Network Learning: The Effects of Partners' Heterogeneity of Experience on Corporate Acquisitions

Christine M. Beckman
University of California, Irvine

Pamela R. Haunschild
Stanford University

March 2002. *Administrative Science Quarterly* (47): 92-124.

ABSTRACT

To examine the effects of interorganizational network structures on acquisition decisions, we propose a model whereby firms learn by sampling the diverse experiences of their network partners. We tested this model by examining the effect of diversity of network partners' experience on firms' acquisition decisions, using data on acquisition premiums and acquirers' stock market performance from 1986 to 1997. Results show that firms tied to others with heterogeneous prior premium experience tend to pay less for their acquisitions and have better-performing acquisitions than those tied to others with homogeneous experience. Firms also pay lower premiums when their network partners (1) have completed deals of diverse sizes, (2) have unique information, and (3) are themselves of diverse sizes. Firms that have multiplex relationships with their partners receive even more benefit. The results extend prior research on networks and learning by showing that collective network experience affects firms' decision quality.•

A substantial body of research shows that firms tend to be influenced by their network partners in decisions about and adoptions of various practices and structures. The experience of network partners is communicated in various forums and tends to be influential relative to other information sources (Haunschild and Beckman, 1998). Network partners have been found to influence many diverse practices, including campaign contributions (Mizruchi, 1992), multidivisional form adoption (Palmer, Jennings, and Zhou, 1993), and several acquisition-related activities (e.g., Davis, 1991; Haunschild, 1993; Palmer et al., 1995; Davis and Greve, 1997). Although this research has been valuable in showing that networks can affect major activities of firms, the theoretical explanations underlying these effects have been somewhat limited. There is a heavy emphasis on institutional theories, with its attendant focus on imitation and mimetic isomorphism as a driver of network influence. Institutional theories predict that firms will adopt the same practices as their network partners because their partners are conveying cultural models, systems of rules, and/or taken-for-granted assumptions that dictate which activities are legitimate (Powell and DiMaggio, 1991). So, for example, firms adopt poison pills as a defense against hostile takeovers when their network partners adopt them because these adoptions substantiate the legitimacy of the practice in question, resulting in normative pressures to adopt (Davis, 1991).[1] Or firms imitate network partners in their acquisition activities because of normative or informational influence flowing through the network ties (Haunschild, 1993).

Careful consideration of the theory of action supporting this body of research reveals limitations in terms of the range of behaviors available to firms. Firms either imitate or not, they do not learn or make inferences that result in changing the practice or structure in question. In this paper, we address this limitation by proposing a different theory of action, through which firms use the experience of their

network partners and learn by sampling that experience. Drawing on theories of statistic sampling and group decision making, we propose that firms in networks composed of partners with heterogeneous experiences will be in a better position to benefit from these experiences than firms in networks composed of partners with homogeneous experiences and will therefore make better decisions.

NETWORK INFLUENCE AND LEARNING

The experiences to which a firm is exposed through its associations with its network partners affect its decisions. The interlock network, for example, has been shown to affect firms' decisions because directors bring their experiences with similar decisions in other companies to bear on the current decision (Davis, 1996). Researchers have found support for this idea in interviews conducted with chief executive officers (CEOs), who noted that sitting on other firms' boards provides valuable first-hand information that executives then use in their own firms' decisions (Useem, 1984; Lorsch and MacIver (1989: 27). Evidence showing that networks other than board interlocks influence firms' decisions suggests this is a general network phenomenon (e.g., Galaskiewicz and Wasserman, 1989; Mizruchi, 1992; Davis and Greve, 1997) and is not limited to the interlock context. In general, networks enable forums for discussion, direct attention to new practices, and facilitate the transmission of information and normative pressures for firms to engage in certain activities.

Networks are considered a potential source of learning (e.g., Levitt and March, 1988; Powell, 1990; Uzzi, 1996), facilitating learning by promoting efficient skill transfer among firms (Hamel, 1991) or by producing novel syntheses of existing information (Powell, Koput, and Smith-Doerr, 1996; Stuart and Podolny, 1997). Other positive effects of networks come from studies documenting the power of

networks to affect outcomes like survival (Uzzi, 1996), growth (Podolny, Stuart, and Hannan, 1996), the likelihood of being taken over by another firm (Palmer et al., 1995), and the time it takes a division to get a product to market (Hansen, 1999). Thus, networks have been shown to affect firms' decisions but it is unclear if they affect the quality of these decisions. Depending on the variety of information available, firms in some network structures may make better decisions than firms in other network structures.

One important attribute of network structure that can affect decision quality is partners' heterogeneity. Firms in networks composed of partners with heterogeneous experiences should be in a better position to benefit from the variety of partners' experiences, and this benefit should be reflected in higher-quality decisions. Network partners' heterogeneity provides firms with more diverse samples of experience from which to learn. For example, if a firm is trying to determine what strategies work well in a given situation, it might look to its own prior experience with various strategies and the outcomes it experienced, but such experience is likely to be biased in various ways (e.g., March, Sproull, and Tamuz, 1991). Although some firms may learn from their own experience, others may have difficulty doing so, especially when that experience is limited. Firms therefore often look to the experiences of others, especially networked others, for guidance. Because networks tend to be stable, changes in network structure are unlikely to occur easily or frequently (Mariolis and Jones, 1982), which means that decision quality is likely to be affected by the heterogeneity inherent in a firm's current network structure.

Firms are able to make more appropriate inferences when the sample of others in their network has characteristics consistent with good experimental methodology. The experimental framework is grounded in varying conditions and in using different treatments to assess causality (Cook and Campbell, 1979). Stronger causal inferences can be made by examining both situations in which the action in question happens and situations in which it does not (Mill, 1893). In other words, good experimental methodology suggests that network partners with varying experiences will assist firms in making correct inferences about underlying causality. To make correct inferences, decision makers cannot restrict their sample to only those who have been successful with a strategy or only those who have failed. To do so is to sample on the dependent variable. Decision makers need to examine cases in which others have done both well and poorly. Statisticians and methodologists have known this for a long time (e.g., Campbell and Stanley, 1966), but there is less appreciation for the fact that firms and firm managers need the same kind of information to make good decisions (Denrell, 1999). This exposes one potential flaw behind exhortations to copy best practices or learn from successful others, which tend to focus on only one cell in the experimental design. Sampling a diversity of experiences is important.

The process through which network diversity can result in improved decisions has multiple steps. First, the diverse experiences of network partners provide firms with a variety of instrumental, normative, and procedural information. The variety of information obtained leads to better causal inferences because a firm is drawing on a sample with a wider set of action-outcome possibilities. Variance means that some examples are different from others, so a firm can see how different actions may result in different outcomes. Second, the diverse experiences of network partners increase organizational attention to existing information. Differences tend to capture our attention (Fiske and Taylor, 1984), which then

results in motivation to resolve differences in presented experiences, to dig deeper, and to learn from contrasting examples.

The group literature offers further insight into the process diversity sets in motion and the link between diverse information and improved performance. Informational diversity tends to stir constructive conflict around the issues at hand, which leads people to deliberate about the appropriate action (Jehn, Northcraft, and Neale, 1999). This deliberation, in turn, improves group performance, especially on complex tasks. Diversity among network partners creates informational diversity, so firms with diverse network partner experiences are likely to debate and deliberate these experiences more than firms with homogeneous network experience. Such debate is useful and is likely to result in improved decision making.

Testing whether network heterogeneity results in better decision making requires a context in which we can (1) assess the quality of firm actions, discriminating between those that are relatively good and those that are relatively poor and (2) examine competing explanations for why firms tend to follow their network partners' actions. Studies to date have been limited in their ability to do this for two reasons. First, studies tend to involve binary decisions in which a firm either adopts or does not adopt the practice in question. For example, firms either adopt a poison pill or they do not adopt one, and evidence for imitation comes from showing that exposure to many others that adopted a pill and/or exposure to network partners that previously adopted a pill increases the likelihood of adoption (Davis, 1991). But adoption is not necessarily a good thing, and we want to differentiate relatively good from relatively poor decisions. We have proposed that the diversity of partners' experiences affects whether

focal firms can learn and improve on their partners' experiences. Acquisition premiums offer a good context in which to develop our model because they can be related to decision quality.

A premium is the percentage spread between the trading price of the target's stock before the announcement of the acquisition and the price per share paid by the acquiring firm. Firms attempt to pay as little a premium as possible because much of the value of the target is captured in its stock price. As a result, the premium represents a standardized measure of overpayment that allows for comparison across firms. Controlling for other factors, higher premiums represent worse decisions than lower premiums because higher premiums generally depress firms' financial returns (both accounting and shareholder). In support of this, Sirower (1994) found that shareholder returns were depressed by high premiums for up to four years after the acquisition date. More recently, Hayward and Hambrick (1997) found that the higher the premium paid, the lower the short-term (one year) shareholder returns. Excessive premiums have even caused the downfall of some acquirers. Campeau Corporation, for example, paid a 124-percent premium to acquire Federated Department Stores. One year later, Campeau declared bankruptcy, citing its inability to meet the debt payments on the acquisition (Kaplan, 1989; Trachtenberg, Meinbardis, and Hiller, 1990).

Although firms would prefer to pay low premiums, premium levels rise in the presence of competitive bidders, with CEO hubris, and with the premiums of network partners (Slusky and Caves, 1991; Haunschild, 1994; Hayward and Hambrick, 1997). One might argue that firms pay higher premiums when targets are undervalued or when the combination of acquirer and target appears to be very good (e.g., synergistic), but prior studies of premium levels show premiums to be surprisingly unrelated to the

financial conditions of the target (e.g., undervaluation), the acquirer, or their combination. Although managers would like to believe that it is sometimes worthwhile to pay a high premium, empirical evidence largely counters this belief (Roll, 1986), and financial variables consistently fail to predict the level of premium that will be paid on a particular acquisition (Varaiya, 1988; Haunschild, 1994; Sirower, 1994; Hayward and Hambrick, 1997).

Network Influence on Premiums

Network partners' experiences are likely to influence premium decisions because determining how much to pay for another company is a difficult decision, subject to much uncertainty and non-financial influence (Haunschild, 1994; Wasserstein, 1998). The acquisition process, which includes the premium determination process, is "not neatly analytical and segmented" (Haspeslagh and Jemison, 1991: 41). Haspeslagh and Jemison (1991:50) noted that "company valuation will always be a subjective and imprecise exercise and should be recognized as such." Uncertainty may explain why premiums vary so widely (ranging from around zero to over 200 percent) and why financial variables are generally not useful predictors of the premium. Research shows that influence from others is greater under conditions of uncertainty (e.g., Cyert and March, 1963; DiMaggio and Powell, 1983), and Haunschild (1994) found that firms tend to turn to outsiders for information to resolve uncertainty about valuing acquisition targets. Network partners' influence on premiums is evident in the case of Campeau Corporation, which paid a 124 percent premium their "advisors had endorsed as reasonable for [them] to pay," and in the case of Merv Griffin, who relied on his accountant's advice in his acquisition of Resorts International (Mahar, 1990; Trachtenberg, Meinbardis, and Hiller, 1990: 1).

Information from network partners is also likely to affect premium decisions because these decisions involve complex information about how to value a deal and negotiate a good price, convince target management to turn over its company, and discourage competitive bids at the same time. From network partners, firms can learn about potential financing options, other industry norms for premium levels, and a variety of non-public and tacit information that may aid in negotiation and target valuation. Networks are particularly useful for conveying such complex, tacit information (Hansen, 1999). Haspeslagh and Jemison (1991: 240) noted that determining the bid price is more complicated than straightforward, and the "strategic benefits from acquisitions may be high for firms whose management teams can learn from their own experiences and from the experiences of others" (italics added).

One key source of network information comes from the experiences of a firm's board interlock partners. Interlocks have been shown to affect many firm decisions in which the board is involved, such as acquisitions, poison pills, CEO salaries, and premiums (Davis, 1991; Haunschild, 1994). Boards of directors tend to be involved in large, important decisions like how much to pay on an acquisition. A senior manager of one firm stated, "the role of our outside Board members is very active. No acquisition over 20 million -- for us not a very big amount -- will be approved without them getting seriously involved" (Haspeslagh and Jemison, 1991: 75). It makes sense that board members' experiences at other firms will be brought to bear on the firm's own decisions, and this effect has been documented in the several qualitative and quantitative studies mentioned earlier.

