A SIGNALING THEORY OF ACQUISITION PREMIUMS: EVIDENCE FROM IPO TARGETS

JEFFREY J. REUER
Purdue University

TONY W. TONG
University of Colorado

CHENG-WEI WU
Purdue University

This article extends signaling theory to research on acquisition premiums and investigates the value that newly public targets capture in post-IPO acquisitions. We complement previous research on acquisition premiums by suggesting that signals about targets can enhance sellers' gains by reducing acquirers' offer price discounting that is due to information asymmetries. Specifically, we argue that target firms can engage in interorganizational relationships (e.g., associations with prominent investment banks, venture capitalists, and alliance partners) that function as signals and enhance sellers' gains. Empirical evidence shows that the benefits of such signals apply to domestic and cross-border deals alike and that these benefits are even greater for IPO targets selling their companies to acquirers based in different industries.

Firms often sell their companies after completing initial public offerings (IPOs) (e.g., Field & Karpoff, 2002; Pagano, Panetta, & Zingales, 1998; Ragozzino & Reuer, 2007). Despite the large gains that acquisitions generally provide targets, IPO targets also face obstacles in realizing these gains. Often IPO firms' core resources (e.g., key technologies and "human capital") and prospects can be difficult for buyers to understand and value (Heeley, Matusik, & Jain, 2007; Sanders & Boivie, 2004), and the IPO firms' short track records or lack of credibility in other markets can compound such challenges (e.g., Stuart, Hoang, & Hybels, 1999). Acquisitions of IPO firms are therefore subject to "information asymmetries" during the processes that an acquisition deal entails, such as due diligence, negotiations, and postacquisition management planning. One consequence of these difficulties is that targets will capture less value in acquisitions if buyers discount their offer prices accordingly (e.g., Akerlof, 1970).

IPOs therefore represent a fruitful context in which to advance understanding of mergers and acquisitions (M&A) (Certo, Holcomb, & Holmes, 2009). In particular, it is interesting to examine the value that IPO targets can capture when selling their companies as well as to identify some of the

determinants of these gains. In this article, we seek to join the literatures on IPOs (e.g., Certo, 2003; Gulati & Higgins, 2003; Higgins & Gulati, 2003) and acquisition premiums (e.g., Laamanen, 2007) with signaling theory to isolate some of the sources of seller gains in acquisitions of IPO targets. Our specific research question therefore is: What particular signals about IPO firms will have an impact on the premiums they obtain when selling their companies?

In addition to bringing together the streams of research on IPOs and acquisition premiums, our study offers two more specific contributions. First, our theoretical contribution lies in advancing a signaling theory of acquisition premiums. The concept of signaling has been widely used in management and other fields to study a variety of phenomena (see Riley [2001] for a review), and our work extends this theory to the study of acquisition premiums. Previous M&A research has identified several determinants of acquisition premiums (e.g., Beckman & Haunschild, 2002; Hayward & Hambrick, 1997; Shelton, 2000), or the difference between the price paid to acquire a company and the estimated preacquisition value of the company, and we complement this research by suggesting that the available signals about target firms can enhance sellers' gains. Our specific theoretical focus is on several interorganizational relationships that IPO firms can form and that function as signals in M&A markets, including their associations with prominent investment banks, venture capitalists, and

alliance partners (e.g., Gulati & Higgins, 2003; Pollock, Chen, Jackson, & Hambrick, 2010; Ragozzino & Reuer, 2007).

Second, by investigating how characteristics of IPO targets have an impact on the acquisition premiums they receive, we are able to shift attention in management research on acquisition premiums from the buyer's perspective to the seller's. This literature has emphasized several "buy-side" determinants of acquisition premiums (e.g., acquirer experience and networks, managerial hubris), and signaling theory highlights the signals available to targets that have an impact on the acquisition premiums that targets receive. Specifically, we suggest that the interorganizational relationships a firm forms while it is still private can have a bearing not only on IPO outcomes (e.g., Gulati & Higgins, 2003; Stuart et al., 1999), but also on the value the firm derives from subsequent mergers and acquisitions. For entrepreneurial firms, our arguments suggest that the value of forming such interorganizational relationships prior to going public may go beyond the more immediate benefits of these signals (e.g., raising more growth capital) studied in prior research. Our focus on the IPO target perspective is also a response to recent calls for research on "sell-side" considerations in work on M&A (e.g., Graebner & Eisenhardt, 2004; Haleblian, Devers, McNamara, Carpenter, & Davison, 2009; Shimizu & Hitt, 2005).

BACKGROUND THEORY

Given our objective of bringing signaling theory into research on acquisition premiums, it is useful to first highlight some of the other theories that have been used in this area. We also provide a brief introduction to signaling theory before developing research hypotheses in our specific empirical context. To begin with, a number of studies investigating acquisition premiums have focused on the total value creation potential of acquisitions as a determinant of acquisition premiums. For example, the total gains from an acquisition can be a function of the acquirer's ability to improve the target's operational efficiency or offer financial resources through excess liquidity or debt capacity (Kaufman, 1988; Nielsen & Melicher, 1973; Varaiya, 1987). Previous studies have also examined how macroeconomic factors such as business cycles or overall supply and demand conditions in the M&A market influence acquisition premiums (Nathan & O'Keefe, 1989; Shelton, 2000).

Management scholars have also investigated how managerial biases and organizational learning can shape acquirers' decisions on acquisition premiums. As one illustration, managers subject to hubris, or overconfidence in their ability to carry out acquisitions, pay higher acquisition premiums on average (e.g., Hayward & Hambrick, 1997). As a second example, previous research suggests that acquirers' network ties with other organizations (e.g., via interlocking directorates and acquisition advisors) influence executives' decisions on premiums (e.g., Beckman & Haunschild, 2002; Haunschild, 1994). Haleblian et al. (2009) observed that management scholars have contributed insights into how acquirer-related considerations affect acquisition premiums, but they have devoted less attention to the role of target firms.

Finance research on target firm considerations has emphasized the implications of agency costs, such as how management resistance to acquisitions affects acquisition premiums. For instance, entrenched managers might resist acquisition offers to ensure their job security and personal benefits, unless they are compensated for their loss of control. Therefore, managers who have power due to their firm's ownership structure or board composition can negotiate greater acquisition premiums or certain positions in the merged firm (Bange & Mazzeo, 2004; Comment & Schwert, 1995; Song & Walkling, 1993). We wish to complement these theories in management and finance by joining this literature with signaling theory and by focusing on target-side determinants of acquisition premiums.

Signaling theory research traces back to the contributions of Spence (1974) as well as other closely related work in information economics that has studied the implications of asymmetric information and "adverse selection" in various markets (e.g., Riley, 2001; Stiglitz, 2002). Spence's (1974) seminal research focused on the hiring of employees by firms as its paradigm problem. He showed that the most productive recruits will not be offered higher wages than less productive individuals, if employers cannot efficiently ascertain productivity during the hiring process. Although productive employees might want to reveal information related to their productivity to enhance their incomes, even if this were possible they encounter credibility problems, since they have natural incentives to disclose positive information, misrepresent abilities that are difficult to verify, and withhold negative information. As a consequence, educational achievement can be a valuable signal if it is positively related to unobservable employee productivity. If educational achievement also tends to be more costly for less productive individuals, then more productive recruits can use educational achievement to differentiate themselves and obtain more attractive wage offers. Studies in other market settings suggest that

the presence of signals or other remedial mechanisms can promote exchanges and reduce offer price discounting (e.g., Akerlof, 1970).

