When is Equity More than Just Financing? Evidence from Strategic Alliances

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Abstract

A strategic alliance is a hybrid organizational form that is between an arms length contract and a full-fledged merger between firms. In some alliances firms take a minority equity stake in the partner firm. We refer to these as equity alliances. Using data on 759 alliances, we examine the motivation for the use of equity in alliances. We study whether equity is intended to strengthen the contractual performance of the alliance or whether it is primarily a means of financing for the capital constrained partner in the alliance. Consistent with the incomplete contracts theory, we find that equity is more likely to be used in alliances where the exact nature and the sharing of the output is ambiguous. We also find that equity is more likely to be used when the difference in bargaining powers between the partners is higher, such as when the partners differ significantly in size, market power, and growth opportunities. Finally, we find that equity alliances are especially likely when the smaller partner (which is almost always the partner selling equity) is high growth but is capital constrained. Thus, equity from alliance partners is a viable alternative source of capital for such firms. Consistent with the view that equity usage mitigates contracting costs and capital constraints, the market reaction to equity alliances is significantly higher compared to other alliances. Overall, the evidence suggests that the market views equity investments in alliances as more valuable than toeholds taken by potential acquirers without a product market relationship.

Recently, there has been an increased interest in studying strategic alliances as a business organizational form (e.g., Baker, Gibbons, and Murphy, 2002; Noe, Rebello, and Shrikande, 2002; Gulati and Singh, 1998; Chan, Kensinger, Keown, and Martin, 1997; Bleeke and Ernst, 1995; Pisano, 1989). An alliance is a hybrid organizational structure that lies between an arms length contract and a merger. In a strategic alliance two or more firms pool their resources, both technological and financial, to pursue a common business objective without going through a full-fledged merger. Most of the research on alliances has focused on developing or testing hypotheses that explain the creation, management, and survival of alliances among independent companies (Gulati, 1995; Parkhe, 1993; Mody, 1993). There has been little research on the relative advantages of the different types of alliances and on how the operations of an alliance are financed. In this paper, we examine the determinants of the use of equity investments by a firm in its partner-firm in strategic alliances.

An equity alliance is a strategic alliance where one of the partners in the alliance purchases equity in the other partner firm. These equity investments are typically made through a direct purchase of the shares in the firm via a private placement. Although non-equity arrangements account for a majority of all alliances across industries, equity linkages are not uncommon when forming alliances (Pisano, 1989; Zagnoli, 1987). Previous studies (Pisano, 1989; Harrigan, 1987) have examined the effect of industry and competitive conditions on the choice between equity and non-equity alliances.

In this paper, using data on 759 alliances initiated over the period 1989-1997, we examine the relative importance of several motives for the use of equity in strategic alliances. We extend the work of Harrigan (1987) and Pisano (1989) by empirically analyzing the firm-specific and alliance–specific determinants that explain the incidence of equity alliances. We

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examine whether the use of equity in an alliance is intended to strengthen the contractual performance of the alliance and also whether it is a means of financing for the capital constrained partner. In particular, we study the role of incomplete contracts, bargaining power differences between partners, and capital constraints in explaining the incidence of equity alliances.

Our paper is closely related to and complements the recent work of Allen and Phillips (2000) on corporate block ownership. They examine the changes in investment and operating performance of firms after other corporations purchase large equity positions, and ask whether the changes in performance differ based on the existence of product market relationships. While they analyze firms that have conducted block purchases and then distinguish between those with product market relations and those without such relations, our aim is to analyze firms that come together with a product market motive and examine the differences between those that have an equity relation and those that do not. By comparing alliances that have an equity link with those that do not, we are able to examine the incremental impact of equity linkages on product market relations. We therefore are able to provide insights into the role of equity is mitigating contracting problems in product market relations.

Our results show that equity is more likely to be used when an alliance is in a high growth area or when the uncertainty about the output from the alliance is high (as in R&D and technology alliances). We also find evidence that equity is used when an alliance pairs firms of very different sizes, firms with different market powers, and firms with large differences in growth options. In general, equity usage in alliances mitigates the post-formation bargaining costs that arise when the difference in bargaining powers between the partners is high.