In an attempt to explore the influence of network partners' diverse experiences on firms' decisions, we conducted semi structured interviews with the CEOs of 12 companies. Ten of the interviews were in

mid-size to large firms, and the interviewees ranged from the CEO of a Fortune 100 firm to the CEO of a private firm with 50 employees. We conducted most of the interviews in 1997, and the interviews typically lasted 45 minutes, but they ranged from 30 minutes to over two hours. Approximately half of the interviews were tape recorded and transcribed verbatim. In the remaining interviews, we took extensive notes. We asked questions about sources of information used in making decisions about mergers, acquisitions, and new technological developments. We prompted for the use of specific information sources, such as internal sources, board members, consultants, accountants, attorneys, alliance partners, and business association members.

The individuals we interviewed recognized the importance of the tacit information that board members bring to the table and how their firms often choose board members explicitly to bring diverse experiences to the board. One CEO suggested, "…smart CEOs know the importance of a board with diverse experiences." Another CEO stated that he "actively seeks out board members with different experiences." Public statements of CEOs contain similar statements, such as "we specifically sought board members to represent new, diverse viewpoints and experiences" (Canada NewsWire, 2000). Concerning acquisitions, investors believed that the merger and acquisition experience represented among the board members of Chrysler would help with Kirk Kerkorian's takeover bid in 1995 (Stern, 1995). Firms also use the information provided by their network partners when making premium decisions. In our interviews, one CEO recounted a recent acquisition decision: "when we talked about how much to pay to acquire [company x], [board member] told us that they had paid $y for [company y] and [board member] had paid $z for [company z]." The ensuing board conversation revolved around how and why these firms paid these prices.

In general, our interviews suggested that networks help transfer the tacit, complex information involved in acquisitions, and partners' diverse experiences are beneficial in this process, but they are not the only source of potential influence on acquisitions. Firms may learn from their own past acquisition and premium experiences, although research has found that such learning is difficult because of internal politics and problems of generalization (Haspeslagh and Jemison, 1991; Haleblian and Finkelstein, 1999). In addition, Menon, Pfeffer, and Sutton (2000) found that firms tend to learn more from outsiders than insiders. Firms may learn from hired advisors such as investment bankers and from the business press and other sources of publicly available information. Prior studies that have investigated the importance of network effects on decisions when there is public information available (e.g., through the business press) show that network information tends to be more influential than other forms of publicly available information (Davis, 1991; Haunschild and Beckman, 1998). Haunschild and Beckman's (1998) study showed that for acquisition activity, network information has more impact on the decision to acquire than other publicly available sources of information. This may be due to the fact that individuals tend to be influenced more by vivid information (e.g., case studies) than pallid statistics (Nisbett and Ross, 1980). Vivid, case study type information is exactly the type of information provided by the direct experiences of network partners. In terms of acquisitions, diversity in network partners' experiences with acquisition premiums, with acquisition deal size, and with industry may influence a focal firm's premium decision, and the structure of the firm's network and its partners' sizes should contribute to the diversity as well as the firm's ability to utilize available information.

Acquisition premium diversity. When a firm has network partners who have made acquisition decisions of varied quality, this variance presents firms with unique information, increases the salience of the acquisition experiences, and encourages a more deliberate, thoughtful conversation among board members. Contrasting premium and other acquisition examples that are brought up in discussions with partners are likely to capture the attention of a focal firm's decision makers. As our interviews demonstrate, boards members talk explicitly about the premiums paid on other acquisitions that they have been involved in. If one partner pays a 120 percent premium and another partner a 40 percent premium, this warrants investigation and explanation, which may lead to insight about how the focal firm can pay a 40 percent premium. Being networked with partners who all pay 120 percent premiums (or even all 40 percent premiums) is less likely to capture attention, warrant explanation, or provide the diverse information needed to make a good premium decision. Network partners with both good and bad premium experiences have useful insights to bring to the discussion. Network partners with positive premium experiences (those that have paid low premiums) can share what they did to negotiate such a low price as well as other considerations. These firms may also create a form of peer pressure, motivating the focal firm to get as good a deal. Network partners that paid high premiums, however, also have insights to contribute. As they attempt to explain past decisions, firms that paid a high premium are likely to engage in counterfactual thinking, in which ideas about what could have been done better are considered. Such thinking is beneficial for learning (Morris and Moore, 2000). Thus, firms that paid high premiums may be able to offer insights from their own learning that those who paid low premiums cannot. Taken together, the insights from others that have paid low and others that have paid high premiums give a better base of data for the focal firm than the insights of either group alone.

Hypothesis 1a (H1a): The greater the diversity of network partners' premiums, the lower the premium a focal firm will pay on its current acquisition.

Size of the deal. When firms do acquisitions, the board discusses and usually approves the deal. The process we described earlier involves board members sharing information about their varying experiences in other acquisitions. The premium that other firms have paid is an important piece of information for firms to consider. In the same way, the size of the deal may also be important.[2] If all board members have experience with a certain size acquisition (e.g., only very large or only very small), the nuances of making certain types of deals may not emerge. For example, a firm attempting a small acquisition may learn from partners who have made deals of similar size, but it may also find that the large, complex experience of another partner helps to approach the deal with additional insights and ideas. Having both sets of experiences to draw on should help the firm with its own decision making. Firms should learn more about how to negotiate and put together a deal when their partners have experiences with deals of diverse sizes.

Hypothesis 1b (H1b): The greater the diversity of the size of network partners' acquisitions, the lower the premium a focal firm will pay on its current acquisition.

Network diversity. Another source of diverse information potentially present in the relationships between a focal firm and its network partners is the diverse information associated with having a network in which the information a firm gets from its partners is unique and nonredundant. Firms with ties to other firms that are themselves tied to many other firms will have more unique information available to them, including more unique information about premiums. Maintaining a network of partners

is time consuming, however, so firms benefit from the ability to access the most unique information with the least effort (Burt, 1992). Rather than focus on the ties among a firm's alters, as done in the literature on structural holes, we focus on the alters' ability to gather information from other firms. By focusing on the partners' partners, we can directly measure unique network information. Network diversity means firms have access to unique information about the premium experiences of their partners and their partner's partners. Thus, firms that have alters with more ties to other firms have access to more diverse information. If diverse information aids in organizational learning, firms in diverse networks should pay lower premiums than firms in less networks.

Hypothesis 1c (H1c): The greater the diversity of a focal firm's network, the lower the premium that firm will pay on its current acquisition.

Industry diversity. Another type of diversity potentially present in a firm's relationships with its network partners is diversity in the world-views of these other firms. This type of diversity is not related directly to the acquisition experiences of those other firms or the structure of firm networks. It is related to the differences between the characteristics or traits of the focal firm and the characteristics or traits of the firms in their networks. Both the literature on organizational demography (e.g., Pfeffer, 1983) and upper-echelons theory (e.g., Hambrick and Mason, 1984) suggest that diverse organizational characteristics such as industry and size are associated with diverse organizational experiences. The characteristics of firms represented on the board can be seen as proxies of information in the same way that an individual's race, age, tenure, and functional background serve as proxies for information in the demography literature (e. g., Pfeffer, 1983). According to upper-echelons theory, a top management team's functional experience exerts influence on the knowledge, perspective, and attitude of the group

(Hambrick and Mason, 1984), and the characteristics of board members can serve as proxies for the cognitive structures and processes that may influence organizational restructuring (Johnson, Hoskisson, and Hitt, 1993), such as happens in acquisitions.

Although these theories focus on individual characteristics, the types of information captured by some organizational and individual variables are similar. For example, both the heterogeneity of industries represented on the board of directors and functional background heterogeneity allow firms to access information from those with disparate experiences, different world-views, and schemas. Stasser and Titus (1987) argued that groups with different backgrounds or experiences (like industry experience) are more likely to share unique information than groups with similar backgrounds or experiences. Thus, firms with partners from diverse industries should have access to diverse information and perspectives, including diverse acquisition information and diverse acquisition perspectives, and those partners will be more likely to share their unique information. Directors from industries different from the focal firm are likely to think about different acquisition issues, ask different questions, and generally see the world in a different way than the directors of the focal firm. Such differences are again likely to increase attention, to increase the sharing of unique information, and to provide for constructive conflict and conversation about acquisition decisions. As a result, firms with boards from diverse industries should pay lower premiums than firms with boards from similar industries because diverse industries offer firms varied experiences upon which to draw.

Hypothesis 1d (H1d): The greater the diversity of network partners' industries, the lower the premium a focal firm will pay on its current acquisition.

Partners' organizational size. Organizational size offers another measure of partners' experience and has been considered an important characteristic in other work on interorganizational networks (Kraatz, 1998). Large companies have different constraints in acquisitions than small companies, and the constraints and issues should be clearer if a focal organization has exposure to both types of firms. Both large and small companies acquire, and the juxtaposition of both types of firms should help increase the diversity of acquisition information for focal firms. For example, IBM has different acquisition experiences than a small software company has, but each may learn from the contrasting experience of the other. In addition, size (like industry) is likely to represent a firm's world-view, and firms should benefit from partners with diverse world-views because such differences should generate constructive conflict and information sharing. We thus expect firms with partners of heterogeneous size to pay lower premiums than firms with partners of homogeneous size.

Hypothesis 1e (H1e): The greater the diversity of network partners' sizes, the lower the premium a focal firm will pay on its current acquisition.

Network multiplexity. Finally, we want to consider what happens in those situations that favor knowledge transfer between a firm and its network partners. Diversity in partners' premium experiences should be especially useful when other conditions that facilitate knowledge transfer exist (Beckman, 1999). One way to look at this is to through relationship multiplexity (Wasserman and Faust, 1994), or the tendency for two or more different relationships to occur together. Firms that have multifaceted relationships with a partner have stronger relationships and should be able to learn better in situations involving complex knowledge transfer. Hansen (1999) found a similar effect when he showed that weak ties interfere with performance on projects involving complex knowledge transfer (see also

Krackhardt, 1992; Uzzi, 1998). So multiple, diverse contact points between two firms are likely to create stronger relationships and to be more conducive to transferring experience. Opportunities to interact across different types of relationships increase opportunities for communication and also increase understanding between organizations. When organizations have multiple organizational affiliations with a network partner, they are more likely to attend to information from that partner because that partner is salient and important to the focal firm.

We can measure the strength and depth of the relationship by examining multiplexity. Different types of relationships (we examined interlock, strategic alliance, and CEO association membership) present different forums for interaction, broadening the knowledge sharing ability of the two firms. These different forums for interaction should, in turn, increase a firm's ability to garner the benefits of diverse partner experiences. Although different types of relationships may serve as substitutes rather than complements to each other (Haunschild and Beckman, 1998), we believe that the premium decision is sufficiently complex and confidential that the influence of the board is not likely to be replaced with other types of organizational relationships. When knowledge transfer between a firm and its partners is facilitated by a strong, deep relationship, diverse interlock-partner premium experiences should be even more influential.

Hypothesis 2 (H2): The more multiplex the relationship between a firm and its network partners, the stronger the relationship between partner diversity and the premium a focal firm will pay on its current acquisition.

DATA AND METHOD

Sample and Dependent Variables

The sample consists of the acquisitions done by the 300 largest publicly held service and manufacturing firms in the U.S. during the 1986-1997 period. Of these firms, 182 completed acquisitions of other public firms during this period. A sample of U.S.-based, publicly held firms was necessary to insure that data were available on premiums, network partners, and several of the control variables. Acquisitions that were started but not completed were included to avoid any sampling bias associated with restricting the sample to only successful acquisitions.

Premium data came from the Securities Data Corporation (SDC). The premium paid for the target is calculated by the SDC as the percentage difference between the final price per target share paid by the acquiring firm and the target's stock-price four weeks before the offer announcement. Premiums are generally calculated two to eight weeks before the announcement date to avoid stock price distortions caused by information leaks surrounding acquisition announcements (Nathan and O'Keefe, 1989). We tested whether other periods for calculating premiums affected our results. They did not, so we report four-week premiums in all analyses.

Independent Variables

To capture network-partner experience, we looked at various measures of experience associated with all 12,123 interlock partners of the focal firms in our sample. We obtained data on interlocks from 1985, 1990, and 1993 proxy statements for each firm. For 1986-1989 acquisitions, we used the 1985

interlock data, for 1990-1992, the 1990 interlock data, and for 1993-1997, the 1993 interlock data. Data on sent interlocks (a focal firm's officer sitting on another board), received interlocks (an officer of another firm sitting on the focal firm's board), and neutral interlocks (a focal firm's non-officer director sitting on the board of another firm) were all collected and analyzed together.[3] We lagged each partner variable when appropriate (H1a and H1b), so we used only partners' experiences in the three years prior to the focal firm's acquisition. We conducted various analyses with different lag structures (e.g., the entire partner acquisition experience base) and found few differences in effects. We report the three-year lag for partner experience in our results.