RESEARCH HYPOTHESES

Application of information economics and signaling theory to the context of acquisitions involving IPO targets suggests that signals can be useful to help a seller to obtain a higher acquisition premium. An acquisition represents a terminal sale of an IPO target, and considerable scope exists for opportunism in M&A negotiations (e.g., Gilson & Schwartz, 2005). As one example, a seller may inflate output or its claims about the business' capabilities and prospects while hiding information about organizational problems or other negative aspects of its resources in various functional areas (Balakrishnan & Koza, 1993). Even if a seller is committed to refraining from such opportunistic behavior, an acquirer will view the claims it makes with skepticism because of the seller's natural desire to justify a higher sales price. However, if an IPO target is able to rely on signals, such as associating with prominent underwriters, venture capitalists, and alliance partners, an acquirer is more likely to proceed with a deal (e.g., Ragozzino & Reuer, 2007). A potential acquirer is also less likely to discount its offer price because the presence of signals reduces the uncertainty bidders face about the potential value of the target (e.g., Barney, 1988; Coff, 1999).

In the hypotheses developed below, we investigate IPO firms' relationships with prominent underwriters, venture capitalists, and alliance partners. These three types of interorganizational relationships have been shown to signal the quality of IPO firms and facilitate subsequent economic exchanges such as equity financing, alliances, and acquisitions (e.g., Gulati & Higgins, 2003; Hsu, 2006; Pollock et al., 2010; Ragozzino & Reuer, 2007; Stuart et al., 1999). For instance, prior research has established that the reputation of an IPO firm's underwriter is one of the most important signals of the firm's quality (e.g., Carter & Manaster, 1990; Higgins & Gulati, 2003) and that backing by a prominent venture capitalist (VC) is another important signal, given the selectivity with which such VCs make investments and the costs borne by firms (e.g., Gulati & Higgins, 2003; Hsu, 2004, 2006). Research has also suggested that associating with alliance partners, and particularly with prominent organizations, conveys signals about a firm's resources and future prospects (e.g., Jensen, 2004; Nicholson, Danzon, & McCullough, 2005; Stuart et al., 1999). In the hypotheses below, we connect

finance research that has shown that IPO targets' acquisition premiums are related to their pre-IPO characteristics (Field & Karpoff, 2002) with management research on signaling via interorganizational relationships that has shown that an organization's early ties with prominent actors can have important effects on its future economic exchanges and performance (e.g., Hallen, 2008; Hsu, 2006).

Investment Bank Reputation

IPO firms' associations with investment banks convey important signals that have implications for future acquisition premiums. As we will suggest below, this is because IPO firms and underwriters are theoretically expected to match with one another during the IPO process in a certain fashion that provides information to acquirers. Specifically, higher-quality firms have an interest in associating with the most prominent investment banks and vice versa.

Higher-quality firms are willing and able to pay for the services of the most reputable investment banks and differentiate themselves from others. A firm going public has not developed a reputation for undertaking IPOs and representing itself to prospective investors. Because of this problem and the fact that attributes of the firm's resources and capabilities are often difficult to judge, investors can be concerned about potential misrepresentations by the firm or other opportunistic actions during the IPO. The most prominent underwriters, by contrast, engage in substantial repeat business, so any opportunistic actions can have adverse effects on their future deals. By signaling through "bonding" with a prominent underwriter (Riley, 2001), the IPO firm is effectively able to apply this "shadow of the future" (Axelrod, 1984) to its IPO, "lease" the reputation of the underwriter, and assuage investors' concerns about the firm's capabilities and prospects. The reverse is also true—namely, that more reputable underwriters have a desire to take public firms with higher quality. These underwriters engage in what is known as "risk signaling," or choosing to take public those firms that present less risk to their accumulated reputational capital (e.g., Carter & Manaster, 1990; Gulati & Higgins, 2003). The incentives of the most prominent underwriters to protect their reputations make forming relationships with them costly to imitate (Certo, 2003), thereby increasing the signaling value of such relationships. Theory and evidence therefore suggest that a two-sided matching phenomenon occurs whereby higher-quality firms are taken public by more reputable underwriters, and lower-quality firms associate with less reputable investment

banks (e.g., Fernando, Gatchev, & Spindt, 2005; Michaely & Shaw, 1994).

This matching process can have important implications for subsequent acquisition premiums involving IPO targets. Given the market segmentation that arises, acquirers purchasing a firm taken public by a prominent underwriter can draw inferences about the firm's unobservable quality, appropriate postacquisition management activities, and the value creation potential of the deal, despite information asymmetries. This signal and others are also available to other potential bidders and can reduce their adverse selection risk, providing a target with other alternatives and thereby increasing its "reservation price." In the absence of signals, acquirers face greater uncertainty and respond by reducing the acquisition premium offered to the target (e.g., Coff, 1999). We therefore hypothesize:

Hypothesis 1. The acquisition premium received by an IPO target is positively related to the reputation of its investment bank.

Venture Capitalist Prominence

Although nearly all firms are taken public by investment banks, many firms go public without the backing of venture capitalists, who also vary in their prominence (Gulati & Higgins, 2003). As noted above, we use theoretical ideas from studies of the role of financial intermediaries in signaling firm quality to link backing by prominent venture capitalists with the gains IPO targets obtain when selling their companies. The rationales for why backing by prominent VCs can provide valuable signals are similar to those developed above, but some differences exist. For instance, VCs are not only very selective in investing in companies (Megginson & Weiss, 1991), but also subsequently carry out evaluations over time and make follow-on investments in stages. Before each round of investment, they exchange information with other VCs and assess the venture's quality, progress, and prospects (e.g., Li, 2008).

Compared to investment banks, venture capitalists therefore have longer relationships with firms and conduct multiple rounds of due diligence (e.g., Carter & Manaster, 1990). The industry expertise of VCs and their attractive investment alternatives also lend credence to their investment decisions (Jain & Kini, 1995). This is particularly the case for the most prominent venture capitalists, who have extensive information channels that enable them to obtain proprietary information about the ventures. Associations with prominent VCs can be costly to imitate, because private companies will need to

accept a lower valuation when leasing a prominent VC's reputation (Hsu, 2004), and high-quality companies are more likely to be able to bear such a cost. Researchers have therefore argued and found that firms' relationships with prominent VCs can enhance the firms' future performance (e.g., Gulati & Higgins, 2003; Hsu, 2006; Krishnan, Ivanov, Masulis, & Singh, 2011; Stuart et al., 1999). Paralleling the arguments above, we therefore advance the following hypothesis:

Hypothesis 2. The acquisition premium received by IPO targets is greater for targets backed by prominent VCs.

Strategic Alliances

The above two hypotheses focus on interorganizational relationships between an IPO target and prominent financial intermediaries, yet the IPO target's interorganizational relationships with other types of firms can also bear upon the value it captures from an acquisition. For example, researchers have argued that a firm's alliance activity provides valuable market signals because alliances are widely observable and reflect the extent to which a firm's resources and capabilities are in demand by other organizations (e.g., Jensen, 2004). Although many alliances involve modest commitments and are narrow in scope, alliance partners tend to be more involved than investment banks or venture capitalists at an operational level, and they are therefore likely to have detailed knowledge of a new venture's technologies and other resources.

