflicts of interest involving M&A advisory banks, conflicts that arise because these banks may put their own fees and brokerage commissions ahead of client

interests (Bodnaruk, Massa, and Simonov, 2007; Morrison and Wilhelm, 2007). Powerful incentives within M&A advisory banking—such as the advisory team's bonus pool and the bank's desire to advance in the League Tables<sup>2</sup> by handling larger and more numerous deals—conflict with the value-creating interests of an acquirer's shareholders. Each acquisition deal increases fees and bankers' bonuses at the end of the year. M&A advisors considering a potentially non-value-creating acquisition may be tempted to trade off their bank's reputation for the sake of their own bonuses. A bank's striving for leadership in the M&A League Table—which is a strong predictor of the bank's future market share in the M&A advisory market (Bao and Edmans, 2008)—exerts an influence in the same direction. Recent research has also found that advisors take advantage of their situation, not only by taking positions in the deals on which they advise but also by affecting the deal's outcome in order to fetch a higher capital gain from those positions (Bodnaruk *et al.*, 2007). These results echo earlier research indicating that bankers experience a negotiator's dilemma in which they may choose either to optimize the outcome in favor of the principals (the acquirer) or to maximize their own personal gains (Bazerman *et al.*, 1992; Kesner *et al.*, 1994).

Those conflicts of interest may be amplified when the M&A advisory bank has also been involved as equity underwriter in the earlier IPO process. The bank that underwrites a company's IPO issue can use its preferential access to the IPO firm's corporate executives and board members, as well as its access to private information, to push for new deals by insistently pitching potential acquisition targets. If there is scope for abusing one's influence on corporate executives of the IPOed firm, then bankers may place little emphasis on deal quality and may start to pitch value-destroying deals. Deals may be value destroying for various reasons including overpayment, bad timing, inability to integrate, and poor target quality. Furthermore, the post-IPO context is conducive to deal chasing because the newly public firm is endowed with new cash and the availability of its public stock as currency for acquisitions, making

<sup>2</sup> In the League Tables, investment banks are ranked according to their volume of M&A transactions for a specific period.

managers of IPOed firms more inclined to pursue their growth ambitions. This context may nurture bankers' propensity to exploit managers' bidding ambitions for their own advantage (Bodnaruk *et al.*, 2007) and to promote acquisitions that the newly public acquirer should not make—a Type II error (Puranam, Powell, and Singh, 2006).

As a result, we expect that investors will favor acquirers that do not rely on one single provider of financial services, especially for major assignments such as IPO and M&A deals, and will view with suspicion any acquisition deal announced by newly public acquirers in which the equity underwriter is retained as the acquisition advisor. This leads to our next hypothesis.

*Hypothesis 2b: Expected returns to newly public acquiring firms are negatively affected when the lead underwriter of their IPO is retained as the acquisition advisor.*

### **Effects of pre-IPO affiliations with VCs on post-IPO acquisition returns**

VCs may also have dual persistent effects on post-IPO acquisition returns. On the one hand, pre-IPO affiliations with VCs may be beneficial to the newly public firm during the post-IPO period through mechanisms similar to those already identified for equity underwriters. On the other hand, affiliations with VCs may also become harmful in a post-IPO period because of potential incentive misalignment between the VCs and the IPOed firm: VCs may have incentive to forgo strategically important acquisition deals (Type I error) in order to avoid changing the business fundamentals and risk profile of the newly public firm before cashing out.

#### *Positive spillover effects of pre-IPO affiliation with VCs during the post-IPO period*

Following the same line of reasoning as developed for equity underwriters, we see that investors may also turn to recent signals associated with VC support to infer the quality of the IPOed firm as an acquirer during the post-IPO period. If we assume that investors remember the firm's relationship with VCs during its post-IPO period, then we can expect investors to be more confident when acquisitions are announced by newly public acquirers that have received VC support than

by newly public acquirers that have not received such support. Furthermore, firms with VC backing may have benefited pre-IPO from resources—such as reputation, connections, knowledge, and governance—that have the potential of being redeployed for subsequent events. VC support typically increases visibility and reputation, which increases the newly public acquirer's opportunity set in terms of potential targets and M&A advisors. A VC may provide longer-term value by providing access to its network of portfolio companies, which often become closely linked through alliance formation and interlocking board directorates. This access may remain after the IPO (Lindsey, 2004; Hsu, 2006; Pollock and Gulati, 2007). For instance, Gompers and Xuan (2009) investigate the 'bridge building' capabilities of VC firms in acquisition deals involving public acquirers and private targets. The authors find that the market reacts more favorably to acquisitions from acquirers with a common VC investor link to the target, particularly in situations of high information asymmetry. As we discussed earlier, the skills, tools, and processes provided by the VCs during the pre-IPO period can be redeployed in subsequent acquisitions as newly public acquirers become poised to tackle the complex activities of the M&A process (e.g., target identification, due diligence, negotiations and financing, managing investor confidence, and post-integration).

Last but not least, VCs typically shape the governance of the young companies in which they invest. As we stressed before, newly public acquirers have unique governance features because managers commonly preserve control benefits by retaining a large portion of the firm's shares in the early stages of its public life (Brennan and Franks, 1997). The presence of VCs is often associated with a more independent governance structure whose effects may also persist after the IPO. A board of directors that is more independent should ensure better monitoring of major corporate decisions such as M&As. The quality of governance matters even more in the post-IPO context, which is conducive to agency issues because insiders have opportunities to take advantage of investors. VCs also put into place extensive monitoring systems (Kaplan and Stromberg, 2003), which can curb agency issues in decisions involving post-IPO acquisitions. Similarly, VC-backed firms are more likely to develop capabilities in accounting, financial, and human resource management practices

that are consistent with maximizing shareholders' wealth and minimizing agency conflict between shareholders and management (Jensen and Meckling, 1976; Boursesli, Davidson, and Abdulsalam, 2002).<sup>3</sup>

For both signaling and resource-related reasons, we expect the market to view more favorably the acquisitions announced by newly public acquirers that have received VC support than those that have not.

*Hypothesis 3: Expected returns to newly public acquiring firms are positively associated with VCs' support.*

#### *Dual effects of pre-IPO affiliation with VCs during post-IPO period*

Although VC backing has been recognized to have a positive effect on a firm's pre-IPO life, evidence on post-IPO life is mixed and suggests that VC presence may have a negative effect. Research in finance finds that VCs sell their shares more aggressively than executives and other shareholders at the expiration of the lockup period—the period (subsequent to the IPO) during which insiders and other pre-IPO shareholders are prohibited from selling any of their shares. When the lockup period expires, the aggressive sale of shares by VCs depresses the share price (Field and Hanka, 2001) and can abruptly impair the IPO firm's governance and advisory systems through the loss of VCs' knowledge and discipline.

It is important to stress that, after the IPO, VCs are in a different situation from equity underwriters. VCs typically want to disengage from their relationship with the IPOed firm and to cash out rapidly after the IPO; whereas an equity underwriter has incentive to reactivate the relationship with its former IPOed client to generate additional revenues from that relationship. VCs typically need to recycle their investments after a company

has reached a certain level of maturity and no longer requires their management assistance, reputation, and close scrutiny. Decreased uncertainty and investment risk also decrease a VC's return on investment (Manigart *et al.*, 2002). Furthermore, the relationship between VCs and their own investors provides further reasons for VCs to exit from portfolio companies, allowing investors to reallocate their capital.

These pressures to disengage from portfolio companies may give rise to incentive conflicts between VCs and newly public firms. Their desire to cash out quickly means that VCs do not want the management team of the IPO firm to divert its efforts to new activities, which run the risk of changing the fundamentals and risk profile of the businesses and thus making it harder to value the newly public firm. It is well known that valuation becomes harder as a firm's composition changes through acquisitions, and this in turn makes quantifying ownership claims (e.g., percentage of preferred stock) difficult. Hence VCs may be inclined to avoid acquisitions, as the following remarks (quoted from a VC we interviewed) illustrate.

When [the] firm has gone through IPO, we want to get out as fast as possible. Having an acquisition during the lockup period is undesirable; it makes the share unpredictable when the lockup period expires. Acquirers also lose money, which is why we discourage acquisitions before we cash out.

In the aftermarket, then, VCs may fail to act in the shareholders' best interests by preventing the newly public firm from making acquisitions that should be made—a Type I error (Puranam *et al.*, 2006). Under such circumstances, imposing a longer lockup period could serve as a commitment device to alleviate the moral hazard problems of pre-IPO investors during the post-IPO period (Brav and Gompers, 2003). For VCs, the earliest possible time to dispose of their stakes is when the lockup agreement expires; after this time, VCs are reluctant to warehouse freely tradable stocks. As a result, the IPOed firm is likely to lose VC backing soon after termination of the lockup agreement. Committed VCs may be more likely to accept longer lockup periods, whereas less committed VCs may push for shorter lockups. Longer lockups may increase the confidence of investors about the quality of decisions made after the IPO.

<sup>3</sup> For instance, VC-backed firms are: (i) less likely to exercise earnings management tactics and to utilize independent audit committees (Erickson and Wang, 1999; Klein, 2002; Gong, Louis, and Sun, 2008); (ii) more likely to separate the CEO and the chairman of the board (Paul, 2007), which in turn increases the board's independence; (iii) more likely to compensate managers based on firm performance (Kenneth *et al.*, 1997; Grinstein and Hribar, 2004); and (iv) less likely to adopt takeover defense mechanisms (Comment and Schwert, 1995; Hochberg, 2008). Each of these factors would lead to an increase in the market's positive reaction if such a firm were to announce an acquisition deal.



In addition, a longer lockup period also gives the newly public firm more time to adjust its own internal governance and advisory support systems. A more extended VC presence may also result in a more disciplined approach when selecting and pricing acquisition candidates. For instance, using a sample of U.K. IPOs, Espenlaub and colleagues (2003) find that returns around the lockup expiry date are lower for VC-backed firms with a shorter lockup period. They conclude that VC backing and lockup agreements are complements, not substitutes: both venture backing and the lockup period shape investors' perceptions of an IPOed firm's value.

We thus expect that the market will react more positively to acquisitions announced by VC-backed newly public acquirers when the VCs are committed to a long lockup period.