Premium experience of network partners. We used the SDC database to obtain data on 1986-1997 premiums paid by those firms on whose boards the focal firm's directors sat. We used the coefficient of variation of the interlock partners' premiums as our measure of partner experience diversity. The coefficient of variation is the best measure of dispersion when a variable does not have a diminishing marginal utility, or the diminishing utility does not matter to the research in question (Allison, 1978). Thus, the variance of the premium paid matters more when the mean is low than when the mean is high. We first calculated the coefficient of variation as the standard deviation of partner premiums divided by the mean partner premium (Allison, 1978). We also calculated a standardized coefficient of variation to control for the number of partner premiums. The S-measure has a range that is independent of n and is calculated as follows: V(d)/[2(1-1/n)], where V(d) is the coefficient of variation and n is the number of partner premiums (Martin and Gray, 1971). Both measures produce similar results, so, because our partner groups are of different sizes, we report the standardized measure in the analysis. Higher values of the coefficient of variation represent more diversity in partner premiums.

Acquisition size of network partners. The SDC reports all acquisitions valued in excess of $1 million. We collected data on the acquisition value for all the network partner acquisitions in the SDC database. We then calculated the coefficient of variation across partner acquisition values in the same manner as partner premiums. As for the premium variable, we report the standardized coefficient of variation. Both the standardized and non-standardized measures give similar results.

Network diversity. In order to capture information in the focal firm's network, we calculated the focal firm's direct and indirect ties (Podolny and Baron, 1997). An organization receives direct ties from network partners that sit on its board. This is the equivalent of network size. An organization has indirect ties with the partners of its network partners. Unlike many other networks examined (e.g., Burt, 1992), we have data on the relationships of the alters, or network partners, and we use the term indirect ties to indicate the alters' partners. A large number of indirect ties indicate access to unique information, but organizations seek access to the most indirect ties through the fewest direct ties. The ratio of indirect to direct ties measures network diversity, and, thus, the most efficient access to unique information. For example, if Company X is tied to Company A and B, and if Company A and B each have a tie to Company C, Company X has two direct ties and one indirect tie. The network diversity measurement for Company X is .5. Networks with high diversity have more informational diversity because they have more unique knowledge per partner tie.

Network partner industry. We measured the industry heterogeneity of the focal firm's partners using an entropy-based index, typical in the treatment of categorical variables (Ancona and Caldwell, 1992). The

measure of diversity is $-\sum P_i(\ln P_i)$, for i = 1 to x, where x is the number of categories and P_i is the proportion of partners in category i. We determined industry by the organization's two-digit Standard Industrial Classification (SIC) code. We collected industry data on the network partners from COMPUSTAT.

Network partner size. We calculated the coefficient of variation of the focal firm's network partner's size (measured as number of employees) in the year prior to the focal firm's acquisition. We collected size data on the network partners from COMPUSTAT.

Network multiplexity. W obtained data on all alliances among publicly held firms from the SDC database. We then checked each of our focal-firm-interlock-partner pairs to see whether the two firms also shared a strategic alliance and coded the multiplexity variable one if they did (22 firms had an interlock and alliance with the same partner). We obtained data on Business Roundtable and Business Council membership lists for multiple years between 1986 and 1996 to examine CEO association membership. We checked both lists for each focal-firm-interlock-partner pair to see whether members of the two firms shared a Roundtable or Council membership and coded the multiplexity variable one if they did. The multiplexity variable was coded two if the pair shared both an alliance and a Roundtable or Council membership. We then calculated the mean multiplexity of the focal firm's network partners and used that as our measure of multiplexity.

Control Variables

We employed a series of variables to help control for factors that may be related to acquisition premiums. First, we controlled for a firm's own past experience. Although a number of studies show that firms learn from experience, especially their production experience (see Argote, 1999, for a review), Haleblian and Finkelstein (1999) showed that firms generally do not learn from their own acquisition experiences. They showed that firms with more acquisition experience have poorer-performing acquisitions than firms with less acquisition experience. Given our focus on learning from others, we do not hypothesize an effect but include prior acquisition experience as a control variable. We coded the number of acquisitions completed by the focal firm during the prior three years as our measure of prior acquisition experience. This variable probably captures more than prior experience, as it controls for many possible firm-level effects, and is therefore a good general control for unobserved heterogeneity (cf. Heckman and Borjas, 1980). We also ran several analyses with alternative measures of prior experience, including the number of premiums paid by the focal firm for the entire study period and the average level and diversity of premiums paid by the focal firm on past acquisitions for the entire study period and for the prior three years. We also examined the highest and lowest premiums paid by the focal firm in the prior three years and for the entire study period.

Financial controls. We used target and acquirer size and acquirer and target profitability (normalized by industry) as financial control variables. Our size measure is total assets. The size variables were highly skewed, so we logged them prior to entering them into the analyses. Profitability was measured by return on equity (ROE), measured as of the end of the year prior to the acquisition. We also ran analyses controlling for the industry of the acquired firm, using 2-digit SIC industry dummy variables. These analyses showed little effect of industry on the premium paid. Only targets in SIC 28 (chemicals)

receive premiums significantly different from targets in other industries, so our final analyses included SIC 28 as a control variable. To control for any macro-level effects on premiums that vary from year to year, we used a series of year dummy variables to measure the year the acquisition occurred.

Deal controls. We also employed a series of variables designed to control for various aspects of the acquisition transaction. We included the number of other bidders for the target, which has been shown in several other studies to increase the premium paid. Another control is whether the acquisition was completed or not, as acquisitions that were not completed may have lower premiums than those completed, which may explain why they were not completed. A third deal control was whether the acquisition consisted of a majority-interest purchase (1 = yes), as opposed to a minority stake in the target. Finally, we controlled for the size of the deal. Because the deal size variable was highly skewed, we used the log of this variable in all analyses.

Firms can also learn from and be influenced in their premium decisions by third parties, with investment bankers being the most likely third party (Haunschild, 1994). We controlled for the possibility that the investment banker used by the acquirer affected the premium paid. To do this, we utilized a series of dummy variables measuring whether a given investment bank, of the twenty most common banks, was used on the acquisition. Very few of these investment-banker effects were significant, but two firms, Morgan Stanley and Merrill Lynch, seemed to be associated with acquisitions that involved higher premiums than other investment bankers. We thus included dummy variables for Morgan Stanley and Merrill Lynch in the analyses.

We controlled for potential synergy between acquirer and target by measuring whether they operated in the same primary industry. A variable was set to 0 if the focal firm and target were in unrelated industries, 1 if in the same one-digit SIC industry, 2 if in the same two-digit SIC industry, 3 if in the same three-digit SIC industry, and 4 if in the same four-digit SIC industry.[4]

Agency controls. Finally, we included a series of governance-oriented control variables in various analyses that have not been included in prior studies. These variables include the proportion of inside ownership of the firm, the proportion of insiders on the board, the proportion of institutional ownership of firm stock, and the concentration of ownership. Managers of firms with a large number of insiders on the board, for example, might find it easier to pay a higher premium than a firm that is more closely monitored or in which top management has less power.

Other controls. We also employed some control variables designed to capture the power or status of the acquiring firm, or the difference in power or status between the focal and target firms. Very powerful or high-status acquirers may be able to extract concessions and pay less for their targets. Firms in central network positions have more power and status than firms in other positions (Bonacich, 1987; Podolny, 1993). We thus controlled for power or status explanations through measuring firm centrality. Degree centrality is simply the number of interlock ties to other firms and is generally thought to be an indicator of exposure to information (Freeman, 1979). If the amount of information obtained from network partners helps the focal firm, rather than the heterogeneity of information, or if central firms use their power to obtain lower premiums, then centrality should be significant. For acquisitions occurring between 1986 and 1988, we used the 1985 proxy statements to calculate the centrality values. For

acquisitions occurring between 1989 and 1992, we used 1990 proxy statements, and for acquisitions occurring between 1993 and 1997, we used 1993 proxy statements.

To be sure that our partner experience diversity measure captured diversity of partner experience, not just having partners with many experiences, we also entered the number of premiums paid by the focal firm's network partners during the three years prior to the focal firm's acquisition as a control variable. Finally, we included in the analysis the mean premium paid by a firm's network partners in the three years prior to the focal firm's acquisition. We included this partly because Haunschild (1994) found mean premium paid by network partners to be significantly related to the premium paid by focal firms. We also included it to insure that our main variable of interest, partner premium heterogeneity, was not acting merely as a proxy for the mean partner premium.

Analysis

The data include both cross-sectional and time series components, so we used random-effects regression models using the generalized least squares (GLS) estimator. The random-effects estimator is the equivalent of estimating $(y_{it}-\theta y_i) = (1-\theta)\alpha+(\mathbf{x}_{it}-\theta\mathbf{x}_i)\beta+[(1-\theta)\nu_i+(\varepsilon_{it}-\theta\varepsilon_i)]$, where ν_i is the firm-specific residual, ε_{it} is the error term, and θ is a function of σ_ν^2 and σ_ε^2. By using random effects, we controlled for firm-specific variance. The data are both unbalanced (firms have between one and 15 acquisitions) and unevenly spaced (firms can have multiple acquisitions in a given year and no acquisitions for another year), and the random-effects model is robust to both considerations. The Hausman specification test demonstrates that the coefficients estimated by the fixed-effects and random-effects estimators are not systematically different, which suggests that the random-effects model is

appropriate. We also ran linear regression models with Huber/White/sandwich estimates of variance. These robust standard errors produce valid standard errors even if the correlation structure is not as hypothesized. Both models produced similar results, and we report the random effects models using the GLS estimator.

RESULTS

Table 1 presents descriptive statistics and correlations for the key study variables. The average premium paid by the sampled firms is 45 percent, which roughly corresponds to that found in other studies using slightly different samples (e.g., Hayward and Hambrick, 1997). The range of premiums paid by focal firms and their partners ranges widely, from below the target stock price to 500 percent of the target stock price. Other studies have also found a wide range of premiums (e.g., Varaiya, 1988; Haunschild, 1994; Sirower, 1994). As we expected, there is little correlation between most of our measures of partner experience heterogeneity, suggesting that these are independent measures of diversity. There do not appear to be any particularly large correlations among any of the independent variables, so multicollinearity should not be an issue. We did, however, enter each variable of interest into the analysis separately to assess its independent effect. We also compared model fit across various models, so our conclusions are valid even if multicollinearity is present.

Table 1 about here

Table 2 presents the results of analyses in which the dependent variable is the premium paid by the focal firm. Model 1 of table 2 is the base model, containing only the control variables. As can be seen from model 1, some of the deal-control variables are significant. The number of competitive bidders has a particularly strong effect on increasing the premium. This is consistent with several prior studies of premiums (e.g., Hayward and Hambrick, 1997). We also see from model 1 that large deals result in higher premiums. Also consistent with prior studies, few of the financial control variables are significant. Larger targets tend to command lower premiums than smaller targets, but profitability (both target and acquirer) has no effect on premium. We also ran models in which we entered the relative size difference between the acquirer and target and profitability difference between acquirer and target, as it may be relative rather than absolute levels that matter, but we found no effects. Premiums were particularly high in 1988 relative to other years, and targets in the chemicals industry (SIC 28) commanded higher premiums than those in other industries.

Most of the agency-related control variables had little effect, with the exception of the proportion of insiders on the board. The larger the proportion of insiders on the board, the lower the premium paid. This effect is opposite to the traditional agency explanations, which would predict that more weakly monitored firms would pay higher premiums in order to get a deal done. The agency-variable effects do not change in models in which each variable is run separately. Thus, it appears there is only weak evidence that the agency situation of the firm affects premiums, and what evidence exists is contrary to traditional explanations.

Results also show that investment bankers affect premiums. Firms using Morgan Stanley as their investment banker paid significantly higher premiums than other firms. These firms may have paid higher premiums because of the type of deals that Morgan Stanley tends to advise on, because of the strategies they advocate, or because firms sometimes choose their bankers for status reasons (Podolny, 1993).