Just as associations with prominent investment banks and VCs convey signals by enabling firms to lease their reputations, the same is true of alliance partners. In biotechnology-pharmaceutical alliances, for example, the pattern of pharmaceutical firms' payments to biotechnology firms in their collaborations over time and the subsequent financial resources the biotechnology firms obtain are consistent with the signaling value of alliances (Nicholson et al., 2005). In particular, a biotechnology firm experiences a so-called first alliance discount, or substantially discounted payments when forming its first collaboration, to compensate the pharmaceutical firm for the signal the relationship conveys to outsiders. The biotechnology firms are then able to recoup the first alliance discount by receiving higher subsequent payments from VCs or other investors (Nicholson et al., 2005). Gulati and Higgins (2003) also suggested that biotechnology firms can partner with prominent pharmaceutical and health care companies having marketing and sales expertise to allay investor concerns about the com-

mercial viability of their products. IPO firms' characteristics shape the acquisition premiums they obtain (Field & Karpoff, 2002), and we expect that the signals associated with alliances with prominent partners are important characteristics of IPO firms affecting the value they capture in acquisitions. Thus, we posit:

Hypothesis 3. The acquisition premium received by an IPO target is positively related to the number of alliances it has formed with prominent partners.

The Contingent Effects of Signals

The foregoing hypotheses suggest that signals associated with IPO targets' interorganizational relationships will enhance the value these firms capture when selling their companies in general, but we also expect that the value of these signals will vary across deals. Although IPO targets generally present valuation challenges during M&As, owing to considerations such as the difficulties associated with appraising their resources (key technologies, human capital, etc.), their market newness, and their lack of credibility in various markets (short track records) (e.g., Certo, 2003; Heeley et al., 2007; Sanders & Boivie, 2004), the value of signals is also a function of the level of information asymmetry faced by an individual acquirer.

Previous research applying information economics to acquisitions suggests that a key determinant of the asymmetric information surrounding an individual M&A deal is the relatedness of the acquirer and target (e.g., Balakrishnan & Koza, 1993; Villalonga & McGahan, 2005). When purchasing a target in its own core business, an acquirer is generally more familiar with the seller's resources, management capabilities, buyers and suppliers, future prospects, and so forth (e.g., Montgomery & Hariharan, 1991). Such familiarity also translates into an enhanced ability to judge the target's claims during negotiations and more efficient evaluation of the target. By contrast, when a firm sells its company to an acquirer situated in an industry with different knowledge requirements, information asymmetries are greater, and the acquirer is more likely to lack the capacity to efficiently evaluate the seller and the representations it makes concerning its resources (Balakrishnan & Koza, 1993; Coff, 1999). Given the greater risk of adverse selection that exists when acquirers and targets operate in industries with different knowledge requirements, it is expected that signals will be especially valuable for such acquisitions. Applying this line of argument to the signaling roles of the three

interorganizational relationships examined earlier, we hypothesize:

Hypothesis 4a. Affiliations with reputable investment banks are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in industries with different knowledge requirements.

Hypothesis 4b. Affiliations with prominent VCs are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in industries with different knowledge requirements.

Hypothesis 4c. Alliances with prominent partners are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in industries with different knowledge requirements.

It is likely that, compared to domestic acquisitions, deals between foreign acquirers and domestic targets involve more information asymmetry problems (Seth, Song, & Pettit, 2000). Despite globalization and economic integration, substantial information asymmetries still exist between buyers and sellers in the international M&A market (Moeller & Schlingemann, 2005). Strategy and management researchers have long recognized that firms investing abroad face a liability of foreignness, or greater costs of doing business than their domestic counterparts face. These costs in particular arise from the firms' lack of information and knowledge about the local business environment as well as their inability to connect to local information sources and flows (e.g., Zaheer, 1995). Recent research has also argued that differences in national institutional environments increase the information asymmetry between firms situated in different countries (e.g., Roth & O'Donnell, 1996), which can adversely affect the negotiation and outcomes of cross-border acquisitions (e.g., Kang & Kim, 2010). Prior research has compared the shareholder valuation effects of cross-border and domestic acquisitions and has shown that foreign acquirers experience significantly lower announcement returns than domestic acquirers (e.g., Moeller & Schlingemann, 2005). By contrast, no research has empirically examined whether acquisition premiums vary across cross-border and domestic acquisitions and whether signals such as various interorganizational relationships play a more important role in cross-border acquisitions than in domestic deals. In parallel to Hypotheses 4a–4c above, we therefore propose:

Hypothesis 5a. Affiliations with reputable investment banks are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in foreign countries.

Hypothesis 5b. Affiliations with prominent VCs are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in foreign countries.

Hypothesis 5c. Alliances with prominent partners are particularly beneficial to the acquisition premiums that IPO targets receive when they sell their companies to acquirers based in foreign countries.

METHODS

Sample and Data

The base sample for this study was obtained from Thomson Financial's Securities Data Corporation (SDC) database, which provides detailed information on firms' IPO, M&A, and alliance activities. We constructed the base sample of newly public firms by first compiling all initial public offerings of common shares by U.S. firms from 1991 to 2000. Following prior IPO research, we excluded transactions associated with real estate investment trusts (REITs), closed-end mutual funds, unit offerings, spin-offs, leveraged buyouts (LBOs), and offerings by firms in the financial services sector. We then merged this information with M&A data to identify acquisitions of newly public firms. We restricted our sample to those IPO firms that were acquired within five years of going public, following precedent in prior research on acquisitions of newly public firms (e.g., Field & Karpoff, 2002). We expect the signals associated with the interorganizational relationships we study to have long-term effects on firms (e.g., Stuart et al., 1999; Hallen, 2008; Hsu, 2006), yet, as we discuss below, we have also addressed the time between the IPO and M&A transactions in several ways. Finally, we followed prior M&A research and focused on deals with a transaction value greater than $50 million (e.g., Dong, Hirshleifer, Richardson, & Teoh, 2006). We then matched the sample with the Compustat database and the Center for Research in Securities Prices (CRSP) data files to obtain accounting and financial information for the IPO targets and their acquirers. After implementing these sampling screens and excluding observations with missing values for the variables described below, we ob-

tained a final data set consisting of 308 deals involving 263 acquirers.

Variables and Measurement

Dependent variable. The dependent variable in our analysis, *acquisition premium*, was measured as the percentage difference between a purchase price and an IPO target's value four weeks prior to the date of the announcement of the acquisition reported in the SDC database. The four-week time lag was used to obtain a scaling factor that is not confounded by the takeover announcement and leakage of information right before the announcement (e.g., Nathan & O'Keefe, 1989); this approach to measuring premiums has been widely used in prior acquisition research in management and other fields (e.g., Beckman & Haunschild, 2002; Kisgen, Qian, & Song, 2009). As discussed in a subsequent section devoted to robustness analyses, we also constructed an alternative dependent variable by using firm size (i.e., total sales) rather than market value as a scaling factor for the acquisition price (e.g., Brau, Sutton, & Hatch, 2010).