Finally, we find strong evidence that equity stakes are also taken to provide financing to the capital constrained partner in the alliance. We find that the selling partners in equity

alliances have higher growth opportunities than their industry counterparts. These firms are also severely capital constrained with little debt capacity. The buying firms, on the other hand, have significantly more cash and are less liquidity constrained than the selling firms. Thus, equity alliances are especially likely when one of the partners in the alliance is high growth but capital constrained.

Our findings that capital constrained firms rely on financing from their alliance partners complements the recent evidence in Baker and Wurgler (2002), Baker, Stein, and Wurgler (2002), and Lerner, Shane, and Tsai (2002). Baker and Wurgler (2002) demonstrate that firms attempt to time the market in their capital raising efforts and raise external equity primarily when they believe they are overvalued. Baker, Stein, and Wurgler (2002) further demonstrate that stock prices have a significant impact on the investment of firms that need external equity to finance their marginal investments (equity dependent firms). In particular, they find that equity-dependent firms, such as younger firms, with low cash balances and cash flow, high leverage and low debt capacity are less likely to proceed with financing an investment if they have to issue undervalued shares. In a similar vein, Lerner, Shane, and Tsai (2002) find that in the biotech industry firms are more likely to finance research through pharmaceutical firms when public markets are poor. Our findings add to the results in these papers, and indicate that equity financing from alliance partners is a viable alternative for capital constrained firms. Furthermore, our results reveal that equity financing by the alliance partner is useful in mitigating contracting problems in an alliance besides solving capital constraint problems.

The stock price reaction to alliances is also consistent with the evidence described above. We find that the reaction to alliances is positive, and technology alliances account for a significant part of the reaction in the sample. Consistent with the view that equity usage

mitigates contracting costs and capital constraints, the market reaction to equity alliances is significantly large. For the firm selling the equity, the announcement period abnormal return is 14.76%, while it is statistically insignificant for the buying firms. This stands in contrast to the evidence documented in Mikkelson and Ruback (1985) and Choi (1991) regarding price reaction to ordinary toehold announcements. They report that when a firm announces an acquisition of shares in an another firm, the market reaction in the selling firm's stock is positive, but only around 2.2%. Thus, our evidence suggests that the market views equity investments associated with strategic alliances as different from ordinary toeholds taken by potential acquirers, perhaps because of the gains to both the buying and the selling firm from the improved contractual performance of the alliance, and not because alliances are viewed as a prelude to an acquisition. In fact, this evidence is consistent with the evidence in Allen and Phillips (2000) that block purchases accompanied by product market relationships are associated with higher abnormal returns than block purchases without product market relationships.

The rest of the paper is organized as follows. Section 1 sets out the hypotheses that explain the use of equity in strategic alliances. Section 2 presents the data and the definitions of the variables used in the study. Section 3 discusses the univariate and regression results. Section 4 presents evidence on the wealth gains in the different types of alliances. Section 5 provides concluding comments.

1. The Choice between Equity and Non-equity Alliances

Several theories in the literature on alliances may be adapted to explain the use of equity in strategic alliances. We classify these theories into three categories: (i) incomplete contracts, (ii) differential bargaining power, and (iii) capital constraints. In what follows, we provide a brief description of these theories and set out the hypotheses extracted from them.

1.1. Incomplete contracts

When two firms enter into a strategic alliance, they typically pool their technological and financial resources to achieve a common business objective. For instance, two firms may have some knowledge of two different aspects of a particular technology, and may decide to share their know-how through an alliance, with a view to designing and developing a new marketable product. As Pisano (1989) argues, in such alliances it is difficult to quantify the relative share of knowledge and technology that each partner contributes to an alliance. It is also difficult to *ex ante* identify the specific nature of the end-product and which of the two partners may stand to benefit more from the output (Grossman and Hart, 1986). In this scenario, it may be especially difficult to write a contract that not only specifies the exact contribution of each partner to the alliance but also allocates the final output and profits from the alliance. Further, most alliances evolve over time depending on the innovation process, which may warrant altering the terms of the contract. Therefore, in such alliances contracting problems are likely since a contract written at the conception of the alliance would have to be complete as well as flexible to accommodate the innovations in the alliance.