Table 2 about here

Model 1 of table 2 also shows no evidence of prior learning, which was measured by the number of acquisitions done by the focal firm in the prior three years. The analyses with alternate specifications of the prior experience variable (number of premiums paid by the focal firms for the entire study period; the average and diversity of premiums paid by the focal firm on past acquisitions for the entire study period and for the prior three years; and the highest and lowest premiums paid in the prior three years and for the entire study period) showed no significant effects (details of these analyses available from authors). None of these variables were related to the current premium. As Haleblian and Finkelstein (1999) noted, this lack of effect may be due to firms not having enough experiences to learn from. Only 20 percent of the firms in our sample completed more than one acquisition in the prior three years, and such limited experience is difficult to learn from (March, Sproull, and Tamuz, 1991).

Model 1 in table 2 demonstrates no evidence for centrality effects or for the number of premiums paid by network partners. This suggests that the number of ties, or amount of potential information available, does not assist the focal firm. There is a significant negative effect for the mean partner premium. This

effect is opposite to that found by Haunschild (1994), a difference that may be due to sample differences. We included many larger firms in our sample, studied a different time period, and also included many more control variables. The negative mean partner premium effect disappears when three outliers with very low mean premiums paid by partners are eliminated. This suggests that there may not be a robust relationship between the mean partner premium and the focal firm premium paid in our sample. In addition, small firms pay higher premiums than larger firms. Thus, outliers and size differences among sampled firms (and also possibly an improved analysis technique, random effects GLS regression vs. OLS regression) explain the differences between our results and those of Haunschild (1994).

Model 2 presents the basic analysis of partner premium heterogeneity. In support of H1a, model 2 shows that the higher the variation in partner premiums, the lower the premium paid by the focal firm. The increase in model fit from model 1 is significant. Thus, the more heterogeneous the premiums paid by a focal firm's network partners during the past three years, the lower the premium paid by the focal firm. This supports the idea that firms are learning from the heterogeneous experience of their network partners**.** Each one-unit increase in partner heterogeneity results in a 16 percent reduction in the premium a focal firm pays on an acquisition.

Model 3 in table 2 demonstrates the effect of partner acquisition-size diversity on the premium paid. In support of H1b, model 3 shows that when a firm has network partners who have done acquisitions of various sizes, the firm pays a lower premium. So, not only do firms learn from the diverse premiums of their network partners, they learn when their network partners have engaged in acquisitions of diverse sizes.

Model 4 of table 2 includes the measure of network diversity. In support of H1c, firms whose networks are diverse pay lower premiums than firms in networks with less unique information. This suggests that firms gather unique, diverse information from alters' network partners, and the information helps them to pay lower acquisition premiums, but this effect seems to be sensitive to outliers. When premiums greater than three standard deviations are dropped, the network diversity effect is not significant (.11), although the effect is still in the right direction. Thus, the network diversity effect may not be as robust as the other findings, although removing the low outliers does not affect the result.

Model 5 in table 2 shows no support for H1d. Having network partners from diverse industries has no effect on the premium a firm pays. Although this type of diversity may be useful for other types of decisions, it does not seem to be important for the acquisition decision. We did, however, find support for H1e in model 6. Firms whose network partners are themselves of diverse sizes pay lower premiums than other firms. Size matters, both in terms of the size of partner acquisitions and in terms of the size of the partner firm (H1b and H1e). Firms benefit when they have both large and small network partners.

In model 7 of table 2, we enter all of the significant diversity effects into the model. All four diversity measures have independent, significant effects on the premium paid. Firms whose network partners have diverse premium experience, whose partners have experience with acquisitions of heterogeneous sizes, whose networks are diverse, and whose partners are themselves of diverse sizes all pay lower premiums. These different types of heterogeneity all seem to aid firms in their acquisition decisions and help them to pay lower premiums.

In models 8 and 9 of table 2, we examine whether the benefit of heterogeneous partner experience is stronger for those firms that have multiplex relationships with their partners (H2). Model 8 adds the multiplexity variable. Model 9 adds the interaction of multiplexity and partner experience diversity. To address potential multicollinearity between main effects and interaction terms, we centered the variables prior to calculating the interaction, a procedure recommended by Cronbach (1987). As can be seen in model 9, and in support of H2, the coefficient on the interaction term is significant and negative, which shows that firms that have multiplex relationships with their partners get even more benefit from partners' experience, paying lower premiums than firms with less multiplex relationships with their partners. The increase in model fit relative to the model with main effects alone (model 8) is significant. In other models (not shown), we also examined the interaction of multiplexity and other types of diversity (partners' acquisition sizes, network diversity, and partners' sizes). We found that multiplexity increases the benefit of partners' acquisition size diversity and size diversity. Overall, we found support for the idea that firms benefit more from partners' diverse experiences when the relationship between a focal firm and its partners is stronger. Multiplexity strengthened three out of the four significant main effects of diversity.

Table 3 about here

Alternate Explanations

Despite the strong evidence between different types of heterogeneity and current premium levels of focal firms, our findings are open to interpretations other than learning. For example, it may be that those that know how to do favorable (low-premium) acquisitions form or join networks with partners that have diverse prior experiences with premium decisions. Although it is unlikely that we would find evidence across all four diversity measures if some alternate explanation were operating, we conducted a series of analyses designed to rule out such explanations. Our earlier discussion implies that firms are learning from their partners' prior experiences. This means we need some evidence consistent with the occurrence of knowledge transfer between a focal firm and their network partners. We can use the lag structure of the diverse experience variables to test this alternate explanation, or any alternate explanation that involves a factor associated with both being in diverse networks and paying low premiums. One way to use the lag structure to do this is to investigate whether current premiums paid by partners has the effect of reducing current premiums paid by the focal firms. If firms learn from past experience, the current premiums of partners should be nonsignificant or weaker than our other heterogeneity effects because the experience of network partners, especially the effects of diverse experience, should not be immediately transferable. Some time needs to elapse for this experience to be communicated, understood, and incorporated into my firm's decision making. Similarly, future premiums paid by partners should not reduce current premiums paid by the focal firms. It is unlikely that firms will be able to learn from the future experience of other firms. Although it is possible that network partners have learned something that will help them pay lower premiums at a later date as well as help the focal firm pay lower premiums now, the effect should be weaker.

Model 1 of table 3 shows that current partner premium heterogeneity and future partner premium heterogeneity do not significantly affect the premium paid by the focal firm.[5] We found only past partner premium experience to be significant (we also entered each variable separately and found the same results). Thus, we have evidence that the partner experience variable has to be lagged to have an effect – only experience that occurred one or more years ago affects the premium paid by the focal firm.

Still another alternate explanation is that firms learn more from extreme success or failure than from diversity. Firms may learn more from homogeneously good or homogeneously bad partner experiences than from heterogeneous experiences. Sitkin (1992) suggested that failure, because of its salience, offers a particularly potent generator of inferential learning. Miner et al. (1999) studied collective reactions to firm failure and found evidence that failure drives organizational change and (in some cases) improvement (see also Kim and Miner, 2000). Studies of learning from success, in contrast, focus on firms imitating or replicating the routines of apparently successful others (e.g., Burns and Wholey, 1993). If firms do learn from extremes, we should find that they are influenced by the lowest premiums of their network partners or by network partners with homogeneously low premiums. In both cases, we still may find firms learning from network partners, but it would be learning from a single network partner or a set of network partners with very positive or very negative experiences.

We created four measures to examine these alternate explanations. We coded the maximum and minimum premium paid by a single network partner in the three years prior to the focal firm's acquisition. To capture homogeneously low and homogeneously high partner premium experience, we first split the premium heterogeneity measure at the median. Firms with partner experience heterogeneity

less than the median were classified as homogeneous. We then split the partner premium levels at the median to further split these firms into homogeneous high and homogeneous low premiums. Thus, firms with partner heterogeneity values less than the median and partner premium values less than the median were classified as having homogeneous low partner premium experiences. Those tied to others that had heterogeneity values less than the median and partner premium values above the median were classified as having homogeneous high partner premium experiences. Firms whose partners were above the median in terms of premium heterogeneity were coded into the heterogeneous partner group. We also experimented with quartile splits and found similar results.

Model 2 of table 3, which examines the lowest and highest premiums paid by a firm's network partners, shows that firms are not learning from either success or failure alone. In analyses not presented here, we examined the highest and lowest partner premiums separately. In neither case did we find individual partner premiums to be significant; firms appear to learn from others only when the experiences of network partners are taken together. We also examined the minimum and maximum acquisition size of network partners (paralleling H1b) and did not find those variables to be significant. In model 3, we examine firms whose partners have paid homogeneously high premiums. Contrary to the learning-from-failure theories, firms pay higher premiums when their network partners pay high premiums. Model 4, which examines firms whose partners have paid homogeneously low premiums, produces no effect. Comparing models 3 and 4, firms whose partners have paid homogeneously low premiums are better off than those firms whose partners have paid homogeneously high premiums. Model 5 reiterates H1a and demonstrates that firms whose partners have paid heterogeneous premiums pay the lowest premium of all. When the heterogeneous partners are included in the model, firms with homogeneously high

partner premiums are no worse off than firms with homogeneously low partner premiums. Thus, it appears that diversity in network partners' experience is the most important type of diversity from which a firm can learn. Taken together, the results suggest that firms do learn from the heterogeneous acquisition experience of their network partners. We found no evidence for the alternative explanations we explored.

Acquisition Profitability

We discussed earlier how paying a lower premium has been shown to result in more favorable market reactions to acquisitions (Sirower, 1994; Hayward and Hambrick, 1997). In the current study, we sought to demonstrate more directly the importance of diverse partner experience for firm performance. In supplementary analyses, we directly examined whether firms in networks with diverse partner experience have better-performing acquisitions than those with homogeneous partner experience. We measured acquisition performance as the abnormal stock returns experienced by the focal firm during the period surrounding the acquisition. This measure, known as CAR (or cumulative abnormal returns) is used in the finance literature as an indication of acquisition performance and has been used in recent organizational studies of acquisition performance (e.g., Hayward and Hambrick, 1997; Haleblian and Finkelstein, 1999). [6] We found no immediate effects on acquisition performance, but there were some longer term effects.

Models 6 and 7 in table 3 include one-year cumulative abnormal returns as the dependent variable and all of the control variables from the premium analyses. To measure heterogeneous partner experience, model 6 includes a dummy variable for firms whose partners have the most diverse premiums (in the top

quartile of the diversity scale). As shown in model 6, those firms whose partners have very diverse partner premium experience have better-performing acquisitions (i.e., they experience higher one-year cumulative stock returns) than firms whose partners have less diverse experience. This result further supports the benefits of diverse partner premium experience for the focal firm. The effect, however, seems to be restricted to the firms that are in these highly diverse networks, as we found nonsignificant (but positive) results when using the continuous heterogeneity measure. Model 7, which examines firms whose network partners are of heterogeneous size, shows that firms whose network partners are of diverse size have more profitable acquisitions than firms whose network partners are of more homogeneous size. We also examined partner acquisition size diversity and network diversity, but we found neither type of diversity to have an influence on acquisition profitability. Given the many factors that can influence acquisition performance, finding evidence that any type of diverse network partner experience increases acquisition returns suggests the power of network diversity on firm outcomes. Because many factors influence acquisition performance, however, and because premiums are a much closer link to the process we are describing, we do not want to overemphasize these results.

DISCUSSION AND CONCLUSIONS

Network partners' experiences clearly affect the price paid for firm acquisitions. Thus, returning to our question how the experience of other firms affects a focal firm's learning and decision making, it appears that heterogeneous interfirm networks facilitate such learning. This is supported by evidence showing that firms in networks with heterogeneous partner experience pay lower premiums than those in networks with homogeneous partner experience. We found several types of partner heterogeneity to be important: firms pay lower premiums when their network partners pay diverse premiums, when they

have diverse networks, when their network partners have experience with acquisitions of various sizes, and when the network partners are themselves of diverse sizes. These types of diversity aid organizations by providing a wide array of information to help make better causal inferences.

We did not, however, find evidence that partner industry diversity aids learning, which suggests we need to better understand why some types of diversity are important and others are not. Industry diversity may be so salient that it allows firms to discount differences in acquisition experience rather than delve deeper into the differences. Industry may be a more salient reason in explaining different acquisition experiences (i.e., the pharmaceutical industry is willing to pay more for acquisitions) than acquisition size or even network partner size. If the benefits of diversity result from an in-depth conversation about the source of differences (constructive conflict), then diversity may be more beneficial on dimensions that are less salient to the group. In fact, if we examine the interaction between industry similarity and partner premium diversity, the effect of premium diversity is stronger (firms pay lower premiums) when network partners are from similar industries. Perhaps firms learn more from diversity when it cannot be easily discounted, as it can be with very salient attributes. This possibility offers an interesting topic for future research.