Independent variables. Our first theoretical variable is the reputation of an acquired IPO firm's investment bank. We measured *investment bank reputation* by employing the ranking index developed by Carter and Manaster (1990). The index is constructed from investment banks' positions in "tombstone" announcements listing members of an underwriting syndicate. Given that IPOs are often comanaged by underwriting syndicates formed by multiple investment banks, we followed previous studies and focused on the ranking of the lead underwriter for each IPO (e.g., Stuart et al., 1999). We used the new issues module of the SDC database to identify the lead underwriter for each issuing firm and the data on investment bank reputation from Loughran and Ritter (2004), who used expert knowledge for exceptional cases, covered a longer period than prior research, and updated prior data sources.

Our second theoretical variable is whether or not a prominent venture capitalist backed a firm at the time of its IPO. We first identified all the VCs that provided financing to a particular IPO firm and examined the number of other IPOs in which the VCs were involved five years prior to the IPO target's issuing date. We then identified a VC firm as prominent if the number of IPOs it backed was above the median number of IPOs for all VCs during that time period. We defined *venture capitalist prominence* as a dummy variable equal to 1 if any of the VCs associated with the IPO target was on the list of prominent VCs, and 0 otherwise (e.g., Gulati & Higgins, 2003). Data on VCs' involvement in IPO

firms were drawn from the SDC database as well as from individual IPO prospectuses.

The third theoretical variable is an IPO firm's number of prominent alliance partners. Although alliances formed by IPO firms prior to going public can influence acquisition premiums, IPO firms can also engage in alliances after going public, and these interorganizational relationships also provide important information on IPO firms' capabilities (e.g., Arikan & McGahan, 2010). Thus, we investigated the alliances formed by an IPO firm both before and after the IPO but prior to the M&A transaction. To identify prominent alliance partners, we counted the firms' partners that were publicly listed, since these organizations play the role of prominent endorsers who are well known and often appreciated by outsiders (Lavie, 2007). We relied upon Compustat and CRSP to verify whether or not the alliance partners of an IPO firm were publicly listed. We found that 44.7 percent of the IPO targets' alliances occurred before they went public and that 55.3 percent occurred after IPO and before acquisition. We also formally tested whether the effects of pre- and post-IPO alliances are different, and we could not reject the null hypothesis that these variables have the same effects on acquisition premiums (i.e., $F = 0.32$), which indicated that the two variables could be pooled. Given the positive skewness that was evident for this measure, we defined the variable as the log of 1 plus the number of prominent alliance partners (i.e., *prominent alliance partners*). We also used a more restrictive criterion for identifying prominent alliance partners by counting partners present in the Standard & Poor's 500 index (e.g., Pollock et al., 2010) and obtained the same interpretations.

Finally, our remaining hypotheses suggest that the positive effects of the above signaling variables on acquisition premiums will be greater when an acquirer is situated in a different industry or country than a target. We incorporated a continuous measure of *knowledge distance* between acquirer and target that has been used in prior corporate strategy research (e.g., Coff, 1999). Specifically, the Bureau of Labor Statistics' Occupational Employment Survey offers information on the proportion of employees in each of 823 occupational categories within industries (at the three-digit SIC level). These employment distributions can then be used to calculate the knowledge distance variable as follows:

$$\text{Knowledge distance} = \left[\sum_k \left(EA_k - ET_k \right)^2 \right]^{0.5},$$

where EA_k and ET_k are the proportions of employees in occupation k in an acquirer's and a target's industries, respectively. Prior research has often distinguished intraindustry and interindustry transactions using a dummy variable (e.g., Balakrishnan & Koza, 1993; Villalonga & McGahan, 2005), so we also replaced the knowledge distance measure with an indicator variable to differentiate intra- and interindustry transactions at the three-digit SIC level, and we obtained results with the same interpretations. Researchers have also argued that acquirers are particularly prone to information asymmetries in cross-border acquisitions (e.g., Kang & Kim, 2010; Moeller & Schlingemann, 2005; Seth et al., 2000). The indicator variable *cross border* equaled 1 if an acquirer was a foreign (non-U.S.) firm, and 0 otherwise.

Control variables. We incorporated a number of variables in the models to address characteristics of IPO targets, acquirers, and M&A deals that might be related to the above explanatory variables and the premiums sellers obtain. At the IPO target level, we first controlled for firm size. Prior work has suggested that the potential gain in productivity of the target's assets, and hence acquisition premiums, may decrease with the target's size (e.g., Beckman & Haunschild, 2002; Comment & Schwert, 1995). *IPO firm size* was measured as the natural log of an IPO firm's total assets in millions of dollars, via data from Compustat. Second, we controlled for *IPO firm Tobin's Q*, which captures a firm's market-based performance as well as the growth opportunities an acquirer can access through acquisition of the firm (e.g., Dong et al., 2006). We measured this variable by following the approach suggested by Chung and Pruitt (1994), using data from Compustat and CRSP. Third, we controlled for *IPO underpricing* (e.g., Loughran & Ritter, 2004), which is the percentage difference between an IPO firm's first-day closing price and the offer price.

After a firm goes public, its coverage by analysts can provide information on its resources and prospects and draw the attention of prospective investors. We counted the number of analysts who provided earnings forecasts for a firm in the year prior to its acquisition announcement. Since positive skewness was evident for this measure, we used the log of the number of analysts plus 1 to define the variable *analyst coverage*. Data for this variable were obtained from the Institutional Brokers Estimate System (I/B/E/S), and firms not covered by I/B/E/S are assumed to have no analyst coverage (e.g., Jensen, 2004). As another means of capturing post-IPO information on targets, we controlled for the time between an IPO and an acquisition (e.g., Arikan & Capron, 2010). *Time since IPO* was measured as the number of years from an IPO issuing date to the announcement of an acquisition deal.

Prior research has suggested that the corporate governance characteristics of firms can influence acquisition premiums because of potential agency conflicts. We therefore included three specific corporate governance variables for IPO targets. First, managers with substantial equity ownership may require higher premiums to compensate for their loss of control rights, or they may accept lower premiums if they can retain their positions in the combined entity (e.g., Bargeron, Schlingemann, Stulz, & Zutter, 2008; Bates & Lemmon, 2003), so we incorporated a variable measuring the percentage of shares held by target firm managers (*managerial ownership*). Second, boards composed primarily of insiders (current or former employees) are less independent and are more likely to favor managers' interests during acquisitions (Bange & Mazzeo, 2004), so we controlled for the percentage of insiders on a target firm's board (*inside directors*). Third, blockholders (holders of 5 percent or more of a firm's shares) have better incentives for and knowledge with which to monitor management, thereby aligning managers' interests with shareholders (e.g., Bange & Mazzeo, 2004). We therefore controlled for the ownership of a target held by blockholders (*blockholdings*). Data were assembled from Compact Disclosure and firms' proxy statements filed with the Securities and Exchange Commission.

We also included a control for the acquirer's acquisition experience since firms with more experience might pick better targets or implement acquisitions more effectively. We counted the number of acquisitions that each acquirer had made during the three years preceding a focal transaction. Since this measure exhibited positive skewness and certain firms did not carry out acquisitions, we transformed this count measure by taking the log of 1 plus the number of acquisitions (*acquirer M&A experience*).