*Hypothesis 4: The longer that VCs remain committed to a newly public firm during its post-IPO period (i.e., the longer the lockup period), the higher the expected returns from acquisitions announced by newly public acquiring firms.*

## ROLE OF UNCERTAINTY AS A MODERATING FACTOR

The literature on the role of pre-IPO affiliations in IPO success has emphasized uncertainty as an important contingency factor. We argue that, during the post-IPO period, uncertainty may also play a role in investors' reaction to post-IPO events.

Previous research focusing on the IPO event finds that pre-IPO affiliations have a stronger signaling value when investors do not have sufficient direct information on the quality of the IPO firm (Spence, 1974; Podolny, 1994). Presumably investors would turn to more distant signals for a newly public firm whose value is uncertain—for example, when the IPO firm is young (Stuart *et al.*, 1999), has a low book-to-market value (Brav and Gompers, 2003), or faces 'hot' market conditions (Gulati and Higgins, 2003). To the extent that the pre-IPO affiliations retain some residual signaling value during the post-IPO period, investors may still attribute stronger value to those pre-IPO affiliations (such as reputable equity underwriters and committed VCs) during the post-IPO period when they face higher uncertainty about the actions taken by the newly public firm.

Uncertainty increases in the presence of intangible assets (Coff, 1999; Reuer and Ragazzino, 2008) because external investors have a harder time evaluating the true value of the firm. There is causal ambiguity between the IPOed firm's underlying assets and its future ability to generate cash flows. In an acquisition context, it is even more difficult to evaluate the future combined cash flows (including the synergistic cash flows) when there are many intangibles. Benefiting from strong pre-IPO affiliations may curb concerns of overvaluation, since investors assume that reputable underwriters and committed VCs had insider information about the quality of the newly public firm at the time of the IPO. Investors may be even more inclined to turn to those distant signals when they evaluate acquisitions announced post-IPO by a newly public acquirer with a highly intangible resource base.

A newly public firm with a highly intangible resource base may benefit even more from the resources captured through its relationship with its pre-IPO partners. For instance, newly public acquirers with high levels of intangibles will probably find it difficult to finance acquisitions in the post-IPO period because debt financing is less available for acquirers with intangible assets than for those with tangible assets that can serve as collateral (Chaddad and Reuer, 2009); firms with highly intangible assets have a lower concentration of debt financing (Titman and Wessels, 1988). Relationships formed during the IPO process with reputable equity underwriters who helped build the initial shareholder base and relationships with the investment community, may be useful post-IPO for increasing the financial stability of the newly public firm (Fischer and Pollock, 2004). This, in turn, increases the IPOed firm's capacity to finance large and risky investments such as acquisitions. Similarly, a newly public acquirer with a highly intangible resource base will likely have a harder time managing acquisitions (e.g., integrating operations, corporate cultures, and human capital) because of the social complexity and resulting causal ambiguity of the firm's expanded asset base. A VC presence can enhance the firm's ability to manage acquisitions effectively through the superior governance and advisory systems set up by VCs. For instance, Hellmann and Puri (2000) document that (i) innovative high-tech start-up firms in Silicon Valley are more likely than firms with a more tangible asset base to secure VC financing, and (ii) high-tech firms that are backed by a VC firm

introduce products more rapidly than firms that are not. We thus expect that, for both signaling and resource-based reasons, pre-IPO affiliations will have a stronger post-IPO impact for newly public acquirers with highly intangible assets.

*Hypothesis 5: The relationship between pre-IPO affiliations—that is, reputable lead underwriters (H5a) and VC presence (H5b)—and expected returns to newly public acquiring firms is stronger for those firms with highly intangible assets.*

### Persistence of effects: signal versus resources

We developed our Hypotheses 1–5 by adopting a perspective that jointly considers the signaling value and the resource-based benefits of developing reputable affiliations during the pre-IPO period. Although there is an emerging literature on the influence of pre-IPO affiliations on the post-IPO likelihood of forming an alliance (Pollock and Gulati, 2007) or becoming an acquisition target (Ragozzino and Reuer, 2007), there is no study that examines whether the long-term effects of pre-IPO affiliations stem more from residual signaling value or from ongoing value related to resource-related benefits. If the benefits of pre-IPO affiliations result mainly from residual signaling value, then we would expect their effects on post-IPO acquisition returns to deteriorate over time as additional information about the newly public firm becomes available. The effectiveness of the signal is indeed highest for resolving uncertainty about the firm with respect to the first relevant event (i.e., the first acquisition announcement), and it most likely decays rapidly for each subsequent event. Furthermore, investors may also have a harder time recalling the initial signal with each subsequent deal.

In contrast, if these pre-IPO affiliations become part of the resource stock of the firm (e.g., part of its relational capital that can be reused for new events), then their effects on the firm's post-IPO value may be more persistent. We have earlier detailed the different types of resources (reputation, connections, knowledge, and governance) that pre-IPO partners might bring to the IPO process. Recent research has developed the notion of 'intertemporal economies of scope' (Helfat and Eisenhardt, 2004), where resources are redeployed to a new activity when the firm exits a market.

Based on this line of thinking, we could view the IPO as a process by which the IPOed firm acquires new resources (and notably builds its relational capital); with those resources becoming part of the stock of the firm, they are amenable to being redeployed for subsequent corporate events such as acquisitions (Capron, Dussauge, Mitchell, 1998).

We have argued here that relationships with pre-IPO partners may provide not only signals but also substantive resources such as reputation, connections, knowledge, and governance. A few recent empirical studies indicate that pre-IPO partners may provide longer-term value because of persistent related benefits. For instance, research on VCs has found that access to their network may well remain after the IPO, featuring the VC 'keiretsu effect' in shaping patterns of alliance formations (Lindsey, 2004). Finance scholars have found that VC presence improves both pre-IPO and post-IPO governance quality of the IPOed firm. During both periods, inside directors and affiliated outsiders occupy fewer board seats when VCs are providing capital to the company (Hochberg, 2008). Also, CEOs own fewer shares of stock before and after the IPO when there is VC involvement.

Although we cannot predict the respective part of value that could be attributed to signal versus resources, we argue that they probably coexist but persist to varying degrees. As the part of the value that may be attributable to the 'signaling' effect decreases, it could be argued that the 'resource-related' part increases after each new event—especially if those resources become part of a cumulative process of resource accumulation and learning. If the firm developed resources based on its relationships with affiliates in the pre-IPO period that are of relevance in the post-IPO context, then increased experience in utilizing these resources after the IPO would indeed improve their effectiveness in subsequent uses. For instance, firms that have formed ties to a reputable underwriter when utilizing its clients-only research services will experience a learning curve of accessing the knowledge base of reports that reflect analysts' quantitative and qualitative assessments of companies, industries, and macro variables in the broader environment. Similarly, VC-backed firms that have adopted governance, accounting, financial, and human resource management practices will increase their utilization and the effectiveness of such routines over time (Nelson and Winter, 1982). Hence resources based on interactions with

third-party affiliates in the pre-IPO period should have an increasingly positive effect as the firm progressively accumulates experience in the post-IPO period. In order to assess this alternative explanation, we developed an approach that empirically controls for the durability of the effects of pre-IPO affiliations in the post-IPO period.<sup>4</sup>

This leads us to our last hypothesis, as follows.

*Hypothesis 6: The effects of pre-IPO affiliations—that is, reputable lead underwriters (H6a) and VC presence (H6b)—on expected returns to newly public acquiring firms persist through each subsequent acquisition announcement.*

## DATA AND METHODS

We start with a population of 3,595 original IPOs issued between 1988 and 1999. The IPO population is gathered from the Securities Data Corporation (SDC) Global New Issues reports. The accounting data are available through COMPUSTAT, and the financial return data are obtained from the Center for Research in Security Prices (CRSP); these latter two datasets are both maintained by Wharton Research Data Services (WRDS). Of the 3,595 original IPOs, 1,738 engaged in acquisitions during the period 1988–1999. Acquisition deals for the IPO firms are gathered from SDC Mergers & Acquisitions reports. We used accounting and financial data to identify 717 firms that had completed 4,029 acquisition deals during this period and for which we could calculate the dependent variable of cumulative abnormal returns. Of these firms, 56 percent IPOed between 1993 and 1997.

In our analysis, we constrained the post-IPO period to a three-year window following the IPO. Within this three-year window, there are 685 firms with 3,174 completed deals, of which: (i) 40 percent are completed in the year,  $t = 1$ , immediately following the IPO; (ii) 38 percent are classified as ‘related’ deals at the four-digit Standard Industrial Classification (SIC) code level; (iii) 41 percent are completed by newly public firms in the services sector, followed by manufacturing (20 percent) and finance, insurance, and real estate (19 percent);

(iv) the targets have an average of \$135 million in total assets, with an average of \$6 million in operating income; and (v) 67 percent (resp. 24 percent) involved private (resp. subsidiary) targets.

## Dependent variable

Panel A of Table 1 describes the list of variables, and Panel B presents the correlation matrix. The dependent variable is the market’s reaction to the announcement of the acquisition deal, as measured by calculating cumulative abnormal returns (CARs). The existence of abnormal returns suggests that the investors anticipate that the firm creates economic value—beyond the expected return to a corporate event—conditional on all the publicly available information being incorporated into the expectations of actors in capital markets.

The CARs are cumulated over  $t = \{-5, \dots, +5\}$  days around the announcement date. We performed robustness checks using alternative event windows of  $t = \{-10, \dots, +10\}$  and  $t = \{-1, \dots, +1\}$  days around the announcement date, and the results were not different from what we report in this paper. Consistent with the ‘event study’ methodology, we used the market model to estimate the expected stock market return. The estimation period is  $t = \{-60, \dots, -20\}$  days around the announcement day ( $t = 0$ ). It is interesting to note that the average CAR is one percent; this is in contrast to CARs associated with the acquisition announcements of established firms, which are generally at about the breakeven point (Singh and Montgomery, 1987; Sirower, 1997).

## Independent variables

### Lead underwriter reputation

Lead underwriter reputation is measured as the underwriter rankings provided by Loughran and Ritter (2004),<sup>5</sup> who based their measure on Carter, Dark, and Singh’s (1998) and Carter and Manaster’s (1990) rankings. The rankings range from a low of 0 to a high of 9, and they can change over time. Carter *et al.* (1998) classify an underwriter as being ‘highly reputable’ if its ranking

<sup>4</sup> This method of isolating the signal value of an underlying asset with productive uses can be employed in other contexts as well.