Incomplete contracts have significant consequences. Klein, Crawford, and Alchian (1978) argue that incomplete contracts between firms may lead to potential hold-up costs. In the context of alliances, when contracts are incomplete, each partner involved in an alliance has ex-ante less incentive to invest because of the fear of ex-post opportunistic behavior by the other partner over the latent profits of the alliance. Equity alliances mitigate these problems of incomplete contracting. As Aghion and Tirole (1994) suggest, through equity ownership, the costs and benefits of innovating, designing, manufacturing, and marketing the product from an alliance are proportionally shared. Even if the objective of an alliance evolves unpredictably

over time, equity ownership mitigates any potential for unilateral opportunism by the partners. Choi (1993) and Kamien, Muller, and Zang (1992) present similar arguments to motivate the incidence of co-operative research joint ventures between firms in an industry.

Although a full-fledged merger may solve the incomplete contracting problems mentioned above it is not without significant costs of its own. For instance, if only a portion of each partner's assets are required for the alliance, a complete integration through a merger will result in additional costs of administering and controlling unrelated businesses (Berger and Ofek, 1999 and 1995). This is supported by the findings in Maksimovic and Phillips (2001). Through a detailed analysis of asset sales, they find that the comparative advantage of multi-division firms is mainly in their primary industries. Also, Meyer, Milgrom, and Roberts (1992), Rajan, Servaes, and Zingales (2000), and Scharfstein and Stein (2000) argue divisional managers of integrated firms have incentives to engage in value-eroding bargaining and divisional rent-seeking behavior that could lead to overinvestment in divisions with poor investment opportunities. From a managerial incentives perspective, there is an additional cost to expansions. Since the stock value of an integrated firm is only a weak signal of the performance of any one divisional manager, stock based compensation is less efficient in integrated firms (Aron, 1991). Finally, if the partners' assets are specialized, valuing these assets for acquisition may be a risky venture for the firm. This is further complicated if the partner has liabilities that are hidden during the valuation process.[1] An equity alliance mimics the key advantages of a merger without incurring any associated disadvantages. Therefore, alliances where contracting problems are higher are likely to be equity alliances.

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[1] Ravenscraft and Scherer (1987) provide several examples of mergers where the latent problems with the target elude the buyer's pre-merger inspections. For example, Wickes Inc. discovered that its recent acquisition, Collins &

1.2. Differential bargaining power

A variation of the incomplete contracting problem arises when there is significant disparity in the bargaining powers of the partners in the alliance (Fagre and Wells, 1982). The problems from differential bargaining power arise even in alliances where the contribution of technological know-how and financial resources are quantifiable. When one partner in an alliance has a bargaining advantage over the other, perhaps because it is larger in size, has less unrecoverable investment in the alliance, or is a dominant firm with high market power, it may be able to force renegotiation of terms after the initiation of the alliance. The dominant firm may be able to extract concessions in the form of lower own-investment, a smaller contribution in technical know-how, or a greater share of the final surplus from the alliance. This problem would adversely affect both the formation and operation of efficiency enhancing strategic alliances. In the extreme, the disadvantaged partner may forego entering into an alliance if they perceive that their investment or knowledge could be subject to hold-up.

The contracting problems that arise due to disparity in bargaining powers may be mitigated if the partner with the bargaining advantage can pre-commit to abstaining from opportunism. Demski and Sappington (1991) and Noe, Rebello, and Shrikande (2002) among others show that cross-ownership of equity or a minority equity investment by the dominant firm in the partner firm are mechanisms that enable the firm to credibly pre-commit to abstaining from opportunism. The costs and benefits of opportunism are internalized when there are equity linkages across the partners. Thus, we expect equity alliances to be more likely when there is a bigger disparity in bargaining power across the partners in an alliance.

Aikman, had potential product liabilities arising from violations of federal flammability standards for carpets. The estimated costs associated with this oversight exceeded 20% of the purchase price of Collins & Aikman.