Several variables were also included to control for particular features of an acquisition transaction. We included *deal size* (Beckman & Haunschild, 2002), which was measured as the natural log of the value of the transaction. We also incorporated a dummy variable indicating whether or not an acquisition was a *tender offer* (a public solicitation for target shareholders' stock). Prior studies have shown that target management often initially resists tender offers, resulting in higher premiums (e.g., Comment & Schwert, 1995). In addition, because premiums can vary according to the method of payment for an acquisition (e.g., Huang & Walkling, 1987), we included a dummy variable, *stock offer*, indicating whether or not the acquirer used its stock as a medium of exchange. We also

controlled for the percentage of shares acquired (*percent acquired*), since target management often requires higher payments for their loss of control rights (e.g., Jarrell, Brickley, & Netter, 1988). Finally, we included a control for competing bidders because a target's bargaining power can increase in the presence of competing bidders (e.g., Bradley, Desai, & Kim, 1988). *Competing bidders* was a dummy variable equal to 1 if another deal for the same target was announced during the 12 months prior to the announcement date of a focal deal and 0 otherwise (Bargeron et al., 2008).

We also sought to control for potential industry effects and the influence of the broader macroeconomic environment. Specifically, we included a dummy variable *high-tech industry* to distinguish high-tech firms from other IPO firms, since high-tech firms are active in private and public equity markets, and they often present attractive growth opportunities yet can be difficult to value. We used AeA's high-tech industry definitions to identify 45 high-tech industries (http://www.aeanet.org). Alternatively, we included a series of industry fixed effects and obtained results very similar to those reported below. Finally, we controlled for *year fixed effects* to account for the influence of economy-wide factors.

Statistical Methods

We used the generalized estimating equations (GEE) method developed by Liang and Zeger (1986) to estimate the determinants of IPO targets' acquisition premiums. This method accommodates outcomes for a firm in different time periods that can be correlated (Liang & Zeger, 1986), such as multiple deals conducted by the same acquirer at different time points. In our sample, 28 acquirers engaged in more than one acquisition transaction. We used the "genmod" procedure in SAS to estimate a generalized linear model, and we used the "repeated" statement to cluster the acquirers and produce robust standard errors in the regression. We employed the commonly used exchangeable correlation structure, but the results were robust to the specification of other correlation structures.

RESULTS

Table 1 presents descriptive statistics and a correlation matrix. The average premium is 46 percent, which roughly corresponds to average premiums reported in previous studies based on different samples (e.g., Laamanen, 2007). We also divided the IPO targets into different subsamples to compare the acquisition premiums received by differ-

TABLE 1
Descriptive Statistics and Correlation Matrix[a]

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Acquisition premium (%)	46.35	37.90																				
2. Investment bank reputation	7.95	1.64	.14*																			
3. Venture capitalist prominence	0.41	0.49	.15**	.06																		
4. Prominent alliance partners	0.49	0.73	.18**	.08	.17**																	
5. Knowledge distance	0.29	0.34	−.15**	−.01	−.01	−.01																
6. Cross border	0.16	0.37	.07	.04	−.05	−.06	.05															
7. IPO firm size	4.31	1.55	−.02	.33***	−.28***	.20***	−.09	.15**														
8. IPO Firm Tobin's Q	3.51	4.05	.08	.04	.15**	.03	.00	−.12*	−.38***													
9. IPO underpricing	0.32	0.69	.06	.15**	.20***	.14*	−.02	−.05	−.16**	.27***												
10. Analyst coverage	1.52	0.78	.02	.25***	−.06	.34***	−.06	.06	.52***	−.12*	−.01											
11. Time since IPO	2.35	1.28	−.04	−.12*	−.01	.24***	−.04	.14*	.36***	−.23***	−.13*	.41***										
12. Managerial ownership	0.09	0.15	.04	−.07	−.12*	.00	.05	−.04	−.18**	.08	.05	−.01	−.03									
13. Inside directors	0.37	0.20	.03	−.13*	−.18**	−.06	.06	.04	.06	−.07	−.17**	.04	.07	.17**								
14. Blockholdings	0.34	0.30	−.05	.01	−.06	−.07	−.04	.04	.03	.07	−.06	.04	.07	−.06	−.06							
15. Acquirer M&A experience	2.06	0.94	−.09	.05	−.01	−.01	.17**	.23***	.08	.10†	.02	.07	−.06	−.05	.01	.00						
16. Deal size	5.85	1.25	.08	.33***	−.11*	.18**	−.11*	.05	.41***	.29***	.17**	.33***	−.07	−.07	−.05	.05	.11†					
17. Tender offer	0.31	0.47	.18**	.00	−.09	−.05	.10†	.30***	.12*	−.14*	−.13*	.03	.08	−.11*	.08	.06	.09	−.07				
18. Stock offer	0.50	0.50	−.08	.03	.17**	.07	−.07	−.34***	−.26***	.16**	.18**	.01	−.15**	.10†	.01	.00	−.19***	.05	−.59***			
19. Competing bidders	0.12	0.33	−.01	−.07	.04	.08	.05	−.02	−.05	.07	.02	−.08	−.03	.00	.00	−.08	.03	.09	−.01	.01		
20. Percent acquired (%)	98.02	11.25	.11†	.03	.04	−.14*	−.04	.01	.01	−.08	.06	−.01	.00	−.01	.02	−.08	−.09	.11*	.02	.16**	.01	
21. High-tech industry	0.47	0.50	.19***	.03	.22***	.29***	−.17**	−.09	−.18**	.28***	.25***	.00	−.11†	.08	−.03	−.12*	−.08	.11†	−.08	.18**	.01	−.06

[a] $n = 308$.
† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

ent types of firms. IPO targets underwritten by investment banks with reputations above the median received an average premium of 51 percent, which compares to an average of 43 percent for targets taken public by less prominent underwriters ($t = 1.89$, $p < .10$). IPO targets backed by prominent venture capitalists received a premium of 53 percent on average, whereas other IPO targets received a premium averaging 42 percent ($t = 2.64$, $p < .01$). IPO targets that had prominent alliance partners received an average premium of 56 percent, compared to others receiving a premium of 40 percent on average ($t = 3.63$, $p < .001$). Targets received lower acquisition premiums when selling to diversifying entrants rather than to acquirers operating in the same industry (39% versus 53%, respectively; $t = -3.19$, $p < .01$). However, no significant differences in acquisition premiums existed between cross-border and domestic transactions ($t = 1.20$, n.s.).

Table 2 presents the results for testing Hypotheses 1–3. Model I is a baseline specification comprising all of the control variables. Models II-IV augment model I by adding each of the three theoretical variables, and model V is the full model. Hypothesis 1 predicts that IPO targets taken public

by more reputable investment banks will command higher premiums than those underwritten by less prominent investment banks. The coefficient estimate for the investment bank reputation variable is positive and significant in models II and V (both $p < .01$), providing support for Hypothesis 1. Hypothesis 2 posits that acquisition premiums will also be greater for IPO targets backed by prominent venture capitalists than premiums when such signals are lacking. In support of Hypothesis 2, the coefficient estimate for VC prominence is positive and significant in models III ($p < .01$) and V ($p < .05$). Hypothesis 3 proposes that alliances with prominent partners can similarly increase the premiums obtained by IPO targets. The sign on this variable is positive and significant in models IV and V ($p < .001$ and $p < .01$, respectively), providing strong support for Hypothesis 3.