<sup>5</sup> The data are provided on Jay Ritter’s homepage at <http://bear.cba.ufl.edu/ritter/ipodata.htm>. Please refer to the following reference on his Web page: ‘IPO Underwriter Reputation Rankings (1980–2004),’ Appendix C of ‘Why Has IPO Underpricing Changed over Time?’ (coauthored with Tim Loughran).

Table 1. Summary statistics

Panel A. Variables						
Variable	Definition	Obs	Mean	Std. dev.	Min	Max
1. CAR <sub>+5,...,-5</sub>	Abnormal returns cumulated over +5, ..., -5 days around the event	3174	0.96	13.18	-46.17	47.68
2. LEADMGR	Dummy=1 if IPO lead underwriter's reputation at the time of the deal is greater than 7.9	3174	0.88	0.33	0.00	1.00
3. VCBACK	Dummy=1 if VC backed	3174	0.37	0.48	0.00	1.00
4. ADVISOR	Dummy=1 if IPO lead underwriter is same as the deal's advisor	3174	0.03	0.16	0.00	11.00
5. VCBACK × LOCKUP	Interaction term	3174	21.44	78.84	-87.73	1085.27
6. LOCKUP	Mean centered natural logarithm of lockup days	3174	70.84	157.90	-87.73	1085.27
7. ROA <sub>t-1</sub>	Return on assets for the focal firm 1-year prior to the deal	2555	-0.03	0.22	-1.99	0.36
8. RECENCY <sub>deal-1</sub>	Natural logarithm of elapsed number of years between the focal deal and the immediate prior acquisition deal	2170	0.27	0.79	-5.79	8.04
9. RELATED	Dummy=1 if acquirer and target are in the same four-digit SIC Industry	3174	0.36	0.48	0.00	1.00
10. SIZE	Natural logarithm of acquirer's size (Total assets-Book value of equity+Market value of equity) at the time of the deal	2533	-0.40	1.40	-4.53	4.25
11. INDMB	Industry market-to-book value of equity at the four-digit SIC code	2625	3.16	1.71	0.49	20.07
12. MAEXP	Prior M&A experience as a ratio of total number of prior M&A and alliance experience including all pre-IPO deals)	2081	0.76	0.37	0.00	1.00
13. IPODEMAND	Dummy=1 if The original mid-price <sup>a</sup> filed is less than the final offer price	3174	0.65	0.48	0.00	1.00
14. HOTIPO	Dummy=1 if the IPO is in a hot-IPO year	3174	0.60	0.49	0.00	1.00
15. MABOOM	Dummy=1 if the acquisition is in a acquisition-boom year	3174	0.82	0.38	0.00	1.00
16. MANUF	Dummy=1 if the acquirer's sector is manufacturing	3174	0.20	0.40	0.00	1.00
17. RELSIZE	Transaction value/SIZE	1489	0.20	0.49	0.00	8.42
18. AFTERIPODAYS	Mean centered natural logarithm of elapsed number of days between the IPO date and the deal date	3133	-0.36	0.87	-4.13	1.64

<sup>a</sup> Mid-price is the midpoint between the opening price and closing price of the initial public offering on the first trading day.

Table 1. Summary statistics (continued)

Panel B. Correlation matrix																		
Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1. CAR <sub>t-4,t-5</sub>	1.00																	
2. LEADMGR		1.00																
3. VCBACK			1.00															
4. ADVISOR				1.00														
5. VCBACK × LOCKUP					1.00													
6. LOCKUP						1.00												
7. ROA <sub>t-1</sub>							1.00											
8. RECOVERY <sub>adj-1</sub>								1.00										
9. RELATED									1.00									
10. SIZE										1.00								
11. INDMB											1.00							
12. MAEXP												1.00						
13. IPODEMAND													1.00					
14. HOTIPO														1.00				
15. MABOOM															1.00			
16. MANUF																1.00		
17. RELSIZE																	1.00	
18. AFTERIPODAYS																		1.00

Significance levels are reported as \* p &lt; 0.1, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01.

is higher than 7.9. Hence, our LEADMGR is a dummy variable that takes the value of 1 if the reputation ranking of the underwriter is higher than 7.9 at the time the acquisition deal is announced (and takes the value of 0 otherwise).

#### *Acquirer advisor*

We controlled for whether the newly public firms used the underwriters of their IPOs as advisors in their subsequent acquisition deals. Thus the dichotomous variable ADVISOR takes the value of 1 only if the advisor is the same as the underwriter.

#### *VC backing*

We operationalize VC backing by a dummy variable, VCBACK, which takes the value of 1 only if the IPO is backed by a venture capital firm.

#### *VC backing and lockup period*

The lockup period begins with the IPO date and ends on the preannounced expiration date. We constructed a continuous measure by taking the natural logarithm of the number of days between the IPO date and expiration date (LOCKUP). Consistent with the documented standardization in IPO lockup periods (Field and Hanka, 2001; Brav and Gompers, 2003; Cao, Field, and Hanka, 2004), most IPO firms in our sample declared a lockup period of 180 days (51%) or 181 days (22%). Given the skewness of the variable, we chose to use the natural logarithm for scaling; where necessary, we mean centered the variable to eliminate multicollinearity.

We created an interaction variable between VCBACK and LOCKUP to test Hypothesis 4. A significant and positive coefficient on the interaction variable would mean that acquisition returns to VC-backed firms with longer lockup periods are, on average, higher. Statistically significant main effects suggest that each of the variables VCBACK and LOCKUP has an impact on the returns to post-IPO acquisitions.

#### *Acquirer intangible asset base*

In order to test Hypothesis 5, we rerun the empirical models by separating the acquirer sample into two groups: firms with a high versus low level of intangible assets. Tobin's quotient is a

convenient, market-based measure that captures the intangibility of a firm's assets. In this paper, we use one-year pre-event Tobin's  $q$  (Tobin, 1969) as an indicator of the target's intangible assets (Grabowski and Mueller, 1978; Lang, Stulz, and Walkling, 1989; Villalonga, 2004). True Tobin's  $q$  ( $Tq$ ) is the ratio of the market value of all financial claims on the firm to the replacement value of tangible and intangible assets. In practice,  $Tq$  is proxied by dividing the market value of all financial claims against the firm by the book value of total assets (see, e.g., Lang *et al.*, 1989). As a proportion of the value of total assets, however, a firm's market value is better than its book value at capturing the economic value of intangible assets. Therefore, if  $Tq > 1$ , then the firm is more likely to have valuable intangible assets. We expect to find stronger coefficients on our model's explanatory variables for high- $Tq$  than for low- $Tq$  newly public firms.

#### *Timing of the deal*

Although we offer no formal hypothesis concerning the effects of how close an acquisition deal is to the IPO date, it is possible that returns to the deal announcement are affected by this timing. The market's reaction to acquisition announcements that are close to the IPO date may reflect not only the market's expectations about that deal but also any trading associated with the new IPO event. For each firm, we took the natural logarithm of the number of days between its IPO date and each acquisition deal announcement in order to derive the variable AFTERIPODAYS. (Where necessary because of high multicollinearity, we centered this variable at its mean value.) If the coefficient of this variable is significant and negative, it could be interpreted as indicating that deals announced closer to the IPO event achieve higher CARs; this would make it questionable whether we could isolate the deal-specific market reaction at all. However, if the coefficient of AFTERIPODAYS is not significant—suggesting that the return to a deal is *not* affected by how long its announcement precedes an IPO date—then we are more confident that our empirical model can isolate the deal-specific market reaction independently of the IPO event.

Hypothesis 6 focuses on the interaction effect of AFTERIPODAYS with the other explanatory variables. The interaction variables were created

by multiplying AFTERIPODAYS by LEADMGR (dummy = 1 if reputation of lead underwriter is greater than 7.9 on 0–9 scale), VCBACK (dummy = 1 if firm was backed by a VC), and ADVISOR (dummy = 1 if buyer's advisor in the acquisition deal is also the IPO underwriter). Interpreting the coefficients of AFTERIPODAYS  $\times$  LEADMGR, AFTERIPODAYS  $\times$  VCBACK, and AFTERIPODAYS  $\times$  ADVISOR proceeds as follows: if the coefficients of the interaction are significant, then there is a time-dependent component associated with the pre-IPO affiliations of the focal firm. For example: if the coefficient of AFTERIPODAYS  $\times$  VCBACK is negative and significant, then this indicates that the signaling value of VC backing decays over time (i.e., with increasing time elapsed between the IPO and the acquisition deal).

### Controls

We also added control variables in our model related to: 1) the deal characteristics; and 2) the acquirer characteristics.

#### Deal characteristics

We controlled for the *recency of prior acquisition deal*: prior acquisition deals that are temporally too distant or too close may be negatively related to the CARs on the focal acquisition deal. We therefore calculated the elapsed year between the focal deal and the one prior to it, RECENCY<sub>deal-1</sub>.<sup>6</sup> We added a dummy variable RELATED, which takes the value of 1 only if both acquirer and target are in the same four-digit SIC code industry (Seth, 1990).

We controlled for the effect of *overall M&A activity*. Merger and acquisitions activity, although cyclical, escalated in the 1990s (Andrade, Mitchell, and Stafford, 2001; Holmstrom and Kaplan, 2001). This general trend might affect the likelihood of pursuing and/or overpaying for acquisitions. We define MABOOM as a dummy variable that takes the value of 1 only if the deal was announced during 1995–1999. We also captured *industry effects* both at the sector level and at the two-digit SIC code industry level. We define MANUF as a

dummy variable that takes the value of 1 only if the IPO firm is in manufacturing.<sup>7</sup> Our continuous variable INDMB is calculated by dividing the market value of equity by the book value of equity at the two-digit SIC code industry level. Other deal-level control variables were checked but are not reported here owing to insignificant coefficients. These include method of payment, premium paid (see Supplemental analyses and Appendix), status of the target (public versus private), deal-year fixed effects, and deal type (i.e., friendly versus hostile acquisitions).