1.3. Capital constraints

A strategic alliance may be an indirect mechanism to forge a financial partnership between a capital constrained firm and a cash-rich firm. Weingartner (1977) and Stiglitz and Weiss (1981) analyze the causes of capital constraints in efficient capital markets. They argue respectively that bankruptcy costs and adverse selection costs impose a limit on the amount of credit extended by lenders. These costs are especially high for small, high growth firms with less tangible assets. Such firms are therefore forced to seek other sources of capital. Equity financing, however, is not a viable alternative either. As Myers and Majluf (1984) argue, when a firm is subject to a high level of information asymmetry between the firm's insiders and the capital market, their equity is likely to be undervalued in the market. In fact, Baker, Stein, and Wurgler (2002) demonstrate that stock prices have a significant impact on the investment of firms that need external equity to finance their marginal investments. They find that equity-dependent firms, such as younger firms with low cash balances and cash flow, high leverage and low debt capacity are less likely to proceed with financing an investment if they have to issue undervalued shares. These firms may have to rely on alternative financing sources such as funds from well-informed private investors or from product market partners.

Hard capital rationing may also occur when a company experiences financial distress or raising capital violates preexisting contractual agreements. Relying on new capital from an informed alliance partner may mitigate the adverse selection costs of external equity for these distressed firms. Partners in a strategic alliance may be better suited to take minority equity positions in small capital constrained firms for two related reasons. First, purchasing a minority equity stake in a capital constrained firm may be a way of financing innovations that require the technological expertise of the capital constrained partner. Second, through an alliance, a firm

may be able to learn more about the cash flows and future prospects of the capital constrained partner, and may be able to correctly value the equity stake in the firm. In fact, the latter reason is further supported by Bhattacharya and Chiesa (1995) and Yosha (1995) who argue that in some cases, a capital constrained firm may be willing to reveal proprietary, firm-specific information more readily to an alliance partner than to a diffuse group of investors. Thus, an alliance where one of the partners is capital constrained is more likely to be an equity alliance.

2. Data and Variable Definitions

2.1. Data

We identify our sample of strategic alliances formed in the U.S. during the period 1989 to 1997 from announcements in the Lexis-Nexis and the Dow Jones News Wires. For each alliance, we obtain information on the partners involved in the alliance, the date on which the alliance was established, the aim and a description of the alliance, and the capital invested (if any) by each of the partners. This last item specifies either the dollar amount or the proportion of one partner's equity bought by the other partner. To be included in our empirical analysis, we require that all the partners in the alliance be publicly traded in the U.S. with at least some financial and stock price information available on CRSP and Compustat. This results in a sample of 759 alliances which we use in our analysis.

Panel A of Table 1 presents descriptive statistics for the firms in the sample. In our sample, about 13% of all alliances are equity alliances. In individual years, the proportion of equity alliances ranges from 11% to 18.2% of all alliances in that year. The table also indicates that significantly more alliances were formed in the more recent years -- with about 60% of the alliances in the sample being formed over the 1995-1997 period.

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We also classify alliances based on the type of agreement or contract between the partners. Following Chan, Kensinger, Keown, and Martin (1997), in Panel B of Table 1 we classify alliances into seven different types of business agreements – R&D alliances, technology agreements, development and manufacturing agreements, marketing agreements, supply agreements, licensing agreements, and alliances that involve more than one of the above objectives. In panel B, alliances with multiple objectives are classified under "multiple" and are also included once under each of their stated objectives. Thus, the total number of alliances add up to more than 759 since alliances with multiple objectives are included multiple times. In 45 alliances we do not have sufficient data to identify the alliance type. In fact, in this last group, often the partners involved in the alliance are themselves uncertain about the nature of the alliance, and the alliance announcement typically involves a vague statement that refers to cooperation for mutual benefit. In the last column of panel B we report the proportion of equity alliances under each category.