Another question to be addressed in more detail is why the other four diversity measures (acquisition premiums, acquisition size, network diversity, and network partner size) all have independent effects on the premium paid by the focal firm. Our findings are similar to those in demography research, in which age, gender, race, and tenure all can have independent effects. If these types of diversity generate task-relevant conflict, which improves performance (Jehn, Northcraft, and Neale, 1999), the different types

of diversity create beneficial conflict for different members of the board. Although the process may be the same, each type of diversity may initiate the process with different network partners, e.g., the smaller partners, or partners that have unique networks. Our results suggest that multiple types of diversity can benefit the firm, but the differences cannot be easily explained by a salient categorization (i.e., industry). Furthermore, the congruence of our findings with the demography and group research point to an important contribution of our study: regularities exist across levels of analysis, and these regularities need to be further explored. Our results add to research suggesting connections across micro and macro levels of analysis. The demography research on top management teams has found heterogeneity to be an important variable (Williams and O'Reilly, 1998), group research has examined the types of conflict that result from heterogeneity (Jehn, Northcraft, and Neale, 1999), and the organizational learning literature has examined the trade-offs between heterogeneity and standardization (Argote, 1999) and has found causal heterogeneity to be a benefit for learning processes (Haunschild and Ni, 2000). The current study shows the importance of heterogeneity at yet another level, the interorganizational (or collective) level. If similar processes explain outcomes both in experimental groups and interorganizational relationships, future research could fruitfully examine the larger social processes that transcend these multiple levels of analysis.

It is important to note that it is the diversity of partner experiences that leads to better decisions. It is not simply having a large number of partners or even having a large number of partner experiences. We controlled for the number of partners with our network centrality measure. We controlled for the amount of partner experience by measuring the number of premiums paid by network partners and by standardizing our diversity measures. Also, partner premiums at the extremes (very high or very low) do

not explain the results. Diverse partner experiences reduce the premium paid and sometimes result in better-performing acquisitions. Firm performance is notoriously difficult to predict (March and Sutton, 1997), so finding a positive impact of partner experience on acquisition performance demonstrates the power and importance of our findings.

Organizational Networks and Learning Theories

Our results have important implications for existing theories of organizational networks and learning. First, by demonstrating that network information affects premiums, we add to existing studies that discuss how networks can be a source of learning for firms (e.g., Powell, 1990). Additionally, one of our key findings demonstrates that multiplex relationships increase learning benefits and that learning is not restricted to the interlock context. Other types of network relationships (e.g., alliances) increase the benefit of diverse experiences of interlock partners. Few studies have shown the effects of multiplex network relationships on firm outcomes.

Learning theories have become central in our understanding of organizations (Miner and Anderson, 1999), and there now exists a large body of research on different learning processes and outcomes (for recent reviews, see Argote, 1999; Miner and Anderson, 1999). Our study begins to fill two important gaps in the work on organizational learning. First, we examined interorganizational or collective level of learning. Learning theories have moved from individual to group to organizational levels of analysis, and almost all empirical work is at these levels. Levitt and March (1988) pioneered theoretical discussions of the processes that might be involved at higher levels, but until recently, theorizing has stopped short of the interorganizational or collective levels (Argote, 1999; for exceptions, see Miner and Haunschild,

1995; Miner and Anderson, 1999). Our study is important to moving research on learning to these higher levels not only because of its empirical focus, but also because our source of learning (variation in the distribution of others' experience) only applies at the collective level. This source cannot be a property of a single organization, group, or individual. In effect, the network functions as a form of memory, a crucial element of learning. Our focus on this collective experience allows us to abstract beyond the experience of a particular partner, which is a crucial focus for work in this area (Miner and Anderson, 1999).

Our study also addresses a second important issue in organizational learning theories, which is the issue of whether success or failure is a better driver of learning. As noted earlier, scholars have recently focused on the potential benefits of both organizational failures and failures of specific routines or practices for learning (Sitkin, 1992; Miner et al., 1999; Kim and Miner, 2000). This research stands in contrast to earlier work, which focused more on learning from successes (e.g., Burns and Wholey, 1993). In fact, much of the management literature on benchmarking has adopted the perspective that in order to be successful, one needs to find successful others and do what they are doing. Those studying failure argue that at least in some situations, failure may produce even more benefit than success for firms and collectivities (Sitkin, 1992; Miner et al., 1999). What we found is that neither failure alone nor success alone is enough -- it is the combination that is necessary for good inference. The contrasting information contained in successes and failures is what produces better learning processes and learning outcomes. We believe that earlier work on the benefits of failure implicitly assumes this contrast, but our current work makes this explicit. Showing the explicit benefits of both failure and success suggests fruitful areas for future work on various sources of learning by organizations and collectivities.

Learning over Time

Our results have interesting and important implications for the impact of learning and networks over time. Many studies have discussed the benefits of having close ties and long-term relationships with others in one's network. Such ties are proposed to promote trust, learning, and other assorted benefits (Powell, 1990; Gulati, 1995; Uzzi, 1996). While these benefits no doubt occur, our results suggest a downside to such networks as well: a reduction in diversity due to a lack of new experiences entering the network. Our findings thus contribute to prior work showing the detriment of close ties (Uzzi, 1996, 1998). Very close, long-term relationships are likely to result in network homogeneity, reducing the diversity of experiences and turnover in the network.

A reduction in diversity has interesting implications for the dynamics of network learning at the population level of analysis (Miner and Haunschild, 1995; Miner and Raghavan, 1999). Firms with diverse ties pay lower premiums than those with homogeneous ties. These lower premiums then enter the experience base of those other firms to which they are networked. The problem is that without new ties, diversity will be driven out of the system. The implication is that the network (and the relevant industry or population) of organizations will gradually move toward lower and lower premiums until much of the diversity is out of the system and premiums again rise as firms can no longer learn from others. We may see, for example, industries getting stuck in particular practices, unable to innovate, because the diversity has been driven from the industry's experience base. Future studies investigating these population-level implications of the effects of network diversity are needed.

Many of the limitations in our knowledge about the effects of interfirm networks on learning could be addressed by closer scrutiny of both networks and information diversity. For example, other types of networks could be investigated. The interlock network is important for board-level decisions, but other networks may be influential for other types of decisions. In fact, our multiplexity measure showed interesting interactions among different networks that a firm might have. Furthermore, although we investigated several different types of diversity that may affect learning from networks, others remain. For example, firms may benefit from ties to both young and old organizations and to both for-profit and non-profit firms. The effects of these different types of diversity need further exploration.

Institutional Theories

Our results also suggest an important extension to institutional theories of organizations. Several studies have now shown that firms tend to be influenced by their network partners' actions. The underlying assumption of these studies is that firms do as their partners are doing -- adopt what they adopt, decide what they decide. The institutional theory prediction in our study would be that if firms were imitating their partners, they would pay a premium close to the average of what was paid by their partners. Or firms may pay premiums similar to those paid by subgroups of partners, such as those that are similar to the focal firm (Kraatz, 1998; Haunschild and Beckman, 1998). Theories of mimetic isomorphism (DiMaggio and Powell, 1983) do not predict that firms will do something different, improving on their partner's experiences. Our results show that when firms are in networks composed of partners with heterogeneous experiences, they are not imitating, they are improving on partners' experiences and paying lower premiums. Network diversity provides the possibility for learning.

Our result differs from the predictions of many economic models of innovation and information diffusion, which suggest that imitation results in the adoption of better practices (for a summary, see Rogers, 1995). If firms are imitating, then those firms that are in networks composed of partners that made uniformly good decisions (those making homogeneously low premium decisions in our case) should be better off than those firms in networks with more heterogeneous experience. We found that network heterogeneity is better than network homogeneity, even homogeneous success. One explanation is that as boundedly rational decision makers (Simon, 1955), we use local sources of information as data from which to make inferences. The problem with imitating others when the experience base of those one imitates is homogeneously poor is fairly clear. If there are no good examples to compare with, then bad begets bad. But exposure to only good examples is perhaps equally bad, because there are no contrasting experiences that allow firms to recognize and benefit from their partners' good experiences. Thus, the problems of limited sampling and sampling on the dependent variable can be found in the interorganizational arena, where network partners' experiences provide the sample.

Limitations and Future Research

We assume that firms with heterogeneous experience or heterogeneous characteristics are engaging in different behaviors to produce those outcomes. A research design that delves more deeply into behavioral diversity, examining what these other firms are doing in order to achieve their premiums and then examining how these different behaviors translate into a focal firm's learning, would help clarify the process underlying the effect of partners' experience diversity or homogeneity on firm decisions. Not only does a firm need to understand its own motivations and needs, it needs to understand the target's motivations in order to negotiate a successful deal. Acquisition decisions, then, are more social than

other types of decisions that do not require insights about other firms in order to succeed. Partner diversity may be more beneficial for these types of decisions than for decisions that are more technical. Examining the acquisition process in more depth would help our understanding of how the diverse experiences of network partners actually translate into better decisions. Rather than technical information being salient, perhaps normative ideas about appropriate premiums or peer pressure to get a better deal drive the effects we found. A process study, therefore, would offer rich data on how the learning process occurs. Although it was not possible to measure process in this study, we found evidence consistent with the processes described in the group research. Our findings on the significant impact of multiple types of heterogeneity, in conjunction with the group research on the processes by which diversity may aid firms, support the idea that firms are learning about acquisitions from their network partners, which allows them to pay lower premium prices.

Our study contributes to the increasingly large body of work suggesting that social relations affect economic action (Granovetter, 1985; Zukin and DiMaggio, 1990). We show that the informational properties of networks can affect major strategic decisions. The distribution of knowledge in a network helps an organization to learn. This presents new opportunities for theory development and also demonstrates the importance of network structure. We need to recognize the value of networks containing diverse experience information. Fortunately, given the dynamic nature of organizational populations, we can hope that experience diversity will not soon be driven out.

Table 1

Descriptive Statistics and Correlations for Key Study Variables (N=458)