#### Acquirer characteristics

We controlled for the *Past performance of the acquirer* in order to account for any independent impact of firm quality on the CARs. This was measured as the return on total assets, ROA<sub>t-1</sub>, prior to the acquisition. We added dummy variable IPODEMAND, which takes the value of 1 only if the final offer price is higher than the original mid-filing price (cf. Brau and Fawcett, 2006) to account for the run up in the stock price of a newly public firm, which may reflect the market's confidence in that firm at the time of the IPO.<sup>8</sup> Similarly, we controlled for whether the IPO was issued during a hot period, HOTIPO (Helwege and Liang, 2004; Ritter, 1984). We also controlled for the *acquirer acquisition experience*. As we stressed earlier, most newly public firms are inexperienced in M&As. We defined MAEXP as a continuous variable designed to capture the prior acquisition experience (as a percentage of total deal experience in alliances and acquisitions) of the focal firm, including any deals announced prior to the IPO (Arikan and McGahan, 2010). We controlled for the *acquirer size*, which has been shown to be negatively related to the CARs on the acquisition (Moeller, Schlingemann, and Stulz, 2004). We calculated the size of the acquirer firm, SIZE, as the market value of total assets. We also controlled for the relative size, RELSIZE, of the transaction

<sup>6</sup> Although the relationship exhibits an inverted U-shape (Hayward, 2003), it was not feasible to include the square of RECENCY<sub>deal-1</sub> as a term because in our models only the first three years of the post-IPO period are considered.

<sup>7</sup> We added back the sector dummies excluding the first dummy for agriculture, forestry, and fishing. The resulting model was unusable owing to inflated standard errors caused by multicollinearity. Also, interchangeably including the sector dummies (as opposed to including only the manufacturing sector dummy) did not change the results qualitatively.

<sup>8</sup> As a robustness check, we also used a continuous variable (percentage increase between mid-filing price and final offer price); the main results were not altered by this change.

to the size of the acquirer. The larger the relative size of the transaction, the lower the CARs to the acquirers (Moeller *et al.*, 2004).

### Specification, tests, and models

With the variables described previously, we use the following linear regression specification to test our hypotheses:

$$\begin{aligned} \text{CAR}_{-5,\dots,5} = & \underset{\text{H1}}{\text{LEADMGR}} + \underset{\text{H2a, H2b}}{\text{ADVISOR}} \\ & + \underset{\text{H3}}{\text{VCBACK}} + \underset{\text{H4}}{\text{VCBACK} \times \text{LOCKUP}} \\ & + \text{LOCKUP} + \text{RECENCY}_{\text{deal}-1} \\ & + \text{RELATED} + \text{MABOOM} \\ & + \text{MANUF} + \text{INDMB} \\ & + \text{ROA}_{t-1} + \text{IPODEMAND} \\ & + \text{HOTIPO} + \text{MAEXP} + \text{RELSIZE} \\ & + \text{SIZE} + \text{AFTERIPODAYS} \end{aligned} \quad (1)$$

Hypothesis 5 is tested by separating the dataset into two subsamples based on the acquirer IPO firm's  $Tq$ .<sup>9</sup> We measured  $Tq$  one year prior to the acquisition announcement so as to more fully dissociate firm valuation from the focal deal. Firms with  $Tq \geq 1$  are put in the high-intangibles group, and firms with  $Tq < 1$  are in the low-intangibles group. Then the empirical model represented by Equation 1 is applied to both samples independently. The results of this analysis are shown in Table 2 (Models 2 and 3).

Hypothesis 6 is tested by including the interaction effects of the AFTERIPODAYS with the main explanatory variables of LEADMGR, ADVISOR, and VCBACK (i.e., AFTERIPODAYS  $\times$  LEADMGR, AFTERIPODAYS  $\times$  ADVISOR, and AFTERIPODAYS  $\times$  VCBACK, respectively). The results of this analysis are presented as model 4 in Table 2.

The empirical models presented here have robust standard errors with correction for heteroskedasticity. There was no statistical advantage to utilizing the unbalanced panel structure of the dataset, so

we chose to pool the data set for a cross-sectional approach. However, we also accounted for the non-independence of deals involving the same firm: the deal observations are clustered by the acquirer IPO firm to account for within-cluster (firm) correlation. The results of our analysis are presented in the next section.<sup>10</sup>

## RESULTS

Summary statistics presented in Panel A of Table 1 reveal that: (i) acquirers in the sample experience an average cumulative abnormal return of one percent; (ii) underwriters who are also advisors of the acquirer—although it is likely to observe higher underwriter ranking at the time of the deal—are less likely to be observed; and (iii) newly public firms, as expected, on average over the three-year period in  $t = \{\text{IPO year}-1, \dots, \text{IPO year}+2\}$  have negative but insignificant return on assets (ROA). Correlation matrix generated by using the pooled data presented in Table 1 highlights positive and significant correlation between LEADMGR and VCBACK, which is consistent with the literature that reputable third-party endorsements tend to cluster together.

Table 2 presents the results. Hypothesis 1 states that the reputation of the lead underwriter is positively associated with the expected returns to newly public acquiring firms from post-IPO acquisition announcements. As expected, the prestige of the lead underwriter endorsing the IPO is positively associated with positive abnormal returns of newly public acquirers (Table 2, Models 1a and 1b). On average, abnormal returns to acquisition announcements increase by three percent if the

<sup>10</sup> It has been an acceptable practice in financial econometrics to see a low  $R^2$  (as in our models) when the dependent variable is CARs. For example, in one of our main reference articles (Field and Hanka, 2001), the models specified have CARs as the dependent variable and the  $R^2$  statistic ranges between 0.023 and 0.011. Finance studies stress that  $R^2$  statistics have unique properties in the econometrics of financial markets. Suppose the dependent variable is the real and/or excess stock return, then, even though the explanatory variable,  $x$ , is 'a perfect proxy for the expected stock return at any horizon ... the  $R^2$  will be very small at a short horizon; as the horizon increases, the  $R^2$  first increases and then eventually decreases' (Campbell, Lo, and MacKinlay, 1997: 271). Theoretically, small  $R^2$ s in the estimations of stock returns are consistent with the *efficient markets hypothesis* (Bachelier, 1900; Fama, 1970): changes in the stock price should *not* be forecastable if prices 'fully' reflect all available information.

<sup>9</sup> We also tested this hypothesis by creating an interaction variable between the indicator  $TQ$  (takes the value of 1 only if  $Tq \geq 1$ ) and the explanatory variables. The results were qualitatively the same when we focused on only the main model, but they suffered from high levels of multicollinearity when all the main effects were included. Hence, we chose to split the data.



Table 2. Impact of lead underwriter and venture capital backing on the acquisition returns to newly public firms

Explanatory variables for Models (1)-(6)	Main analysis			Robustness analysis			
	Pooled data <sup>a</sup>		Contingency of signaling mechanisms <sup>a,b</sup>	Durability of the signal value <sup>a</sup>	Sample selection bias for focusing on firms with M&A deals <sup>b,c</sup>		
	(1a)	(1b)			Tq>= 1 (2)	Tq<1 (3)	OLS (4)
LEADMGR <sup>d</sup>	5.58*** 1.36	3.15** 1.52	3.09** 1.56	0.81 3.01	3.07** 1.36		2.2* 1.2
VCBACK	-1.90 1.20	-2.18 1.43	-1.62 1.54	-4.52 3.30	-1.91 1.36		-1.99 1.36
ADVISOR	-2.91** 1.38	-3.22** 1.52	-4.35** 1.69	-0.14 1.37	-3.32** 1.53		-2.92** 1.27
VCBACK × LOCKUP	0.01** 0.01	0.01* 0.01	0.02* 0.01	0.00 0.01	0.01* 0.01		0.013* 0.007
LOCKUP	0.00 0.00	0.00 0.00	0.00 0.00	0.01 0.01	0.00 0.00		0.00 0.00
REGENCY <sub>deal-1</sub>		1.28** 0.61	0.74 0.74	2.46** 1.08	1.26** 0.61		1.35 0.61
RELATED	0.37 0.83	0.51 0.84	-1.29 1.13	0.66 2.24	-0.83 0.98		-0.75 0.99
MABOOM <sup>d</sup>	-3.67*** 1.19	-3.25*** 1.33	-4.08*** 1.37	-0.36 3.45	-3.29** 1.34		-2.94** 1.21
MANUF	0.66 1.05	1.15 1.22	1.21 1.35	-0.92 2.42	1.10 1.22		1.15 1.11
INDMB	0.81 1.43	3.54 3.02	-0.22 0.41	0.56 0.90	0.16 0.40		0.12 0.37
ROA <sub>t-1</sub>		0.72 3.22				0.67** 0.32	
IPODEMAND	-0.59 0.67	1.03 0.64	0.24 0.92	-1.09 1.58	0.48 0.85		0.1 0.8
HOTIPO	0.85 0.96	1.46 0.92	0.99 1.08	0.64 2.13	1.43 0.94		1.05 0.91
MAEXP <sup>d</sup>	-0.47 0.37	-0.41 0.42	1.66 1.78	-4.26 5.83	4.41 2.97	2.97*** 0.15	0.16 1.64
RELSIZE	0.22 0.32	0.13 0.39	0.84 0.61	4.17 3.30	1.06* 0.63		0.96 0.63

Table 2. (Continued)

Explanatory variables for Models (1)–(6)	Main analysis			Robustness analysis		
	Pooled data <sup>a</sup>		Contingency of signaling mechanisms <sup>a,b</sup>	Durability of the signal value <sup>a</sup>		Sample selection bias for focusing on firms with M&A deals <sup>b,c</sup>
	(1a)	(1b)		Tq > 1	Tq < 1	
				(2)	(3)	(4)
SIZE	–0.19	–0.82		–0.66	0.73	–0.37
AFTERIPODAYS	0.92	0.98		0.49	0.93	0.41
AFTERIPODAYS × VCBACK	0.04	–0.28		–0.41	–0.96	0.52
	0.54	0.66		0.77	1.19	1.97
AFTERIPODAYS × LEADMGR						1.34
						2.17
AFTERIPODAYS × ADVISOR						–1.17
						2.05
INDTQ <sub>1-1</sub>						2.46
						2.86
LAST_MA (last deal was an M&A=1)						–0.96***
LAMBDA						0.06
						0.02
CONSTANT	–2.59	–1.88				0.1
	2.30	2.32				
R-squared	0.031	0.042		0.036	0.061	
Chi2	2.67***	2.43***		2.42***	2.24***	
Log-likelihood	–4159	–3026		–2221	–800	
Number of firm clusters	324	274		213	78	
Number of M&A deals	1065	807		593	214	
Mean VIF <sup>e</sup>	1.38	2.9		1.36	2.54	
						–5.25
						3.75
						0.021
						2.346***
						–3025
						274
						807
						2.49
						–271
						1142
						42.64***
						–3030
						271
						1142

<sup>a</sup> Dependent variable is the CAR<sub>5, ..., +5</sub>, estimated over the –60, ..., –20 days around the event date. Significance levels are reported as \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are given below the coefficient estimates. <sup>b</sup> The CONSTANT term is insignificant; excluding it from the estimation did not qualitatively change the results. <sup>c</sup> Based on the Wald test of independence of Equations 4 and 5 ( $\rho = 0$ ;  $\chi^2(1) = 2.05$  with Prob > 0.15), we fail to reject the independence; hence there is no statistically significant source of bias due to sample selection of firms with M&A deals. <sup>d</sup> LEADMGR, MAEXP, and MABOOM are centered at their means in Model 3 to decrease multicollinearity. <sup>e</sup> VIF is the multicollinearity test generated by STATA using the VIF command. If the mean value of VIF and the VIF value for each regressor is above 10, then there is evidence of multicollinearity.

underwriter is highly prestigious (ranking  $>7.9$ ). Thus Hypothesis 1 is strongly supported.