Table 3 reports the regression results testing the central proposition stated in Hypotheses 4a–4c that the signals from interorganizational relationships with prominent organizations will be particularly beneficial when an IPO firm is selling to an acquirer coming from an industry with different knowledge requirements. Hypothesis 4a suggests that the positive impact of investment banks' prom-

TABLE 2
Results for the Determinants of Acquisition Premiums[a]

Independent Variables	I		II		III		IV		V	
Intercept	7.33	(17.54)	14.54	(18.04)	3.27	(17.36)	15.49	(16.78)	17.13	(17.92)
Year fixed effects	Included		Included		Included		Included		Included	
IPO firm size	−0.93	(1.87)	−2.48	(1.99)	0.23	(1.84)	−2.29	(1.95)	−2.43	(2.08)
IPO firm Tobin's Q	0.72	(0.57)	0.67	(0.61)	0.70	(0.55)	1.09[†]	(0.59)	0.80	(0.59)
IPO underpricing	−0.24	(3.41)	−0.37	(3.39)	−0.72	(3.37)	−1.08	(3.12)	−1.53	(3.11)
Analyst coverage	3.04	(3.57)	1.94	(3.68)	2.40	(3.48)	2.35	(3.71)	0.12	(3.71)
Time since IPO	−0.40	(1.81)	0.57	(1.87)	−1.10	(1.84)	−1.39	(1.72)	−1.13	(1.84)
Managerial ownership	11.82	(13.94)	12.39	(13.50)	18.58	(13.92)	8.35	(13.78)	16.25	(13.27)
Inside directors	1.83	(10.10)	3.38	(10.03)	5.30	(10.04)	−2.02	(8.99)	5.87	(9.34)
Blockholdings	−4.48	(6.47)	−4.13	(6.43)	−3.92	(6.41)	2.22	(6.56)	0.19	(6.48)
Acquirer M&A experience	−4.57[†]	(2.43)	−4.08[†]	(2.41)	−4.75*	(2.40)	−2.68	(2.42)	−3.48	(2.37)
Deal size	1.26	(2.39)	0.53	(2.41)	1.37	(2.35)	−0.93	(2.28)	−0.45	(2.37)
Tender offer	18.21***	(5.32)	17.64***	(5.25)	17.87***	(5.27)	17.13**	(5.24)	16.73**	(5.17)
Stock offer	−3.52	(5.38)	−4.63	(5.29)	−4.74	(5.41)	−4.10	(5.36)	−6.18	(5.30)
Competing bidders	2.05	(7.85)	3.57	(7.35)	1.76	(7.68)	3.09	(7.45)	2.65	(6.87)
Percent acquired	0.40***	(0.11)	0.41***	(0.12)	0.39***	(0.11)	0.59***	(0.11)	0.53***	(0.11)
High-tech industry	9.51[†]	(4.95)	9.18[†]	(4.83)	8.05[†]	(4.81)	1.42	(4.90)	2.18	(4.78)
Cross border	3.11	(6.01)	1.82	(5.85)	2.65	(6.02)	1.10	(5.78)	1.63	(5.72)
Knowledge distance	−13.55*	(6.12)	−14.14*	(5.97)	−13.34*	(6.04)	−14.05*	(5.82)	−14.95**	(5.77)
Investment bank reputation			3.49**	(1.33)					3.51**	(1.38)
Venture capitalist prominence					11.65**	(4.49)			9.41*	(4.59)
Prominent alliance partners							10.98***	(3.23)	10.31**	(3.33)
QIC	326.90		326.50		327.00		325.11		326.23	

[a] $n = 308$. Robust standard errors appear in parentheses.
 [†] $p < .10$
 * $p < .05$
 ** $p < .01$
 *** $p < .001$

TABLE 3
Results for the Knowledge Distance Interaction Effects[a]

Independent Variables	I		II		III		IV	
Intercept	18.38	(18.59)	2.54	(17.18)	3.34	(18.62)	15.65	(19.90)
Year fixed effects	Included		Included		Included		Included	
IPO firm size	−2.05	(1.94)	0.11	(1.84)	−1.56	(1.88)	−1.79	(1.99)
IPO firm Tobin's Q	0.72	(0.60)	0.65	(0.56)	0.75	(0.55)	0.64	(0.58)
IPO underpricing	−0.04	(3.29)	−0.63	(3.43)	−1.50	(2.91)	−1.49	(2.92)
Analyst coverage	1.92	(3.58)	2.22	(3.50)	0.57	(3.63)	−0.94	(3.56)
Time since IPO	0.13	(1.81)	−1.10	(1.84)	−2.16	(1.77)	−2.06	(1.83)
Managerial ownership	17.51	(13.70)	17.92	(14.26)	13.85	(13.44)	23.12[+]	(13.81)
Inside directors	−0.07	(9.98)	4.85	(9.94)	5.15	(9.95)	4.74	(9.48)
Blockholdings	−5.35	(6.51)	−3.45	(6.41)	−1.70	(6.53)	−1.55	(6.49)
Acquirer M&A experience	−3.99[+]	(2.36)	−4.55[+]	(2.40)	−4.29[+]	(2.36)	−3.59	(2.33)
Deal size	0.23	(2.34)	1.39	(2.38)	0.93	(2.41)	0.15	(2.40)
Tender offer	18.63***	(5.25)	17.92***	(5.22)	17.08***	(5.13)	17.38***	(5.03)
Stock offer	−3.66	(5.27)	−4.32	(5.40)	−5.87	(5.34)	−5.96	(5.26)
Competing bidders	3.31	(7.23)	2.59	(7.62)	−0.78	(7.54)	1.47	(6.80)
Percent acquired	0.38**	(0.13)	0.41***	(0.11)	0.59***	(0.14)	0.57***	(0.13)
High-tech industry	8.17[+]	(4.82)	7.40	(4.81)	4.99	(5.00)	1.85	(4.85)
Cross border	2.66	(5.82)	2.39	(6.03)	4.82	(5.77)	3.64	(5.66)
Knowledge distance	−15.07**	(5.86)	−13.57*	(6.05)	−15.78**	(5.99)	−17.13**	(5.80)
Investment bank (IB) reputation	3.57**	(1.35)					3.22*	(1.37)
Venture capitalist (VC) prominence			11.61**	(4.49)			9.14*	(4.67)
Prominent alliance partners					12.70***	(3.24)	11.46***	(3.21)
Knowledge distance × IB reputation	9.38**	(3.60)					9.07**	(3.50)
Knowledge distance × VC prominence			−12.68	(12.24)			−18.08	(11.92)
Knowledge distance × Prominent alliance partners					16.78*	(8.37)	15.05[+]	(8.23)
QIC	326.83		327.69		328.67		329.65	

[a] $n = 308$. Robust standard errors appear in parentheses.
   [+] $p < .10$
   * $p < .05$
  ** $p < .01$
 *** $p < .001$

inence on acquisition premiums will be greater for IPO targets purchased by acquirers with dissimilar knowledge bases. The positive and significant interaction of knowledge distance with investment bank reputation in models I and IV provides strong support for this hypothesis (both $p < .01$). Hypothesis 4b similarly predicts that the positive effect of backing by prominent VCs on acquisition premiums will be greater for IPO targets purchased by acquirers with dissimilar knowledge bases. However, no support is evident for this hypothesis in models II and IV. Thus, it appears that backing by prominent VCs helps IPO firms obtain greater premiums, yet this effect does not vary across acquirers situated in different industries. Finally, Hypothesis 4c proposes that the signaling effects of prominent alliance partners will be greater for IPO targets purchased by acquirers in different industries. The interaction effect between knowledge distance and prominent alliance partners is positive and significant in models III ($p < .05$) and IV ($p < .10$), lending support for this hypothesis.