Variable	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Focal premium	44.83	50.68	-57.33	578.40															
2. (Log) Deal size	5.26	2.11	-.69	10.29	.09														
3. Number of competing bids	.13	.38	0	2	.22	.21													
4. Completed acquisition	.83	.38	0	1	.01	-.03	-.20												
5. Synergistic acquisition	1.54	1.54	0	4	-.01	.20	.04	-.08											
6. Focal firm centrality	15.06	8.07	0	45	.00	-.11	-.02	.11	-.10										
7. Acqsn. type	.76	.43	0	1	.19	.52	.19	.06	.10	.05									
8. (Log) Focal size	9.23	1.19	5.90	12.52	-.15	.05	-.13	-.03	-.08	.31	-.14								
9. (Log) Target size	5.78	1.93	.90	12.05	-.14	.57	.07	-.07	.24	-.07	-.02	.23							
10. Target ROE	1.16	9.90	-39.60	115.41	-.03	.06	.05	-.01	.07	.09	.05	-.01	.14						
11. Focal ROE	-16.30	211.11	-1918.00	1974.46	.01	.08	.05	-.04	.06	-.02	.12	-.04	-.03	-.02					
12. Target in SIC 28	.09	.29	0	1	.10	.06	.04	-.06	.19	.00	-.02	-.08	-.08	.03	-.01				
13. IBank Morgan Stanley	.10	.30	0	1	.12	.23	.02	.04	.11	-.11	.14	.00	.12	-.01	.07	.10			
14. IBank Merrill Lynch	.03	.17	0	1	.08	.03	.04	-.05	.05	.01	.07	-.09	.03	.13	-.04	-.01	-.06		
15. Prop. insiders on board	30.26	9.26	8.33	72.22	-.11	-.05	-.08	-.04	-.02	.01	-.11	.10	.05	.00	-.04	.16	.12	.01	
16. % Institutional investors	51.11	10.79	0	91.10	-.03	-.10	.02	-.01	-.02	.06	-.04	-.09	-.14	-.05	-.03	.06	-.21	-.03	-.02
17. Ownership concentration	10.12	11.18	0	76.40	.00	-.08	.01	-.01	-.01	-.13	.00	-.14	-.03	-.01	.06	-.13	-.10	.01	.06
18. % Insider ownership	.05	.05	0	.31	-.03	-.13	-.07	.05	.03	-.10	-.11	-.09	.04	.02	-.11	-.16	-.09	.08	.06
19. N partner premiums	6.74	4.72	1	30	.02	.03	-.02	.09	-.15	.25	.09	.25	-.02	.00	-.08	-.03	-.03	.00	.03
20. N focal premiums	.73	1.12	0	6	-.05	-.15	-.11	.06	-.05	.06	-.21	.18	.04	.06	-.06	-.05	-.05	-.02	.09
21. Mean partner premium	43.19	22.16	-73.04	127.93	-.10	.01	.01	.00	.01	.10	.06	.03	.10	.11	-.02	-.01	-.01	.05	.00
22. Ptnr. premium heterogeneity	.63	.40	0	4.85	-.06	.11	.08	-.03	.02	-.15	.00	.04	.03	-.27	-.01	-.02	.04	-.06	.00
23. Ptnr. acq. size heterogeneity	.86	.26	0	1.80	-.12	.12	-.07	.01	.04	.03	.03	.18	.13	.08	-.06	.03	-.01	-.03	.02
24. Ptnr. industry heterogeneity	2.31	.54	0	3.09	-.06	.02	-.01	.07	-.12	.56	.08	.27	-.02	-.01	-.06	-.06	-.10	-.01	-.15
25. Ptnr. size heterogeneity	1.44	.39	1	2.76	-.10	-.02	.03	.01	.04	.12	.00	.04	-.01	-.04	-.07	.07	-.04	-.05	.07
26. Network diversity	3.83	2.56	0	23	-.06	.03	-.02	-.02	-.07	.04	.08	.08	-.05	-.01	.03	-.06	-.07	.01	-.17
27. Ptnr. premium het. (Y0)	.52	1.83	-11.72	22.17	-.04	.01	.00	.03	-.03	-.05	-.05	.13	.05	.03	.03	-.02	-.01	.01	-.05
28. Ptnr. premium het. (Y+1--Y+3)	1.42	9.62	0	206.26	-.02	-.01	-.01	.02	.04	.02	-.08	.04	.01	-.01	-.02	-.02	-.01	-.02	.00
29. Max. ptnr. Premium	97.92	60.64	-73.04	578.40	-.03	.02	.02	.02	-.09	.13	.09	.16	.03	.02	-.04	-.03	-.05	.00	.00
30. Min. ptnr. Premium	3.06	28.64	-73.04	112.77	-.09	-.05	-.07	-.04	.08	-.06	-.03	-.13	.05	.08	.11	.00	.05	.01	-.03
31. Tie multiplexity	.01	.45	-.45	1.45	.06	.07	-.07	.04	-.11	.14	.05	.31	.03	-.11	-.01	-.02	.08	.01	-.01
32. Acquisition profitability	-.06	.45	-2.12	2.05	.06	.04	.07	-.05	.02	-.05	.06	-.08	-.07	-.02	.01	.05	.02	-.07	-.02
33. Ptnr. premium homo. low group	.44	.50	0	1	.12	-.04	.05	.02	.00	-.09	.10	-.25	-.14	-.01	.06	-.02	.06	.10	.06
34. Ptnr. premium homo. high group	.31	.46	0	1	-.05	-.03	-.11	.04	-.02	.16	-.08	.18	.09	.06	-.03	.04	-.03	-.01	.00
35. Ptnr. premium het. group	.25	.43	0	1	-.07	.08	.02	-.03	-.02	-.04	.01	.15	.06	-.09	-.01	-.04	.00	-.10	-.06

Variable	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
16. % Institutional investors																			
17. Ownership concentration	.09																		
18. % Insider ownership	-.09	.46																	
19. N partner premiums	.01	-.07	-.13																
20. N focal premiums	-.05	-.02	.19	.02															
21. Mean partner premium	.00	.06	-.05	.10	-.10														
22. Ptnr. premium heterogeneity	.08	.03	.03	-.12	.09	-.36													
23. Ptnr. acq. size heterogeneity	.04	-.08	.01	.15	-.02	-.11	.04												
24. Ptnr. industry heterogeneity	.07	-.10	-.10	.29	-.04	.14	-.07	.03											
25. Ptnr. size heterogeneity	.09	-.05	.02	.05	.12	-.02	.03	.03	.13										
26. Network diversity	-.03	-.04	-.13	.18	-.12	.03	-.03	-.05	.32	-.04									
27. Ptnr. premium het. (Y0)	-.02	.01	-.01	-.01	.00	.10	-.09	-.02	.04	.00	.05								
28. Ptnr. premium het. (Y+1--Y+3)	.00	.00	.00	.04	.01	.01	.00	-.02	.03	-.05	.02	.00							
29. Max. ptnr. Premium	.04	.03	-.06	.55	.04	.57	-.03	-.07	.20	.04	.10	.05	.05						
30. Min. ptnr. Premium	-.05	.00	.04	-.46	-.13	.53	-.39	-.09	-.11	-.11	-.11	.10	-.01	-.11					
31. Tie multiplexity	-.07	-.06	-.03	.34	.07	-.05	.05	.11	.21	-.01	.10	.00	.01	.14	-.32				
32. Acquisition profitability	.08	.00	-.08	.06	-.02	-.10	.06	.02	.01	.10	.03	-.02	-.08	-.02	-.06	-.05			
33. Ptnr. premium homo. low group	-.03	.02	.10	-.08	-.14	-.36	-.18	-.01	-.27	-.05	-.11	.01	-.05	-.32	.02	-.16	.00		
34. Ptnr. premium homo. high group	-.02	-.02	-.08	.09	-.06	.63	-.36	-.05	.22	-.08	.06	.11	.07	.24	.38	.09	-.10	-.60	
35. Ptnr. premium het. group	.03	-.02	-.03	.15	.27	-.25	.57	.15	.13	.13	.05	-.11	-.02	.18	-.51	.18	.11	-.48	-.29

Table 2

Results from Random-effects GLS Regression of Premium Paid (N = 458) *

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
(Log) Deal size	3.144 •	3.454 •	3.327 •	3.157	3.297	3.116	3.624 •	3.226	3.239
	(1.840)	(1.835)	(1.835)	(1.837)	(1.841)	(1.831)	(1.815)	(1.835)	(1.826)
Number of competing bids	21.310 ••	23.081 ••	20.546 ••	20.916 ••	21.400 ••	22.304 ••	22.785 ••	23.492 ••	22.979
	(6.532)	(6.537)	(6.515)	(6.522)	(6.523)	(6.513)	(6.489)	(6.538)	(6.511)
Completed acqsn. (1 = yes)	2.415	2.397	2.412	1.870	2.325	2.342	1.709	2.006	2.308
	(6.204)	(6.170)	(6.178)	(6.200)	(6.195)	(6.172)	(6.105)	(6.165)	(6.137)
Synergistic acqsn.	-1.558	-1.455	-1.469	-1.638	-1.683	-1.358	-1.257	-1.244	-1.316
	(1.583)	(1.575)	(1.577)	(1.581)	(1.583)	(1.578)	(1.560)	(1.581)	(1.574)
Acqsn. type (Majority = 1)	6.238	6.640	6.821	6.838	6.770	7.873	9.529	6.778	7.004
	(7.741)	(7.701)	(7.715)	(7.734)	(7.739)	(7.735)	(7.655)	(7.723)	(7.688)
IBanker Morgan Stanley	18.013 •	18.815 •	17.406 •	17.126 •	17.866 •	17.497 •	16.656 •	17.376 •	19.806
	(7.970)	(7.933)	(7.943)	(7.972)	(7.960)	(7.933)	(7.867)	(7.956)	(7.992)
IBanker Merrill Lynch	23.876	23.500	23.061	24.630	23.616	22.217	21.871	23.059	24.299
	(13.734)	(13.659)	(13.684)	(13.713)	(13.716)	(13.684)	(13.526)	(13.660)	(13.606)
(Log) Focal size	-2.766	-2.326	-2.095	-2.590	-2.492	-2.806	-1.479	-3.057	-3.244
	(2.298)	(2.293)	(2.310)	(2.296)	(2.303)	(2.286)	(2.290)	(2.342)	(2.332)
(Log) Target size	-4.832 ••	-4.919 ••	-4.699 ••	-4.956 ••	-4.884 ••	-4.868 ••	-4.955 ••	-4.842 ••	-4.973
	(1.768)	(1.759)	(1.762)	(1.766)	(1.766)	(1.760)	(1.741)	(1.759)	(1.752)
Adj. target ROE	-0.006	-0.013	-0.003	-0.006	-0.007	-0.008	-0.012	-0.012	-0.016
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
Adj. focal ROE	-0.089	-0.113	-0.112	-0.080	-0.113	-0.123	-0.157	-0.128	-0.139
	(0.233)	(0.232)	(0.233)	(0.233)	(0.233)	(0.233)	(0.230)	(0.232)	(0.231)
Target in SIC 28	17.851 •	17.246 •	18.210 •	17.314 •	17.438 •	18.593 •	17.760 •	16.408	15.814
	(8.530)	(8.487)	(8.497)	(8.519)	(8.523)	(8.493)	(8.399)	(8.495)	(8.459)
Year 1986	4.514	3.013	5.286	2.825	4.238	5.814	3.231	2.615	-0.553
	(11.176)	(11.132)	(11.136)	(11.199)	(11.161)	(11.133)	(11.062)	(11.135)	(11.172)
Year 1987	12.575	8.851	13.881	11.479	11.992	12.223	8.710	9.270	6.100
	(10.737)	(10.791)	(10.711)	(10.735)	(10.729)	(10.684)	(10.699)	(10.750)	(10.792)
Year 1988	30.481 ••	27.131 ••	29.516 ••	29.732 ••	29.430 ••	30.250 ••	25.130 •	27.056 ••	24.134
	(10.503)	(10.538)	(10.470)	(10.491)	(10.512)	(10.450)	(10.433)	(10.509)	(10.540)
Year 1989	12.076	9.654	12.205	11.637	11.131	11.297	8.577	12.824	10.535
	(10.865)	(10.852)	(10.820)	(10.845)	(10.868)	(10.815)	(10.731)	(10.976)	(10.972)
Year 1990	20.511	19.688	19.632	20.399	20.989	22.085	20.222	16.677	15.258
	(11.591)	(11.532)	(11.551)	(11.567)	(11.579)	(11.552)	(11.422)	(11.704)	(11.666)
Year 1991	20.606	19.070	23.076 •	20.374	20.420	21.445	22.241 •	17.801	15.611
	(11.159)	(11.116)	(11.175)	(11.137)	(11.144)	(11.109)	(11.051)	(11.183)	(11.173)
Year 1992	12.962	11.592	13.960	12.243	12.663	17.444	16.279	10.722	7.162
	(12.178)	(12.125)	(12.138)	(12.161)	(12.163)	(12.271)	(12.147)	(12.142)	(12.188)
Year 1993	-5.610	-6.742	-6.455	-5.399	-5.595	-3.201	-4.977	-5.725	-9.521
	(11.661)	(11.606)	(11.620)	(11.638)	(11.645)	(11.649)	(11.522)	(11.588)	(11.657)
Year 1994	3.880	0.824	4.731	3.710	5.289	6.607	4.284	-0.335	-2.942
	(10.715)	(10.732)	(10.679)	(10.693)	(10.742)	(10.726)	(10.677)	(10.780)	(10.791)
Year 1995	8.537	5.839	8.645	9.036	8.553	10.810	8.824	6.050	3.527
	(9.938)	(9.947)	(9.897)	(9.922)	(9.924)	(9.936)	(9.882)	(9.914)	(9.931)
Year 1996	6.639	4.980	7.405	6.388	7.742	6.475	5.370	5.945	3.323
	(10.109)	(10.077)	(10.074)	(10.089)	(10.122)	(10.058)	(9.965)	(10.049)	(10.069)
Prop. insiders on board	-0.661 ••	-0.664 ••	-0.667 ••	-0.719 ••	-0.725 ••	-0.623 •	-0.697 ••	-0.642 •	-0.635
	(0.255)	(0.254)	(0.254)	(0.257)	(0.258)	(0.254)	(0.254)	(0.254)	(0.253)
% Institutional investors	-0.091	-0.038	-0.055	-0.116	-0.075	-0.044	0.018	-0.025	0.012
	(0.221)	(0.221)	(0.221)	(0.221)	(0.221)	(0.221)	(0.220)	(0.221)	(0.220)
Ownership concentration	0.199	0.217	0.173	0.198	0.186	0.163	0.151	0.210	0.231
	(0.238)	(0.237)	(0.238)	(0.238)	(0.238)	(0.238)	(0.235)	(0.237)	(0.236)
% Insider ownership	6.807	5.006	13.655	0.891	9.646	12.209	10.838	2.747	-2.765
	(51.505)	(51.227)	(51.396)	(51.521)	(51.468)	(51.298)	(50.871)	(51.197)	(51.014)
Focal firm centrality	0.013	-0.039	-0.011	0.016	0.296	0.104	0.031	-0.039	-0.002
	(0.331)	(0.330)	(0.330)	(0.330)	(0.382)	(0.332)	(0.329)	(0.330)	(0.328)
N partner premiums	0.570	0.409	0.723	0.683	0.652	0.579	0.706	0.627	0.523
(Y-1…Y-3)	(0.534)	(0.535)	(0.536)	(0.537)	(0.536)	(0.531)	(0.538)	(0.559)	(0.559)
N focal past acquisitions	1.714	2.207	1.476	1.236	1.486	2.205	1.895	2.283	2.401
(Y-1…Y-3)	(2.234)	(2.231)	(2.228)	(2.248)	(2.236)	(2.233)	(2.237)	(2.245)	(2.235)
Mean partner premium	-0.317 ••	-0.405 ••	-0.349 ••	-0.313 ••	-0.297 ••	-0.319 ••	-0.436 ••	-0.354 ••	-0.340