Hypotheses 2a and 2b explore how the returns to the newly public acquiring firm are affected when the lead underwriter of its IPO is retained as acquisition advisor. Results presented in Table 2 (Models 1a and 1b) suggest that, on average, CARs to the buyers decrease by three percent if the advisor was also the underwriter for the IPO. Hence Hypothesis 2b is supported.

Hypothesis 3 states that VC backing increases post-IPO acquisition expected returns. As shown in Table 2, coefficients for VCBACK are nonsignificant across all models, which means that we fail to reject the null that VC backing is *not* a statistically significant explanatory variable in our regressions. Our nonsignificant finding suggests that the negative impact of VCs selling their shares as soon as possible is cancelled out by the positive impact of their presence as an insider in the IPO firm. We thus conclude that Hypothesis 3 is not supported.

Hypothesis 4 states that the relationship between pre-IPO VC backing and expected returns to newly public acquirers from post-IPO acquisitions would be positively related if the VCs commit to a longer lockup period. We therefore tested whether VCs' commitment to a long lockup period was positively associated with abnormal returns of newly public acquirers (Hypothesis 4), using the interaction term between VCBACK and LOCKUP (i.e., the  $VCBACK \times LOCKUP$  term). As presented in the first two columns of Table 2, the interaction term's coefficient is positive and significant. This suggests that if the firm is backed by a VC then a longer lockup period increases the CARs. Interpretation of this coefficient must take into account that the lagged lockup period is mean centered (to accommodate multicollinearity concerns). Holding all else constant, a one percent deviation from the mean of the lockup period for a VC-backed firm increases abnormal returns to the acquisition announcements of these firms by one percent (Table 2, Models 1a and 1b). Therefore, Hypothesis 4 is supported. These findings are consistent with our premise that affiliations with VC firms have productive post-IPO uses if these insiders are committed to the firm over a longer period of time after the IPO.

Hypothesis 5 states that the effects of pre-IPO affiliations on post-IPO expected returns are contingent on the intangibility of the newly public acquirer's resource base. As reported in Table 2, Model 2 uses the subsample of firms with high

intangibles ( $Tq \geq 1$ ) and Model 3 uses the subsample of firms with low intangibles ( $Tq > 1$ ). Comparison of Models 2 and 3, as presented in Table 2, suggests that coefficients for LEAD-MGR and for the interaction variable  $VCBACK \times LOCKUP$  are positive and significant for the subsample of acquirers with high intangibles (Model 2) but are nonsignificant for the subsample of acquirers with low intangibles (Model 3). In addition, if the acquirer's advisor is the same as its lead underwriter, then abnormal returns to the acquirer decrease by four percent if the firm has high intangibles (the results are statistically insignificant for firms with low levels of intangibles). Observe that, as in the pooled sample, VCBACK and LOCKUP do not have significant main effects on the abnormal returns to the newly public acquirers regardless of how intangible their asset bases are.

In other words, holding all else equal: (i) a one percent increase in the lockup period of the high-intangible acquirers with VC backing increases their abnormal returns by two percent; and (ii) a three percent increase in their abnormal returns to the acquisitions is shown for high-intangible acquirers with highly reputable lead underwriters. So Hypothesis 5 is strongly supported because the reputation of the lead underwriter (whether or not it was the IPO underwriter), together with the interaction between VC backing and lockup period, yields a significant effect on the expected returns from acquisitions for firms with highly intangible assets.

We then examine whether the effects of pre-IPO affiliations on expected returns to newly public acquirers persist through each subsequent acquisition announcement (Hypothesis 6). We used interaction variables ( $AFTERIPODAYS \times LEAD-MGR$ ,  $AFTERIPODAYS \times VCBACK$ , and  $AFTERIPODAYS \times ADVISOR$ ) to tease out signal versus resource effects (see Model 6 of Table 2). The main results on the explanatory variables are not changed qualitatively, and the interaction variables that represent the signal value of pre-IPO affiliations are not statistically significant. We interpret these findings as being consistent with the idea that relationships built during the IPO process can, with respect to M&A activity, have valuable productive uses in the post-IPO period (independent of the time elapsed between the IPO and the acquisition) that go beyond the signaling

value of such affiliations.<sup>11</sup> Thus, Hypothesis 6 is supported.

## Controls

Table 2 (Model 1b) shows that, on average: (i) if the acquisition deal is announced when there is a merger boom, then CARs decrease by three percent; and (ii) if the deal is announced with a greater lag from the prior acquisition deal, then CARs increase by one percent. Some of the control variables differ in their explanatory power across Models 2 and 3 in Table 2. Holding all else equal, we can state that, on average: (i) if a one-year increase occurs in the lag between focal and prior acquisition deals, it increases the CARs to buyers with low levels of intangible assets by two percent, but has no statistically significant effect on CARs to buyers with high levels of intangible assets; and (ii) if a deal is announced in a year that features a wave of mergers, then abnormal returns to high-intangible firms decrease by four percent (although abnormal returns are not significantly associated with low-intangible firms).

## Supplemental analyses

We conducted several robustness checks to our findings. There are three main issues that need to be considered theoretically and therefore empirically. First, firms that acquire following their IPO might be systematically different from the rest of the IPO population, hence there could be a *sample selection bias*. Second, our results might

be driven by the unobservable firm characteristics such that because the firm quality itself is a predictor of *both* the likelihood of the acquiring firm getting an endorsement during its IPO process *and* the returns to the acquisitions made by the focal firm in the post-IPO period, there could be an *endogeneity bias*. Third, the underlying quality for the target firm might be driving our main results, hence, there could be an *alternative* explanation. The Appendix details these robustness checks and associated empirical models.

We employed a two-staged estimation approach to check whether the main findings are robust to potential sample selection and endogeneity biases. The analysis associated with the robustness check for sample selection bias is presented in Table 2, Models 5 and 6. Although the inclusion of the probability of doing a post-IPO acquisition deal changes the coefficients slightly, the significance levels are not changed and LAMBDA from the first-stage model is not statistically significant. Based on this analysis, we can firmly conclude that the main findings of this study are robust to the sample selection bias.

Similarly we tested for potential endogeneity bias due to underlying firm quality driving both securing third-party endorsements (being backed by a VC and endorsements from highly reputable underwriters) *and* firm's performance following the IPO. Based on prior related literature, we estimated the probabilities of being backed by a VC and securing a highly reputable underwriter as the first-stage models as presented in Table 3 and Table 4, respectively. Then, the inverse Mills ratios calculated using the estimated probabilities, LAMBDA, are entered into the ordinary least squares (OLS) regressions where the dependent variable is one of the commonly used proxy for firm performance, ROA. If the coefficients of the LAMBDA were significant in the second-stage OLS equations, then we would have concluded that there is a potential endogeneity bias. Based on the results of the second-stage models presented in Tables 3 and 4, we conclude that the probabilities of being backed by a VC and securing a highly reputable underwriter are not statistically significant predictors of post-IPO firm performance. Hence, we have no evidence of an endogeneity bias due to the underlying firm quality.

Accounting for the alternative explanation of a target firm's underlying quality involved using

<sup>11</sup> The fraction of equity retained by insiders can serve as a signal of quality (Leland and Pyle, 1977; Courteau, 1995). Yet current evidence on the relationship between capital sold to the public and IPO performance is mixed, reporting negative and positive as well as U-shaped relationships. Divesting a significant portion of the insiders' stake might be perceived as a lack of confidence in the firm. However, retaining a large controlling stake in the firm might be seen as a (negative) signal of insiders' entrenchment. Hence, the market's valuation of post-IPO acquisitions could be affected by the intensity and type of insider transactions in the first year of the IPO (we also looked at the period within 100 days of IPO). The results on the main explanatory variables were the same with the addition of INSTRADE (net purchases of insiders as a percentage of total trading) and INSPURCHASE (dummy = 1 if insiders purchase net of sale), although the coefficient of INSTRADE is significant and positive. In essence, a one-unit increase in the net purchases of insiders within the year following the IPO will increase the return to an acquisition deal by 15 percent (results available upon request from the authors). Insiders' stock market transactions can be obtained from Thomson Financial Ownership Data (TFN), which is maintained by WRDS.

Table 3. Robustness check for endogeneity bias in underlying focal firm quality and venture capital firm backing<sup>b,c</sup>

Explanatory variables for Model (7)	Probit for firm choice (VC backed=1) (7)	OLS with dependent variable of return on assets <sup>a</sup> (8)	Explanatory variables for Model (8)
LEADMGR <sub>t=IPO year</sub>	0.19 0.17	0.07 0.06	LEADMGR <sub>t=IPO year</sub>
LOCKUP	−0.001* 0.00	−0.00** 0.00	LOCKUP
IPODEMAND	−0.13 0.19	0.03 0.08	INDEPS <sub>t−1</sub>
STATECA (Yes=1)	0.79** 0.31	0.04* 0.02	LN_SALES <sub>t−1</sub>
STATETX (Yes=1)	−0.23 0.38	0.07 0.15	MAEXP
STATENY (Yes=1)	0.00 0.29	0.35* 0.20	MABOOM
INSIDEROWNERSHIP <sub>pre-IPO</sub>	−0.01** 0.00	0.19** −0.08	MANUF
PRICE/BOOK <sub>pre-IPO</sub>	0.00 0.00	0.03 −0.04	SIZE
EQUITY/TOTAL ASSETS <sub>pre-IPO</sub>	0.00 0.00	0.00 −0.02	INDMB
HOTIPO	−0.02 0.29	0.05* 0.03	EPS <sub>t−1</sub>
ACQUISITION <sub>pre-IPO</sub> (Yes=1)	−0.76*** 0.21	0.15 0.18	LAMBDA
HITECH (Yes=1)	0.53* 0.31		
TOTAL ASSETS <sub>pre-IPO</sub>	−0.09 0.08		
CONSTANT	−0.10 0.86	−0.67*** 0.25	
R-squared	0.22		
Chi2	342.66***	52.71***	
Log-likelihood	−622.00	−605.93	
Number of firm clusters	211	211	
Number of M&A deals	1208	1208	

<sup>a</sup> Dependent variable is the CAR<sub>−5, ..., +5</sub>, estimated over the −60, . . . , −20 days around the event date. Significance levels are reported as \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are given below the coefficient estimates.