Table 4 presents the regression results testing the central proposition stated in Hypotheses 5a–5c that

the positive effects of the signals from interorganizational relationships on acquisition premiums will be greater in cross-border transactions than in domestic transactions. Contrary to these predictions, none of the interaction terms is significant, indicating that the positive influence of signaling variables on acquisition premiums is invariant to whether or not an acquirer is based in the U.S. We also included all of the knowledge distance and cross-border interactions in a separate model and tested them at the same time, and the results were qualitatively the same as those reported above.

Turning to the control variables, we find several results are noteworthy. First, in keeping with predictions from information economics, an IPO target receives a lower premium when selling to an acquirer coming from an industry with different knowledge requirements ($p < .01$) (e.g., Balakrishnan & Koza, 1993; Montgomery & Hariharan, 1991). Second, the tables also show that an acquirer making a tender offer or seeking to acquire a larger percentage of shares tends to pay a higher premium (both $p < .001$). These results for IPO targets are consistent with research on the market for corpo-

TABLE 4
Results for the Cross Border Interaction Effects[a]

Independent Variables	I		II		III		IV	
Intercept	13.88	(18.13)	3.38	(17.39)	15.27	(16.69)	21.48	(18.13)
Year fixed effects	Included		Included		Included		Included	
IPO firm size	−2.45	(2.00)	0.22	(1.86)	−1.99	(1.98)	−2.13	(2.12)
IPO firm Tobin's Q	0.69	(0.61)	0.70	(0.55)	1.13[+]	(0.59)	0.81	(0.59)
IPO underpricing	−0.34	(3.40)	−0.70	(3.39)	−1.14	(3.15)	−1.46	(3.15)
Analyst coverage	2.03	(3.68)	2.42	(3.49)	2.33	(3.68)	0.23	(3.70)
Time since IPO	0.60	(1.87)	−1.10	(1.85)	−1.48	(1.72)	−1.24	(1.85)
Managerial ownership	13.08	(13.45)	18.58	(13.94)	9.05	(13.62)	17.24	(13.22)
Inside directors	3.98	(10.21)	5.27	(10.03)	−1.04	(9.07)	6.95	(9.58)
Blockholdings	−4.45	(6.48)	−3.93	(6.46)	2.17	(6.56)	−0.15	(6.57)
Acquirer M&A experience	−4.00[+]	(2.41)	−4.73*	(2.40)	−2.82	(2.39)	−3.58	(2.36)
Deal size	0.39	(2.47)	1.37	(2.34)	−1.06	(2.26)	−0.52	(2.41)
Tender offer	17.48***	(5.26)	17.85***	(5.27)	17.28***	(5.24)	16.75***	(5.16)
Stock offer	−4.65	(5.28)	−4.77	(5.39)	−3.75	(5.39)	−5.96	(5.29)
Competing bidders	3.48	(7.37)	1.76	(7.67)	4.08	(7.53)	3.35	(6.98)
Percent acquired	0.42***	(0.12)	0.39***	(0.11)	0.58***	(0.11)	0.52***	(0.11)
High-tech industry	9.20[+]	(4.81)	8.03[+]	(4.81)	1.98	(4.90)	2.72	(4.81)
Cross border	1.66	(5.84)	2.59	(6.01)	2.12	(5.75)	2.46	(5.68)
Knowledge distance	−14.09*	(5.96)	−13.33*	(6.04)	−13.94*	(5.82)	−14.80**	(5.76)
Investment bank (IB) reputation	3.57**	(1.32)					3.37*	(1.37)
Venture capitalist (VC) prominence			11.64**	(4.52)			9.49*	(4.57)
Prominent alliance partners					11.31***	(3.15)	10.52**	(3.24)
Cross border × IB reputation	1.95	(2.73)					0.64	(2.56)
Cross border × VC prominence			−0.94	(12.12)			−4.62	(12.09)
Cross border × Prominent alliance partners					10.53	(7.83)	9.44	(8.54)
QIC	326.27		327.79		325.33		327.08	

[a] $n = 308$. Robust standard errors appear in parentheses.
  [+] $p < .10$
  * $p < .05$
  ** $p < .01$
  *** $p < .001$

rate control and the value of managers' control rights. Finally, it is interesting to note that none of the three corporate governance variables is a significant determinant of IPO targets' acquisition premiums. Prior studies have examined the influence of these corporate governance variables on acquisition premiums for more established targets (e.g., Bange & Mazzeo, 2004; Bargeron et al., 2008; Bates & Lemmon, 2003). Taken together, the results therefore suggest that certain sources of agency conflicts do not influence acquisition premiums for IPO targets.

Supplementary Analyses

We also sought to investigate the robustness of our results in several additional ways (detailed results are available from the authors). First, we assessed whether the findings and interpretations were potentially subject to sample selection bias. Studies on acquisition premiums have generally not addressed this possibility, a recent exception being Gaspar, Massa, and Matos (2005), who did not find evidence of selection bias. In our empirical analysis, it is possible that the signaling variables and unobserved factors might influence target selection and bias the interpretations, which we investigated using a two-stage Heckman model. Specifically, we collected data on IPO firms that were *not* acquired to construct a first-stage probit model distinguishing these firms from our sample of IPO targets. In addition to incorporating the second-stage regressors defined at the time of an IPO, we also controlled for whether or not the IPO firm obtained visibility by listing on a major stock exchange, either the New York Stock Exchange (NYSE) or NASDAQ (*major exchange*) (e.g., Rao, Davis, & Ward, 2000) as well as the level of acquisition activity in the IPO firm's industry (*industry M&A volume*) (e.g., Song & Walkling, 2000). The insignificance of the selection correction term in the second-stage acquisition premium model ($t = -0.95$, n.s.) indicates that we cannot reject the null hypothesis of no sample selection bias.

Second, we wanted to examine if potential endogeneity in firms' interorganizational relationships might affect the results and interpretations. Firms hold different motives for these relationships (e.g.,

obtaining early-stage growth capital) compared to a sale via acquisition, which makes a "feedback relationship" less likely (e.g., Hayashi, 2000). The passage of time between the formation of these interorganizational relationships and acquisition after a firm goes public also reduces a feedback relationship. Nevertheless, we wanted to assess whether unobserved heterogeneity surrounding these interorganizational relationships might account for our findings. We examined the endogeneity of the VC prominence variable by using a two-stage model controlling for self-selection. A first-stage VC choice model was estimated that follows Baker and Gompers (2003) in employing state location dummies for instrumentation purposes, and in none of the three estimated second-stage models (a model for the full sample, and two models for the subsamples of firms backed by prominent VCs versus not backed by such VCs) was the self-selection correction term significant. Given that most firms did not have alliances with prominent partners (i.e., 60.4%), we employed a similar approach for the alliance variable, and these tests also provided no evidence of endogeneity. Finally, we employed a two-stage least squares (2SLS) model to examine investment bank reputation, a continuous variable, and a Durbin-Wu-Hausman test indicated that the null of exogeneity could not be rejected for this regressor as well ($F = 0.01$, n.s.).