Table 3

Results from Random-effects GLS Regression of Premium Paid (N = 458) *

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6 +	Model 7 +
(Log) Deal size	3.546	3.437	3.023	3.264	3.198	-0.010	-0.009
	(1.846)	(1.841)	(1.838)	(1.843)	(1.832)	(0.016)	(0.016)
Number of competing bids	23.155 ••	22.745 ••	22.506 ••	21.315 ••	23.325 ••	0.032	0.031
	(6.551)	(6.574)	(6.557)	(6.529)	(6.540)	(0.057)	(0.057)
Completed acqsn. (1 = yes)	2.666	2.696	2.250	2.185	1.646	-0.048	-0.053
	(6.200)	(6.174)	(6.192)	(6.202)	(6.171)	(0.054)	(0.054)
Synergistic acqsn.	-1.440	-1.413	-1.499	-1.545	-1.430	0.010	0.009
	(1.584)	(1.576)	(1.580)	(1.583)	(1.574)	(0.014)	(0.014)
Acqsn. type (Majority = 1)	6.132	6.241	7.221	6.017	7.411	0.026	0.022
	(7.769)	(7.705)	(7.748)	(7.741)	(7.715)	(0.068)	(0.068)
IBanker Morgan Stanley	18.758 •	19.491 •	18.235 •	17.581 •	17.459 •	0.040	0.045
	(7.942)	(7.964)	(7.955)	(7.977)	(7.929)	(0.070)	(0.070)
IBanker Merrill Lynch	23.389	24.340	24.109	23.107	22.615	-0.054	-0.052
	(13.701)	(13.679)	(13.706)	(13.747)	(13.665)	(0.120)	(0.121)
(Log) Focal size	-2.129	-2.367	-3.196	-2.417	-2.735	-0.032	-0.030
	(2.331)	(2.294)	(2.308)	(2.318)	(2.307)	(0.020)	(0.020)
(Log) Target size	-4.981 ••	-4.792 ••	-4.814 ••	-4.796 ••	-4.726 ••	0.005	0.006
	(1.767)	(1.766)	(1.765)	(1.768)	(1.758)	(0.016)	(0.016)
Adj. target ROE	-0.013	-0.013	-0.005	-0.006	-0.006	0.000	0.000
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.000)	(0.000)
Adj. focal ROE	-0.111	-0.116	-0.088	-0.103	-0.118	-0.001	-0.001
	(0.233)	(0.234)	(0.233)	(0.234)	(0.232)	(0.002)	(0.002)
Target in SIC 28	17.195 •	17.181 •	16.969 •	18.194 •	17.109 •	0.018	0.010
	(8.509)	(8.488)	(8.529)	(8.533)	(8.493)	(0.075)	(0.075)
Year 1986	3.047	3.178	7.390	1.152	2.117	0.006	-0.026
	(11.155)	(11.204)	(11.285)	(11.562)	(11.499)	(0.099)	(0.098)
Year 1987	8.839	9.582	12.208	11.110	8.812	-0.004	-0.020
	(10.813)	(10.813)	(10.717)	(10.812)	(10.786)	(0.095)	(0.094)
Year 1988	27.097 ••	28.381 ••	30.432 ••	29.658 ••	28.631 ••	-0.004	-0.016
	(10.559)	(10.666)	(10.481)	(10.525)	(10.469)	(0.092)	(0.092)
Year 1989	9.552	10.158	10.095	12.803	10.316	0.086	0.083
	(10.878)	(10.964)	(10.907)	(10.880)	(10.861)	(0.095)	(0.095)
Year 1990	20.228	20.003	17.665	21.059	16.918	-0.508 ••	-0.526 ••
	(11.666)	(11.912)	(11.692)	(11.597)	(11.647)	(0.102)	(0.102)
Year 1991	18.823	19.395	20.068	21.195	20.967	-0.232 •	-0.231 •
	(11.154)	(11.369)	(11.141)	(11.168)	(11.101)	(0.098)	(0.098)
Year 1992	11.823	12.093	12.188	13.233	12.244	-0.094	-0.129
	(12.167)	(12.206)	(12.162)	(12.177)	(12.110)	(0.107)	(0.108)
Year 1993	-7.265	-6.403	-5.411	-6.112	-6.354	0.227 •	0.210 •
	(11.678)	(11.711)	(11.637)	(11.666)	(11.596)	(0.102)	(0.102)
Year 1994	0.742	1.094	2.488	4.224	2.286	0.314 ••	0.292 ••
	(10.757)	(10.780)	(10.725)	(10.716)	(10.679)	(0.094)	(0.094)
Year 1995	5.511	6.427	7.733	7.939	5.908	0.109	0.078
	(9.982)	(10.143)	(9.929)	(9.949)	(9.922)	(0.087)	(0.087)
Year 1996	4.262	5.599	6.510	6.698	6.549	0.077	0.084
	(10.200)	(10.119)	(10.089)	(10.106)	(10.045)	(0.089)	(0.088)
Prop. insiders on board	-0.673 ••	-0.656 ••	-0.647 ••	-0.693 ••	-0.705 ••	0.002	0.001
	(0.255)	(0.254)	(0.255)	(0.256)	(0.255)	(0.002)	(0.002)
% Institutional investors	-0.036	-0.043	-0.080	-0.087	-0.064	0.002	0.002
	(0.221)	(0.221)	(0.220)	(0.221)	(0.220)	(0.002)	(0.002)
Ownership concentration	0.219	0.211	0.221	0.202	0.240	0.002	0.002
	(0.238)	(0.239)	(0.238)	(0.238)	(0.237)	(0.002)	(0.002)
% Insider ownership	4.737	3.993	6.279	1.790	-4.851	-0.422	-0.491
	(51.327)	(51.396)	(51.399)	(51.680)	(51.437)	(0.454)	(0.461)
Focal firm centrality	-0.056	-0.016	-0.043	0.029	-0.046	0.000	-0.001
	(0.333)	(0.330)	(0.332)	(0.331)	(0.331)	(0.003)	(0.003)
N partner premiums	0.410	-0.201	0.593	0.545	0.554	0.008	0.009 •
(Y-1…Y-3)	(0.537)	(0.739)	(0.533)	(0.534)	(0.531)	(0.005)	(0.005)
N focal past acquisitions	2.217	1.808	2.077	2.017	2.974	-0.010	-0.005
(Y-1…Y-3)	(2.236)	(2.251)	(2.240)	(2.250)	(2.269)	(0.020)	(0.020)
Mean partner premium	-0.404 ••	-0.538 ••	-0.459 ••	-0.269 •	-0.452 ••	0.001	0.000
(Y-1…Y-3)	(0.120)	(0.202)	(0.143)	(0.122)	(0.142)	(0.001)	(0.001)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6 +	Model 7 +
Constant	98.320 ••	102.040 ••	96.397 ••	83.023 ••	97.870 ••	-0.016	-0.098
	(28.176)	(28.320)	(28.157)	(28.752)	(28.045)	(0.246)	(0.252)
Ptnr. premium het.	-0.570						
(current year)	(1.276)						
Ptnr. premium het.	-0.100						
(Y+1…Y+3)	(0.236)						
Ptnr. premium het.	-15.955 ••	-19.036 ••					
(Y-1…Y-3)	(6.592)	(7.227)					
Max. ptnr. premium		0.084					
(Y-1…Y-3)		(0.063)					
Min. ptnr. premium		-0.017					
(Y-1…Y-3)		(0.139)					
Homo. high ptnr. premium			11.429 •		5.660		
(1 = yes)			(6.854)		(7.328)		
Homo. low ptnr. premium				6.285			
(1 = yes)				(5.567)			
Het. ptnr. premiums					-13.494 •	0.087 •	
(1 = yes)					(6.247)	(0.052)	
Ptnr. size het.							0.100 •
							(0.053)
Chi-square	102.07	104.12	98.46	96.62	103.98	107.46	108.2
D. f.	33	33	31	31	32	31	31

•p < .05;••p <.01; one-tailed test for hypothesized effects.

*Unstandardized coefficients are reported. Standard errors are in parentheses.

+The dependent variable in models 6 and 7 is acquisition profitability (cumulative abnormal returns the year following the acquisition).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
(Y-1…Y-3)	(0.115)	(0.120)	(0.115)	(0.114)	(0.115)	(0.114)	(0.119)	(0.116)	(0.116)
Constant	90.483 ••	99.036 ••	98.054 ••	98.756 ••	101.336 ••	103.351 ••	128.762 ••	91.853 ••	94.070
	(27.992)	(28.065)	(28.105)	(28.372)	(28.892)	(28.400)	(28.949)	(28.455)	(28.338)
Ptnr. premium het.		-15.713 ••					-15.352 ••	-10.822 ••	-8.822
(Y-1…Y-3)		(6.560)					(6.483)	(4.157)	(4.232)
Ptnr. acq. size het.			-19.795 •				-20.589 •		
(Y-1…Y-3)			(9.332)				(9.241)		
Network diversity				-1.538 •			-1.734 •		
				(0.924)			(0.913)		
Ptnr. industry het.					-7.929				
					(5.341)				
Ptnr. size het.						-13.767 ••	-13.608 ••		
						(5.952)	(5.880)		
Tie multiplexity								6.587	8.066
								(6.021)	(6.028)
Het. x Multiplexity									-15.707
									(6.997)
Chi-square	95.29	102.08	100.57	98.45	97.76	101.61	117.88	104.14	110.17
D. f.	30	31	31	31	31	31	34	32	33

•p < .05;••p <.01; one-tailed test for hypothesized effects.

*Unstandardized coefficients are reported. Standard errors are in parentheses.

REFERENCES

Allison, P. D.

1978 "Measures of inequality." American Sociological Review, 43: 865-880.

Ancona, D., and D. Caldwell

1992 "Demography and design: Predictors of new product team performance." Organization Science, 3: 321-341.

Argote, L.

1999 Organizational Learning. Boston: Kluwer.

Beckman, C. M.

1999 "Learning from difference: The effects of interorganizational networks on organizational learning." Unpublished Ph.D. thesis, Stanford University.

Bonacich, P.

1987 "Power and centrality: A family of measures." American Journal of Sociology, 92: 1170-1182.

Burns, L. W., and D. W. Wholey

1993 "Adoption and abandonment of matrix management programs: Effects of organizational characteristics and interorganizational networks." Academy of Management Journal, 36: 106-138.

Burt, R. S.

1992 Structural Holes. Cambridge, MA: Harvard University Press.

Campbell, D. T., and J. C. Stanley

1966 Experimental and Quasi-Experimental Designs for Research. Boston: Houghton Mifflin.

Canada NewsWire

2000 "Cognos expands board, appoints two new members." April 6.

Cook, T. D., and D. T. Campbell

1979 Quasi-Experimentation: Design and Analysis Issues for Field Settings. Boston: Houghton Mifflin.

Cronbach, L.

1987 "Statistical tests for moderator variables: Flaws in analyses recently proposed." Psychological Bulletin, 102: 414-417.

Cyert, R. M. and J. G. March

1963 A behavioral theory of the firm. Englewood Cliffs: Prentice Hall.

Davis, G. F.

1991 "Agents without principles? The spread of the poison pill through the intercorporate network." Administrative Science Quarterly, 36: 583-613.

1996 "The significance of board interlocks for corporate governance." Corporate Governance, 4: 154-159.

Davis, G. F., and H. R. Greve

1997 "Corporate elite networks and governance changes in the1980s." American Journal of Sociology, 103: 1-37.

Denrell, J.

1999 "The myths of management: Organizational learning and the illusion of validity." Working paper, Institute of International Business, Stockholm School of Economics.