<sup>b</sup> Based on the Wald test of independence of Equations 7 and 8 ( $\rho = 0$ ;  $\chi^2(1) = 0.75$  with Prob > 0.39), we fail to reject the independence; hence there is no statistically significant source of endogeneity bias—due to firm performance or being backed by a VC firm—that is driven by unobservable firm characteristics.

<sup>c</sup> The CONSTANT term is insignificant; excluding it from the estimation did not qualitatively change the results.

both the premium paid to the target, PREMIUM, as the proxy for the target firm's quality and estimating a model to predict the PREMIUM and then obtaining the residuals of this estimate as a proxy for the *unobserved quality of the target firm*, PREMIUM\_RESID. A detailed discussion and the results of this analysis are presented in Table 5 in the Appendix. The inclusion of the unobserved target firm's quality, PREMIUM\_RESID, does not change the results of the main model, and the coefficient of the PREMIUM\_RESID is statistically insignificant.

## DISCUSSION AND CONCLUSION

In this paper we examine under which conditions pre-IPO affiliations with equity underwriters and VCs continue to have value for the post-IPO corporate event of an acquisition. Drawing on a sample of 4,029 acquisitions made by 717 newly public firms, we find that, on average, the announcement of an acquisition by a newly public acquirer elicits a positive response from investors. We find that the market views more favorably acquisitions announced by newly public acquirers

Table 4. Robustness check for endogeneity bias in underlying focal firm quality and underwriter reputation<sup>b,c</sup>

Explanatory variables for Model (9)	Probit for firm choice (LEADMGR <sub>t=IPOyear</sub> ) <sup>d</sup>	OLS with dependent variable of return on asset <sup>a</sup>	Explanatory variables for Model (10)
	(9)	(10)	
VCBACK	0.40*	−0.03	VCBACK
	0.21	0.03	
LOCKUP	0.00	0.00	LOCKUP
	0.00	0.00	
HOTIPO	−0.31	−0.03	INDEPS <sub>t−1</sub>
	0.25	0.06	
STATECA (Yes=1)	0.54	0.04***	LN SALES <sub>t−1</sub>
	0.40	0.01	
STATETX (Yes=1)	0.89***	0.13**	MAEXP
	0.29	0.06	
STATENY (Yes=1)	0.18	0.19	MABOOM
	0.37	0.15	
INSIDEROWNERSHIP <sub>pre-IPO</sub>	0.00	0.06	MANUF
	0.00	0.05	
ACQUISITION <sub>pre-IPO</sub> (Yes=1)	−1.15***	−0.01	SIZE
	0.28	0.02	
HITECH (Yes=1)	0.59**	−0.02	INDMB
	0.21	0.02	
TOTAL ASSETS <sub>pre-IPO</sub>	0.37***	0.05*	EPS <sub>t−1</sub>
	0.07	0.03	
		0.08	LAMBDA
		0.07	
CONSTANT	0.44	−0.36***	
	0.48	0.14	
R-squared	0.38		
Chi2	406.04***	43.88***	
Log-likelihood	−325.25	−183.67	
Number of firm clusters	218	218	
Number of M&A deals	1027	1027	

<sup>a</sup> Dependent variable is the CAR<sub>−5, ..., +5</sub>, estimated over the −60, . . . , −20 days around the event date. Significance levels are reported as \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are given below the coefficient estimates. <sup>b</sup> Based on the Wald test of independence of Equations 9 and 10 ( $\rho = 0$ ;  $\chi^2(1) = 2.47$  with Prob > 0.12), we fail to reject the independence; hence there is no statistically significant source of endogeneity bias—due to firm performance or retaining a reputable underwriter—that is driven by unobservable firm characteristics. <sup>c</sup> The CONSTANT term is insignificant for the selection Model (9) while significant in Model (10); excluding it from the estimation of both models did not qualitatively change the results. <sup>d</sup> LEADMGR<sub>t=IPO year</sub> is a dichotomous variable that is equal to 1 if the lead underwriter reputation is greater than 7.9 (9 being the highest rank) which is the baseline cut-off for highly reputable underwriter firms (Carter *et al.* [1998] classify an underwriter as being ‘highly reputable’ if its ranking is higher than 7.9).

associated with prestigious equity underwriters, but the market reaction becomes negative when the lead underwriter is retained as acquisition advisor. We also find that the market reacts more favorably to acquisitions announced by VC-backed newly public acquirers *only* when those VCs are committed to a longer lockup period. The effects of pre-IPO affiliations on expected returns are stronger for newly public acquirers with a highly intangible resource base (i.e., with low book-to-market value) and persist throughout the three-year post-IPO period (across each subsequent acquisition announcement).

This study contributes to the corporate strategy literature by showing that a change in the capital structure—namely, an IPO—may be more than just a liquidity event: it is likely to imprint post-IPO corporate life and to affect the firm’s corporate capabilities and ultimately its post-IPO value. The IPO process involves forming new relationships with IPO partners, which have consequences far beyond their effects at the time of the IPO. Pre-IPO affiliations not only retain some residual signal value during the post-IPO period but they also likely provide substantive resources to the IPOed firm. In the case of acquisitions, a newly

Table 5. Robustness check for target quality

Dependent variable Model	Pooled data <sup>a</sup>			Target quality	
	CAR OLS	CAR OLS	CAR OLS	PREMIUM OLS	
Explanatory variables for Models (1a), (1b), and (2)	(1a)	(1b)	(2)	Explanatory variables for Model (3)	(3)
LEADMGR	5.58***	3.15**	3.15**	VCBACK <sup>c</sup>	−6.91***
	1.36	1.52	1.52		2.32
VCBACK	−1.90	−2.18	−2.18	STOCK <sup>c</sup>	−2.65*
	1.20	1.43	1.48		1.54
ADVISOR	−2.91**	−3.22**	−3.22**	PRIVATE <sup>c</sup>	−14.47***
	1.38	1.52	1.53		3.57
VCBACK × LOCKUP	0.01**	0.01*	0.01*	VCBACK × PRIVATE	15.75***
	0.01	0.01	0.01		5.31
LOCKUP	0.00	0.00	0.00	STATE_CA <sup>c</sup>	2.54
	0.00	0.00	0.00		3.16
ROA_t-1		0.72	0.72	LOCKUPDAYS	0.02***
		3.22	3.26		0.00
RECENCY <sub>deal-1</sub>		1.28**	1.28**		
		0.61	0.61		
RELATED	0.37	0.51	−0.82		
	0.83	0.84	0.99		
SIZE	−0.19	−0.82	−0.41		
	0.92	0.98	0.44		
INDMB	0.81	3.54	0.13		
	1.43	3.02	0.39		
MAEXP	−0.47	−0.41	3.54		
	0.37	0.42	3.02		
IPODEMAND	−0.59	1.03	0.51		
	0.67	0.64	0.86		
HOTIPO	0.85	1.46	1.46		
	0.96	0.92	0.92		
MABOOM	−3.67***	−3.25***	−3.25**		
	1.19	1.33	1.34		
MANUF	0.66	1.15	1.15		
	1.05	1.22	1.22		
RELSIZE	0.22	0.13	1.03		
	0.32	0.39	0.65		
AFTERIPODAYS	0.04	−0.28	−0.28		
	0.54	0.66	0.67		
PREMIUM_RESID (standardized errors from model (3))			−0.003		
			0.37		
CONSTANT	−2.59	−1.88	−4.46		
	2.30	2.32	4.14		
R-squared	0.03	0.04	0.02		0.089
Chi2	2.67***	2.43***	2.3***		3.93***
Log-likelihood	−4159.07	−3025.94	−3025.94		−1940.756
Number of firm clusters	324.00	274.00	274.00		230
Number of M&A deals	1065.00	807.00	807.00		402
Mean VIF <sup>b</sup>	1.38	2.90	1.37		2.1

<sup>a</sup> Dependent variable is the CAR<sub>+5,...,−5</sub>, estimated over the −60, ..., −20 days around the event date. Significance levels are reported as \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Standard errors are presented below the coefficient estimates. <sup>b</sup> VIF is the multicollinearity test generated by STATA using the VIF command. If the mean value of VIF as well as the VIF value for each regressor is above 10 then there is evidence of multicollinearity. <sup>c</sup> Variables are centered at their means in Model 3 to decrease multicollinearity.

public acquiring firm may benefit from redeploying the knowledge resources it gained during the IPO process or from importing new knowledge by reactivating the relationship with its pre-IPO partners for subsequent M&A deals. We also find interesting dual effects of those pre-IPO affiliations, which may become harmful when conflict of interests arise between the IPOed firm and its pre-IPO partners. Typically, when the lead underwriter continues to advise on post-IPO acquisition deals, there is a risk of the investment bank using its influence over insiders and the board to promote deals at any cost. Also, VCs may misadvise on acquisition strategy because they are keen to cash out as soon as possible. Investors seem to be sensitive to cases where the risk of incentive misalignment exists, such as those where the lead underwriter was retained as acquirer advisor or VCs did not commit to a long lockup period.