Third, we also sought to determine if the signaling variables decayed in influence in the five years after an IPO, and we followed Arikan and Capron (2010) in testing the interactions between the three signaling variables and the time since IPO. If the signals do decay within this time interval as information on a firm accumulates, we would expect negative coefficients on the interaction terms. The results indicated none of the interactions was significant, however.

Finally, we examined whether the results presented above extend to alternative measures for the signals and acquisition premiums. Prior research suggests that funding by any venture capitalist offers a valuable signal of a firm's quality (e.g., Brau et al., 2010; Jain & Kini, 1995; Megginson & Weiss, 1991). We therefore replaced the VC prominence variable with a variable indicating whether or not an IPO firm was backed by any venture capitalist at the time it went public, and we found qualitatively similar results (i.e., $p < .05$). We also followed recent research that has counted the number of alliances a firm had formed with any partner (Jensen, 2004) rather than distinguishing partners by degree of prominence, and we obtained similar results (i.e., $p < .05$). Following recent research on acquisitions of privately held firms as well as IPO

firms (Brau et al., 2010), we also constructed a premium measure that scales the acquisition price by total firm sales. When we estimated models using this dependent variable, we continued to find that acquisition premiums are positively related to venture capitalist prominence and prominent alliance partners ($p < .001$ and $p < .10$, respectively), but we did not find significant results for investment bank reputation.

DISCUSSION

Contributions and Implications

Our study makes several contributions to different streams of research. We advance M&A research by developing a signaling theory of acquisition premiums. Finance research on acquisition premiums often emphasizes how agency costs in target firms can affect acquisition premiums (e.g., Bange & Mazzeo, 2004; Comment & Schwert, 1995; Song & Walkling, 1993), and management research tends to focus on considerations in acquiring firms that influence acquisition premiums (Haleblian et al., 2009), including managerial biases, network ties, and organizational learning (e.g., Beckman & Haunschild, 2002; Haunschild, 1994; Hayward & Hambrick, 1997). Our study therefore complements prior M&A research in management and finance with arguments and findings that target firms' signals can positively affect the acquisition premiums they receive. By focusing on targets' interorganizational relationships and their gains in M&As, we also respond to calls for research on sell-side considerations in acquisitions research (e.g., Graebner & Eisenhardt, 2004; Haleblian et al., 2009; Shimizu & Hitt, 2005).

Our study also contributes to recent research on the signaling benefits of firms' interorganizational relationships in two ways. This research has suggested and shown that interorganizational relationships with prominent organizations (e.g., venture capitalists and alliance partners) confer a number of benefits, such as facilitating economic exchanges (e.g., future collaborations) and enhancing firm performance (e.g., Hsu, 2006; Stuart et al., 1999). By linking such signals to the value an IPO firm captures from subsequent acquisition, we identify a new benefit of such interorganizational relationships, one that is less immediate than the benefits that have been reported for private firms. Our findings therefore suggest that entrepreneurial firms might take into account the longer-term benefits of interorganizational relationships as well as consider acquisitions occurring beyond their IPOs as a means of capturing value.

Signaling theory research has also suggested that the benefits of interorganizational relationships are likely to depend on the informational environment of signals, such as overall market conditions (e.g., Gulati & Higgins, 2003). The contingency perspective we develop suggests that the signaling value of interorganizational relationships in the M&A market varies across acquirers purchasing a target. We find that the benefits of such signals are greater when IPO firms sell their companies to acquirers based in different industries, but the benefits of signals apply to domestic and cross-border deals alike. One possible explanation for this set of findings is that an acquirer's familiarity with, or ability to evaluate, an IPO target's resources is associated more with the knowledge requirements of their respective industries than with whether or not the deal is a cross-border transaction. The cross-border indicator might also be too coarse an indicator of information asymmetry, as foreign acquirers have heterogeneous resources and capabilities. Certain foreign acquirers might also prioritize other remedies for adverse selection, perceive signals differently, or focus on other information during acquisition deals (e.g., Certo, 2003; Graffin, Carpenter, & Boivie, 2011).

Limitations and Future Research Directions

Our study has several limitations that may also present fruitful avenues for future research. To begin with, our study has focused on acquisition premiums received by IPO targets, so there are many other research opportunities to join the IPO and M&A literatures by investigating other acquisition decisions and outcomes for IPO targets (e.g., Certo et al., 2009). In addition, IPO firms are engaged in acquisitions not only as targets but also as acquirers (e.g., Arikan & Capron, 2010; Brau & Fawcett, 2006), so it would be interesting to investigate whether and how IPO firms are unique as acquirers and how they carry out product-market and international diversification programs.

Second, future research might examine the generalizability of our findings on the value of signals by studying acquisitions of IPO firms in other countries or by investigating deals involving more established targets. For example, institutions can have an important influence on the information available on targets, the functioning of IPO markets, and the types of interorganizational relationships with financial intermediaries that might be used as signals for these firms. In addition, the types of signals that affect acquisition premiums might be different for more established targets. In general, research using other samples to study signals might also be valuable to draw comparisons with agency theory or other perspectives used in previous research on acquisition premiums.

Finally, given our focus on IPO firms' interorganizational relationships as signals, ample opportunities also exist to examine other signals or remedies for the challenges of acquisition deals. Other signals are at firms' disposal, and recent studies have proposed several other financial and social remedies to adverse selection, such as contingent contracts, ownership sharing, and organizational trust (e.g., Dewally & Ederington, 2006). It would also be interesting to examine whether signals substitute for each other or for other ways firms might address adverse selection. Research investigating contingencies such as these could prove valuable in identifying important boundary conditions of signals.

Conclusions

We extend signaling theory to the literature on acquisition premiums, joining research on acquisitions with recent work on the signals associated with firms' interorganizational relationships. By focusing on IPO targets and the signals conveyed by their interorganizational relationships, we identify important determinants of the value that such targets capture in acquisitions. Specifically, associations with prominent underwriters, venture capitalists, and alliance partners can enhance the gains IPO firms obtain when selling their companies. Our arguments and evidence suggest that private firms' interorganizational relationships not only can facilitate more immediate economic exchanges and performance, but also can enhance longer-term benefits in the form of higher acquisition premiums. The benefits of such signals apply similarly to domestic and cross-border acquisitions, and these benefits are more pronounced when IPO firms sell their companies to acquirers based in different industries. We hope that this study encourages more research on signaling theory in the M&A context as well as work joining the literatures on IPOs and acquisitions.

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Jeffrey J. Reuer (jreuer@purdue.edu) is the Blake Family Endowed Chair in Strategic Management and Governance at the Krannert School of Management at Purdue University. His research interests are in the area of corporate strategy. Current projects concern firms' corporate development activities, alliance governance, and applications of information economics to corporate strategy.

Tony W. Tong (tony.tong@colorado.edu) is an assistant professor in the Leeds School of Business at the University of Colorado. He received his Ph.D. from The Ohio State University. His current research examines firms' corporate and international scope decisions involving alliances, acquisitions, and multinational investment, with a focus on the role of uncertainty in shaping these activities.

Cheng-Wei Wu (wu107@purdue.edu) is a doctoral candidate in strategic management at the Krannert School of Management at Purdue University. He received his MBA from the National Taiwan University. His research interests include mergers and acquisitions, initial public offerings, and entry strategy for multinationals.

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