DiMaggio, P. J., and W. W. Powell

1983 "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields." American Sociological Review, 48: 147-160.

Fiske, S. T., and S. E. Taylor

1984 Social Cognition. New York: Random House.

Fowler, K. L., and D. R. Schmidt

1988 "Tender offers, acquisitions and subsequent performance in manufacturing firms." Academy of Management Journal, 31: 962-974.

Freeman, L. C.

1979 "Centrality in social networks: Conceptual clarification." Social Networks, 1: 215-239.

Galaskiewicz, J., and S. Wasserman

1989 "Mimetic processes within an interorganizational field: An empirical test." Administrative Science Quarterly, 34: 454-479.

Granovetter, M.

1985 "Economic action and social structure: The problem of embeddedness." American Journal of Sociology, 91: 481-510.

Gulati, R.

1995 "Social structure and alliance formation patterns: A longitudinal analysis." Administrative Science Quarterly, 40: 619-652.

Haleblian, J., and S. Finkelstein

1999 "The influence of organization acquisition experience on acquisition performance: A behavioral learning perspective." Administrative Science Quarterly, 44: 29-56.

Hambrick, D. C., and P. A. Mason

1984 "Upper echelons: The organization as a reflection of its top managers." Academy of Management Review, 9: 193-206.

Hamel, G.

1991 "Competition for competence and inter-partner learning within international strategic alliances." Strategic Management Journal, 12: 83-103.

Hansen, M.

1999 "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." Administrative Science Quarterly, 44: 82-111.

Haspeslagh, P. C., and D. B. Jemison

1991 Managing Acquisitions: Creating Value through Corporate Renewal. New York: Free Press.

Haunschild, P. R.

1993 "Interorganizational imitation: The impact of interlocks on corporate acquisition activity." Administrative Science Quarterly, 38: 564-592.

1994 "How much is that company worth? Interorganizational relationships, uncertainty, and acquisition premiums." Administrative Science Quarterly, 39: 391-411.

Haunschild, P. R., and C. M. Beckman

1998 "When do interlocks matter?: Alternate sources of information and interlock influence." Administrative Science Quarterly, 43: 815-844.

Haunschild, P. R., and B. Ni

2000 "Learning from complexity: Effects of airline accident/incident heterogeneity on subsequent accident/incident rates." Best Paper Proceedings, Academy of Management.

Hayward, M. L. A., and D. C. Hambrick

1997 "Explaining the premium paid for large acquisitions: Evidence of CEO hubris." Administrative Science Quarterly, 42: 103-127.

Heckman, J. J., and G. J. Borjas

1980 "Does unemployment cause future unemployment: Definitions, questions, and answers from a continuous time model of heterogeneity and state dependence." Econometrica, 47: 247-283.

Jehn, K., G. Northcraft, and M. Neale

1999 "Why differences make a difference: A field study of diversity, conflict, and performance in workgroups." Administrative Science Quarterly, 44: 741-763.

Johnson, R. A., R. E. Hoskisson, and M. A. Hitt

1993 "Board of director involvement in restructuring: The effects of board versus managerial controls and characteristics." Strategic Management Journal, 14: 33-50.

Kaplan, S. N.

1989 "Campeau's acquisition of Federated: Value destroyed or value added?" Journal of Financial Economics, 25: 191-212.

Kim, J., and A. S. Miner

2000 "Crash test without dummies: A longitudinal study of interorganizational learning from failure experience in the U.S. commercial banking industry, 1984-1998." Best Paper Proceedings, Academy of Management.

Krackhardt, D.

1992 "The strength of strong ties: The importance of philos in organizations." In N. Nohria, and R. G. Eccles (eds.), Networks and Organizations: 216-239. Boston: Harvard Business School Press.

Kraatz, M. S.

1998 "Learning by association? Interorganizational networks and adaptation to environmental change." Academy of Management Journal, 41: 621-643.

Levitt, B., and J. G. March

1988 "Organizational learning." Annual Review of Sociology, 14: 319-340.

Lorsch, J. W., and E. MacIver

1989 Pawns or Potentates: The Reality of America's Corporate Boards. Boston: Harvard Business School Press.

Mahar, M.

1990 "Wheel of misfortune: Was Merv Griffin's bid for Resorts just a bad gamble?" Barron's, 70, 39: 10-48.

March, J. G., L. Sproull, and M. Tamuz

1991 "Learning from samples of one or fewer." Organization Science, 2: 1-13.

March, J. G., and R. I. Sutton

1997 "Organizational performance as a dependent variable." Organization Science, 8: 698-706.

Mariolis, P., and M. H. Jones

1982 "Centrality in corporate interlock networks: Reliability and stability." Administrative Science Quarterly, 27: 571-584.

Martin, J. D., and L. N. Gray

1971 "Measurement of relative variation: Sociological examples." American Sociological Review, 36: 496-502.

Menon, T., J. Pfeffer, and R. I. Sutton

2000 "The valuation of internal versus external knowledge: Why managers sometimes prefer the knowledge possessed by outsiders over the knowledge possessed by insiders." Unpublished manuscript, Graduate School of Business, Stanford University.

Mill, J. S.

1893 A System of Logic, Ratiocinative and Inductive. New York: Harper & Brothers.

Miner, A. S. and P. Anderson

1999 "Industry and population-level learning: Organizational, interorganizational, and collective learning processes." In A. S. Miner and P. Anderson (eds.), Advances in Strategic Management, 16: 1-30. Stamford, CT: JAI Press.

Miner, A. S., and P. R. Haunschild

1995 "Population level learning." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, 17: 115-166. Greenwich: JAI Press.

Miner, A. S., I. Holzinger, J. Kim, and P. R. Haunschild

1999 "Fruits of failure: Organizational failure and population level learning." In A. S. Miner and P. Anderson (eds.), Advances in Strategic Management, 16: 187-220. Stamford, CT: JAI Press.

Miner, A. S. and S. Raghavan

1999 "Interorganizational imitation: A hidden engine of selection." In J. Baum and W. McKelvey (eds.), Variations in Organization Science: In Honor of Donald T. Campbell: 35-62. New York: Oxford University Press.

Mizruchi, M. S.

1992 The Structure of Corporate Political Action. Cambridge, MA: Harvard University Press.

Morris, M. W., and P. C. Moore

2000 "The lessons we (don't) learn: Counterfactual thinking and organizational accountability after a close call." Administrative Science Quarterly, 45: 737-765.

Nathan, K. S., and T. B. O'Keefe

1989 "The rise in takeover premiums: An exploratory study." Journal of Financial Economics, 23: 101-119.

Nisbett, R. E., and L. Ross

1980 Human Inference: Strategies and Shortcomings of Social Judgment. Englewood Cliffs, NJ: Prentice-Hall.

Palmer, D., P. Devereaux Jennings, and X. Zhou

1993 "Late adoption of the multidivisional form by large U. S. corporations: Institutional, political, and economic accounts." Administrative Science Quarterly, 38: 100-131.

Palmer, D., B. M. Barber, X. Zhou, and Y. Soysal

1995 "The friendly and the predatory acquisition of large U.S. corporations in the 1960s: The other contested terrain." American Sociological Review, 60: 469-499.

Pfeffer, J.

1983 "Organizational demography." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, 5: 299-357. Greenwich, CT: JAI Press.

Podolny, J. M.

1993 "A status-based model of market competition." American Journal of Sociology, 98: 829-872.

Podolny, J. M., and J. N. Baron

1997 "Resources and relationships: Social networks and mobility in the workplace." American Sociological Review, 62: 673-693.

Podolny, J. M., T. E. Stuart, and M. T. Hannan

1996 "Networks, knowledge, and niches: Competition in the worldwide semiconductor industry, 1984-1991." American Journal of Sociology, 102: 659-689.

Powell, W. W.

1990 "Neither market nor hierarchy: Network forms of organization." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, 12: 295-336. Greenwich, CT: JAI Press.

Powell, W. W., and P. J. DiMaggio

1991 "Introduction." In W. W. Powell and P.J. DiMaggio (eds.), The New Institutionalism in Organizational Analysis: 1-38. Chicago: University of Chicago Press.

Powell, W. W., K. W. Koput, and L. Smith-Doerr

1996 "Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology." Administrative Science Quarterly, 41: 116-145.

Roll, R.

1986 "The hubris hypothesis of corporate takeovers." Journal of Business, 59: 197-218.

Rogers, E.

1995 Diffusion of Innovations, 4th ed. New York: Free Press.

Simon, H. A.

1955 "A behavioral model of rational choice." Quarterly Journal of Economics, 69: 99-118.

Sirower, M. L.

1994 "Acquisition behavior, strategic resource commitments and the acquisition game: A new perspective on performance and risk in acquiring firms." Unpublished doctoral dissertation, Columbia University.

Sitkin, S.

1992 "Learning through failure: The strategy of small losses." In L. L. Cummings and B. M. Staw (eds.), Research in Organizational Behavior, 14: 231-266. Greenwich, CT: JAI Press.

Slusky, A. R., and R. E. Caves

1991 "Synergy, agency and the determinants of premia paid in mergers." Journal of Industrial Economics, 39: 277-296.

Stasser, G., and W. Titus

1987 "Effects of information load and percentage of shared information on the dissemination of unshared information during group discussion." Journal of Personality and Social Psychology, 53: 81-93.

Stern, G.

1995 "Chrysler directors' takeover experience could be a factor in Kerkorian's favor." Wall Street Journal, April 17: 3.

Stuart, T., and J. Podolny

1997 "Positional causes and consequences of strategic alliances in the semiconductor industry." Working paper, Graduate School of Business, Stanford University.

Trachtenberg, J. A., R. Meinbardis, and D. B. Hiller

1990 "Buy-out bomb: An extra $500 million paid for Federated got Campeau into trouble." Wall Street Journal, Jan. 11: 1.

Useem, M.

1984 The Inner Circle. New York: Oxford University Press.

Uzzi, B.

1996 "The sources and consequences of embeddedness for the economic performance of organizations: The network effect." American Sociological Review, 61: 674-698.

1998 "Access and control benefits through embedded ties and network complementarity: The case of midmarket firms and banks." Working paper, Kellogg Graduate School of Management, Northwestern University.

Varaiya, N. P.

1988 "Determinants of premiums in acquisition transactions." Managerial and Decision Economics, 8: 175-184.

Wasserman, S., and K. Faust

1994 Social Network Analysis: Methods and Applications. New York: Cambridge University Press.

Wasserstein, B.

1998 Big Deal: The Battle for Control of America's Leading Corporations. New York: Warner Books.

Williams, K. Y., and C. A. O'Reilly

1998 "Demography and diversity in organizations: A review of 40 years of research." In B. M. Staw and R. I. Sutton (eds.), Research in Organizational Behavior, 20: 77-140. Stamford, CT: JAI Press.

Zukin, S., and P. J. DiMaggio (eds.)

1990 Introduction to Structures of Capital: The Social Organization of the Economy. Cambridge: Cambridge University Press.

•We would like to thank Don Cram, Jim March, Anne Miner, Reed Nelson, Don Palmer, Jeffrey Pfeffer, Joel Podolny, and three anonymous reviewers for their helpful comments and suggestions.

[1] A typical poison pill allows shareholders to purchase shares in the firm at a deeply discounted rate if a takeover attempt occurs without board approval.

[2] We thank a reviewer for this suggestion.

[3] We analyzed each type of tie separately as well but found no effects. It seems that firms need the entire range of experiences available to them -- information from sent, received, and neutral ties -- to benefit from diversity.

[4] In additional analyses, we examined synergies from the acquirer and target being in vertically related industries but found no significant effects. We also examined synergy as separate dummy variables rather than a continuous measure. Results are available from the authors.

[5] We examined current and future acquisition size as well and found that same lag structure is required.

[6] The precise measure of CAR is $R_{jt} = a_j + b_j R_{mt} + e_{jt}$ where R_{jt} is the compounded return of security j over period t, $a_j = E(R_{jt}) - b_j E(R_{mt})/var(R_{mt})$; $b_j = cov(R_{jt}, R_{mt})/var(R_{mt})$; R_{mt} = the compounded rate of return on the equally weighted market index over period t; e_{jt} is the error term of security j over period t. The abnormal return is $AR_{jt} = R_{jt} - a_j - b_j R_{mt}$, where a and b are estimated over the 255 trading days ending 45 days before the acquisition. The cumulative abnormal return is the sum of AR_{jt} from the 30 days prior to the acquisition to 331 days after the announcement.