Our study also contributes to the M&A literature, which has mainly focused on the performance drivers of acquisitions made by established public firms (Seth, 1990; Anand and Singh, 1997; Sirower, 1997; Capron, 1999; Capron and Pistre, 2002). In contrast, our study is one of the first to address investors' perceptions of success factors for newly public acquirers beyond the well-known factors that we control for (relatedness, acquisition experience, size, etc.). Newly public acquirers can influence the market's reaction to their acquisition announcement by their relationships with pre-IPO partners and by the way they leverage those affiliations. The benefits (and limitations) of leveraging pre-IPO affiliations across different corporate events also suggest that pre-IPO affiliations, as relational resources developed at the corporate level in the IPO context, may have intertemporal economies of scope when redeployed as firms pursue acquisitions in the post-IPO period (Helfat and Eisenhardt, 2004; Karim and Mitchell, 2004; Capron, 1999; Helfat *et al.*, 2007; Teece, 2007). These findings are consistent with the relational view on competitive advantage (Dyer and Singh, 1998), which emphasizes the importance of idiosyncratic interfirm linkages in determining firm performance (Hitt *et al.*, 2006). Most of the literature demonstrates the value of relational resources for applications in the context from which they were developed.

Finally, our study may contribute to the literature on social networking by showing that affiliations may have enduring performance effects.

Those effects become negative when there is a risk of incentive misalignment between pre-IPO affiliated partners and the newly public firm. We also ran an empirical test that is a first attempt to disentangle the two drivers of the post-IPO value of pre-IPO affiliations: residual signaling value versus resource-related benefits. Our results suggest that we need to go beyond the 'social signal' explanation and take into account the benefits of redeployed resources.

There are several limitations to this study. We do not have data on the underlying mechanisms of learning and of 'reactivating' pre-IPO affiliations in the post-IPO period. We see this line of inquiry as a fruitful venue for future research. The data on the quality of VC firms was sparse at best, and the exploration of how VCs affect the post-IPO period would be a good way to explore the multifaceted nature of affiliations as a source of productive relational resources. Similarly, the underlying mechanisms by which affiliations can be a source of disadvantage have not been detailed.

Although our study is one of the few that empirically isolates the signaling effect from the actual value of the input, there is much more to be done. In particular, relational resources have signaling value and productive uses that might be complementary or substitutive in effectiveness, depending on the context in which the relational resource is activated. All of these limitations can guide future research opportunities in exploring the value of pre-IPO affiliations in the post-IPO period.

Our study has managerial implications. It suggests that investors infer the quality of a newly public acquirer from secondary indicators (such as pre-IPO affiliations) not only during the IPO process but also in the post-IPO period. Relationships formed during the IPO can imprint conditions for post-IPO life and thus have a lasting effect on firm value. These relationships do have a double-edged aspect: although they can be viewed positively by investors, they can also be viewed with suspicion when there is scope for conflicts of interest between the newly public acquirer and its pre-IPO partners—notably with bankers who have underwritten the firm's IPO issue.

This study yields at least three implications for private firms going public. First, IPO success is facilitated by attentiveness to different forms of certification (ties and endorsements from prestigious third parties) and to governance attributes (length of lockup period) and such attentiveness



enhances post-IPO firm value. Second, newly public firms (notably those who must compensate for weak relationships and lower-quality endorsements during the pre-IPO period) must strive to reduce information asymmetry with investors: they must convey detailed and honest information about their corporate governance processes, acquisition-related capabilities, relationships with third parties, and overall company prospects. Third, firms must recognize that conflicts of interest may arise if past relationships are reactivated and, thus, they must clearly articulate the soundness of such partnership renewal undertaken to pursue new assignments.

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## APPENDIX: SUPPLEMENTAL ANALYSES

*Which firms pursue M&A?—sample selection bias*

We can account for sample selection bias by using a two-stage approach to the estimation model (as in Shaver, 1998). In the first stage, the probability of acquiring is estimated; this is followed by the second-stage estimation of the CARs. Newly public firms that choose to pursue acquisitions might differ systematically from newly public firms that do not pursue them. If these systematic differences also affect the returns to acquisitions and if we fail to include proxies for these differences, then the OLS regression will have an 'omitted variable' problem due to sample selection bias (Heckman, 1979). We used the standard Heckman estimation as described for the previous group of robustness checks.

Based on the extant M&A literature, we expect that prior M&A experience will increase the likelihood of pursuing additional M&A deals (see e.g., Arikian and McGahan, 2010; Haleblan and Rajagopalan, 2006). We also expect that, as the size of the firm increases, the probability of engaging in M&A activity also increases. The firm's profitability is likewise expected to increase the probability of engaging in an acquisition. We measured the acquirer's profitability as the ROA one year prior to announcement of the deal. Finally, we controlled for the industry's condition by taking into account the impact of product life cycle on industry structure (see Anderson and Zeithaml, 1984). On the one hand, industries in the growth stage offer incumbents the potential for scale economies and thus are conducive to M&As. On the other hand, because newly IPOed firms tend to be smaller than the industry average, they are likelier targets than acquirers. The proxy we used for the newly IPOed firm's industry growth opportunities is Tobin's  $q$  (INDTQ, measured as the industry's total market value over its book value of assets) one year prior to announcement of the deal.

The two-stage estimation model is as follows. For the first stage:

$$\begin{aligned} \text{ACQ} = & \text{MAEXP} + \text{SIZE} \\ & (+) \quad (+) \\ & + \text{INDTQ}_{t-1} + \text{LASTDEAL} \\ & (-) \quad (+) \end{aligned}$$

This yields the estimate for LAMBDA. For the second stage:

$$\begin{aligned} \text{CAR}_{-5, \dots, +5} = & \text{LEADMGR} + \text{ADVISOR} \\ & \text{H1} \quad \text{H2a, H2b} \\ & + \text{VCBACK} + \text{VCBACK} \times \text{LOCKUP} \\ & \text{H3} \quad \text{H4} \\ & + \text{LOCKUP} + \text{ROA}_{t-1} + \text{YEARDIF}_{\text{deal}-1} \\ & + \text{IPODEMAND} + \text{HOTIPO} + \text{RELATED} \\ & + \text{MABOOM} + \text{MANUF} + \text{INDMB} \\ & + \text{SIZE} + \text{RELSIZE} + \text{MAEXP} \\ & + \text{AFTERIPODAYS} + \text{LAMBDA} \end{aligned}$$

The results are presented in Table 2. The first stage is represented in the column for Model 5. As expected, the higher the percentage of past M&A deals (compared to alliances and to having no deals), the more likely it is that the firm will pursue an M&A deal. On average, a one percent increase in M&A experience increases the odds of pursuing an acquisition deal by a factor of 19.5 ( $e^{2.97}$ ), *ceteris paribus*. The  $\text{INDTQ}_{t-1}$  term had a negative and significant impact on the probability of making an acquisition. A one percent increase in Tobin's  $q$  for the industry *decreases* the firm's likelihood of making an acquisition in that industry by a factor of 0.38 ( $e^{-0.96}$ ). The firm's profitability, however, increases the firm's likelihood of pursuing an acquisition deal. The coefficient of ROA is positive and significant, and it suggests that a one percent increase in the prior year's profitability increases the odds of pursuing an acquisition deal by a factor of 2 ( $e^{0.67}$ ).

These results are presented in Model 6 of Table 2. Although the magnitudes of the coefficients are slightly changed for LEADMGR,  $\text{VCBACK} \times \text{LOCKUP}$ , and ADVISOR, the results are qualitatively the same as in the initial model. Moreover, based on the Wald test of independence of Equations 1 and 2 (Models 4 and 5, respectively), where the null hypothesis is  $\rho = 0$ , we fail to reject independence. Thus we determine that there is no statistically significant source of bias due to sample selection of firms with M&A deals ( $\chi^2(1) = 2.05$  with Prob > 0.15). This analysis shows that the results of the initial model, presented in Table 2, are robust to sample selection bias.

*What about underlying firm's quality?—Endogeneity bias*

We conducted supplemental analyses to see whether the focal IPOed firm's underlying quality was not driving both the existence of highly reputable affiliations in the pre-IPO period and higher CARs to the announcements of acquisition deals in the post-IPO period. Because our sample includes only IPO firms, the empirical model in effect controls for the underlying firm quality and VC quality at the time of the IPO. Other research has shown that firms backed by reputable VCs are more likely to make an IPO than to be acquired (Hsu, 2006; Sørensen, 2007). Moreover, private firms with VC-backed funding are more likely to pursue cooperative agreements (Hsu, 2006). We can therefore argue that our sample population of privately held firms that undertook an IPO is, on average, of higher quality than the universe of privately held firms. Yet it is precisely those firms that have IPOed that are more likely to have reputable affiliations, such as with VCs and an investment bank as underwriter. Both affiliation types accrue to the firm as a function of its quality—specifically for making an IPO but not necessarily for enabling post-IPO growth—through operational effectiveness and corporate strategies.

VC backing (VCBACK) is essentially a firm effect (and thus a constant) in the estimations, which creates the potential for endogeneity bias. We addressed this concern in two ways. First we created a measure of quality, at the time of the deal, for the VC (i.e., via VC's investment as a proportion of the VC industry's total investment value) that backed the IPO firm and then reestimated the models with a much smaller subsample (due to the limited availability of VC-specific data). The results of the reestimation, which substituted VC investment rate for VCBACK in Models 1a and 1b, did not significantly alter the main results.<sup>12</sup>

Second, we used a standard Heckman selection model with full maximum likelihood estimation (Heckman, 1976; Wooldridge, 2002). Heckman proposes a two-stage approach: in the first stage, the probability of selection is estimated (Mills ratio, selection hazard); in the second stage, non-selection hazard is entered into the regression as a proxy for self-selection (LAMBDA or inverse

Mills ratio).<sup>13</sup> We employed a standard Heckman selection model that estimates the likelihood of having a VC as the endogenous first-stage model and then, in the second stage, estimates the ROA to the focal firm with the inverse Mills ratio from the first stage (as well as some other control variables that are correlated with ROA). The results are presented in Table 3.

We estimated the probability of being backed by a VC using variables that have been identified in the literature: length of the lockup period (Field and Hanka, 2001); where headquarters are located (Hsu, 2006); and whether the firm has pursued cooperative agreements (Hsu, 2004)—which is negatively correlated with the acquisition experience variable MAEXP because it is measured relative to the total deal experience of alliances and acquisitions. We also added variables that are linked to the quality of the firm: the lead underwriter's reputation at the time of the IPO; whether there is high demand for the IPO; the percentage of insider ownership prior to the IPO; the price-to-book value of equity share; the equity ratio; whether the IPO coincides with a hot period (Helwege and Liang, 2004); whether the firm is in a high-technology industry; and size of the firm (in total assets) before the IPO (Moonchul and Ritter, 1999).

The equations for the first and the second stages are as follows. For the first stage:

$$\begin{aligned} \text{VCBACK} = & \text{LEADMGR}_{t=\text{IPOyear}} + \text{LOCKUP} \\ & + \text{IODEMAND} + \text{STATECA} + \text{STATETX} \\ & + \text{STATENY} + \text{INSIDEROWNERSHIP}_{\text{pre-IPO}} \\ & + \text{PRICE/BOOK}_{\text{pre-IPO}} \\ & + \text{EQUITY/ASSETS}_{\text{pre-IPO}} \\ & + \text{HOTIPO} + \text{ACQUISITION}_{\text{pre-IPO}} \\ & + \text{HITECH} + \text{TOTALASSETS}_{\text{pre-IPO}} \end{aligned}$$

This yields the estimate for LAMBDA (inverse Mills ratio, or nonselection hazard). For the second stage:

$$\text{ROA}_t = \text{LEADMGR}_{t=\text{IPOyear}} + \text{LOCKUP}$$

<sup>13</sup> The most important part of the analysis is estimating the first-stage model with appropriate and theoretically meaningful explanatory variables, at least one of which is *not* included in the second-stage regression.

<sup>12</sup> Analysis available upon request.

$$\begin{aligned}
& + \text{INDEPS}_{t-1} + \ln(\text{SALES}_{t-1}) + \text{MAEXP} \\
& + \text{MABOOM} + \text{MANUF} + \text{SIZE} + \text{INDMB} \\
& + \text{EPS}_{t-1} + \text{LAMBDA}
\end{aligned}$$

According to the results presented in Table 3 (Model 7), the likelihood of being backed by a VC is a function of four factors: shorter lockup period, whether the firm is headquartered in California, decreased insider ownership prior to the IPO, and limited acquisition experience in the pre-IPO period. The likelihood of being backed by a VC (LAMBDA) and lead underwriter reputation ( $\text{LEADMGR}_{t=\text{IPOyear}}$ ) at the time of the IPO are not statistically significant in the estimation of ROA. Based on the findings presented in Model 8 of Table 3, the performance of the buyer prior to a deal is a function of: shorter lockup period, sales, whether the pre-deal year was in a boom period, whether the firm is in the manufacturing sector, and earnings per share.

Based on the Wald test of independence of Equations 7 and 8 in Table 3 ( $\rho = 0$ ;  $\chi^2(1) = 0.75$  with Prob  $> 0.39$ ), we fail to reject independence. Thus we determine that there is no statistically significant source of endogeneity bias as would be caused by the underlying firm quality driving both CARs to acquisition deals and being backed by a VC firm.

Our measure of lead underwriter reputation rankings, LEADMGR, is assigned at the time of the acquisition deal and not at the time of the actual IPO. Although this might reduce the likelihood of endogeneity bias with respect to reputable underwriter affiliations and firm quality, it is important to note that underwriter reputation is fairly stable over time and that—because we have focused on the first three years following the IPO date—underwriter reputation at the time of the deal might be highly correlated with underwriter reputation at the time of the IPO.<sup>14</sup> Hence, we performed an analysis similar to the one just described in order to test whether the underlying firm quality is the driver of both CARs to acquisition deals and securing a highly reputable underwriter for the firm's IPO. In Table 4, Models 9 and 10, we present the results of this supplemental analysis.

As already mentioned, we employed a standard Heckman selection model that estimates the likelihood of having a highly reputable underwriter

( $\text{LEADMGR}_{t=\text{IPOyear}}$ ) as the endogenous first-stage model and then, in the second stage, estimates the ROA to the focal firm with the inverse Mills ratio from the first stage (as well as some other control variables that are correlated with ROA). The results are presented in Table 4.

As is the case for the VC backing, affiliations with reputable underwriters are also expected to be driven by firm-level variables that signal quality and certification. Therefore, for the first-stage estimation, we utilized the same variables but added whether the firm has VC backing (as a proxy for third-party certification) and excluded those variables that are endogenously determined by the presence of an underwriter (e.g., the price-to-book value of equity share, the equity ratio, and whether the IPO can be classified as being in high demand based on its stock price on the first day of trading following its IPO). The first-stage model specification is as follows:

$$\begin{aligned}
\text{LEADMGR}_{t=\text{IPOyear}} = & \text{VCBACK} + \text{LOCKUP} \\
& + \text{HOTIPO} + \text{STATECA} + \text{TATETX} \\
& + \text{STATENY} + \text{INSIDEROWNERSHIP}_{\text{pre-IPO}} \\
& + \text{ACQUISITION}_{\text{pre-IPO}} + \text{HITECH} \\
& + \text{TOTALASSET}_{\text{pre-IPO}}
\end{aligned}$$

The first-stage equation yields the estimate for LAMBDA (inverse Mills ratio, or nonselection hazard). For the second stage:

$$\begin{aligned}
\text{ROA}_t = & \text{VCBACK} + \text{LOCKUP} + \text{INDEPS}_{t-1} \\
& + \ln(\text{SALES}_{t-1}) + \text{MAEXP} + \text{MABOOM} \\
& + \text{MANUF} + \text{SIZE} + \text{INDMB} + \text{EPS}_{t-1} \\
& + \text{LAMBDA}
\end{aligned}$$

Results presented in Table 4 suggest that the odds of enlisting a highly reputable underwriter is increased if the firm is VC-backed, is located in specific regions (such as Texas), and operates in a high-technology industry as its primary SIC code identification. A one percent increase in the focal firm's total assets prior to its IPO increases the odds of securing a highly reputable underwriter, whereas doing more acquisitions (than alliances) decreases those odds. Furthermore the coefficient of the LAMBDA in the second-stage estimation (Table 4, Model 10) is not statistically significant,

<sup>14</sup> We thank a reviewer for pointing this out to us.

suggesting that firm performance is not driven by the odds of securing a reputable underwriter.

We again utilized the Wald test to determine whether these two equations are independent. The results of this test are presented in Table 4. Based on the Wald test of independence of Equations 9 and 10 ( $\rho = 0$ ;  $\chi^2(1) = 2.47$  with Prob  $> 0.12$ ), we fail to reject independence; hence there is no statistically significant source of endogeneity bias—due to firm performance or retaining a reputable underwriter—that is driven by unobservable firm characteristics.

#### *What about target firm's quality?—Alternative explanation*

We used the premium paid by the focal firm, PREMIUM as a proxy for the target firm's quality and controlled for the alternative explanation that target quality is driving our results independently of the other hypothesized explanatory variables via two methods. First, we included the premium paid to the target in the main model, but the sample size shrank dramatically to 216 deals with 123 firm clusters with the addition of premium. Furthermore, the overall model became insignificant for this subsample with PREMIUM while the coefficients of the explanatory variables and the coefficient of PREMIUM itself were statistically insignificant. We carried out a Hausman test to see any of the variables are impacted more between the main model and the new model, which also includes PREMIUM. The analysis shows that there is no statistically significant difference between the coefficients for the same explanatory variables across models except for the difference in the coefficients for lead underwriter reputation, LEAD-MGR, across these two specifications (with and without PREMIUM), which is significant at the nine percent level. Hence the coefficients of the explanatory variables are not qualitatively affected except for the reputable lead underwriter, LEAD-MGR; including PREMIUM rendered the coefficient of LEADMGR positive but insignificant.

We rethought the 'target quality' and how it might confound the results in our main model (other than the main effect of PREMIUM, which is less likely to be informative in our context because it is a noisy proxy for target firm quality). Perhaps the target firm's quality is determined by unobservable characteristics of the target firm, which in turn systematically impact the returns to the acquirer.

Therefore, we focused on determining a proxy for the *unobserved heterogeneity in the quality of target firms* while taking into account the predictable variation using the covariates that were identified in the literature. Gompers and Xuan (2009) find that even though acquirers pay lower premiums for targets when both companies are affiliated with the same VC, the quality of the target is more likely to be higher. Their explanation of this empirical regularity is based on the fact that the premium paid for the target reflects the economic value of (i) decreasing information asymmetry regarding the acquirers' stock—the most often used method of payment—for the target, and (ii) certifying the target's quality for the acquirer. Their explanation of this empirical regularity is based on the value of decreasing information asymmetry for targets about the acquirers' stock, which happens to be the most used method of payment for these acquirers while certifying the quality of the target.

First, we estimated the premium paid for the target by using the following variables which (according to Gompers and Xuan, 2009) are theoretically and empirically related: VC backing (VCBACK), stock payment (STOCK: purely stock=1 and otherwise 0), privately held target (PRIVATE: yes=1 and otherwise 0), interaction between VC backing and privately held target (VCBACK  $\times$  PRIVATE), location of the buyer (STATE, CA: California=1 and otherwise 0), and number of days in the lockup period (LOCKUPDAYS). The results of this analysis are presented in Table 5.

As expected, the premiums are lower if (i) the buyer is backed by a VC firm, (ii) the target firm is privately held, and (iii) the method of payment is purely stock; premiums are higher for deals where the VC-backed buyer acquires a privately held target.

$$\begin{aligned} \text{PREMIUM} = & \underset{(-)}{\text{VCBACK}} + \underset{(-)}{\text{STOCK}} \\ & + \underset{(-)}{\text{PRIVATE}} + \underset{(+)}{\text{VCBACK} \times \text{PRIVATE}} \\ & + \text{STATECA} + \text{LOCKUPDAYS} \end{aligned} \quad (1)$$

Second, we calculated the predicted PREMIUM using Model 3 in Table 5 and obtained the standardized residuals, PREMIUM\_RESID, using Equation 2:

$$\text{PREMIUM\_RESID} = \text{PREMIUM} - \widehat{\text{PREMIUM}} \quad (2)$$



Third, we reestimated our main model (Model 1b) with the addition of the PREMIUM\_RESID. The results of this analysis are presented in Model 2 of Table 5. Including the proxy for the unobserved heterogeneity in the target quality (PREMIUM\_RESID, with statistically insignificant

coefficient) had no impact on the explanatory variables. The results of the main model, which are included in Table 5 as Model 1b, are not impacted by the inclusion of the unobserved heterogeneity of the premium paid, which is a proxy for the unobserved heterogeneity of the target firm's quality.