Consistent with the incomplete contracts hypothesis, R&D alliances and alliances with multiple objectives have the highest incidence of equity usage. More than half the R&D alliances, and over one-quarter of the multiple alliances are equity alliances. In contrast, among marketing alliances, where there is typically little or no uncertainty about the final output of the alliance, only 10.4% of the alliances use equity. The evidence for the incomplete contracts hypothesis is especially highlighted when we classify alliances into two broad categories – technology and non- technology alliances. We classify all alliances that have R&D, technology, development and manufacturing, or multiple objectives as technology alliances, and others such as marketing, supply, and licensing agreements, as non-technology alliances. It may be seen that

nearly a fifth of all technology alliances are equity alliances while less than 5% of the non-technology alliances are equity alliances.

2.2. Variable definitions

2.2.1. Incomplete contracts

To test the incomplete contracts hypothesis, we first identify alliances where writing complete contracts is especially likely to be difficult. We expect contracting problems to be higher when an alliance brings together partners who operate in different lines of business. This is because each partner may not have the expertise to evaluate the contribution and monitor the input of the other partner who operates in a different industry. Further, since the end-product is the result of synergies between different industries, the firms in the alliance may not be able to ex-ante accurately estimate the payoffs from the alliance. Therefore, we use an indicator variable, *cross-industry alliance*, which is 1 if the partners in the alliance do not belong to the same 3-digit SIC code and zero otherwise as one proxy for alliances likely to have more problems of incomplete contracting. We also use another variable, *Distance*, to capture alliances where writing complete contracts are more difficult. Distance is a categorical variable which is 1, 2, 3, or 4 depending on whether the partners in the alliance differ in their 4-digit, 3-digit, 2-digit, or 1-digit SIC codes, respectively. A high value for *distance* would indicate very dissimilar firms. This variable is 0 if the partners have the same 4-digit SIC code.

We also use another measure of distance in our analyses. This is a continuous measure of distance and is used only as a specification check for the two measures used above. Following Mohanram and Nanda (1998), if the partner firms have the same 4-digit SIC code, the distance is 0. If they have the same 3-digit code but different 4-digit code, distance is equal to the absolute value of the difference in the 4th digit. If they have the same 2-digit code but different 3-digit

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code, distance is equal to the absolute value of the difference in the 3rd digit multiplied by 10. If they have the same 1-digit code but different 2-digit code, then distance is the difference in the 2nd digit multiplied by 100. Finally, if the firms differ in their 1-digit code, then we assign a distance of 1000, since a smaller difference in the 1st digit does not imply any similarity in the products of the two industries. Greater is the distance in an alliance, larger are the contracting problems. We expect cross-industry alliances and alliances with greater distance to have a higher likelihood of using equity linkages.

A diametrically opposite view of the incomplete contracting problem is in Harrigan (1987). She argues that when alliances pair firms that operate in the *same* industry, the contracting problems are particularly severe. Her conclusion is based on the view that firms operating in the same industry are direct competitors and the loss of revenues, market share, and future profitability of one firm is a more distinct advantage to the other. This results in more opportunistic behavior that undermines the contractual performance of alliances. Based on this view, we would expect alliances that pair firms from the same industry to be more likely to use equity to mitigate hold up and other incomplete contracting problems.

Equity is also likely to be used when there is high uncertainty about the latent profits from the alliance. The higher the uncertainty involved, the more difficult it is to write a complete contract. As a consequence, the probability of opportunistic behavior increases. Pisano (1989) shows that in the biotechnology industry, partners forming alliances in which the main objective is R&D are more likely to have equity ties. In supply agreements, for example, it is possible to write a contract that contains the technical specifications of the item supplied. In this case, there is less room for opportunistic behavior, and therefore, less need for equity linkages. Pisano also argues that alliances with multiple objectives are subject to more

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contracting problems, and are therefore likely to be equity alliances. We define a variable, *technology dummy*, which is 1 if the alliance is an R&D alliance, technology sharing agreement, or has multiple objectives, and is 0 otherwise We expect this variable to be positively related to the likelihood of equity usage in the alliance. Along the same lines, we also define an *R&D dummy* variable which is 1 if the alliance is an R&D alliance and 0 otherwise, and a *development dummy* which is 1 if the alliance involves product development and 0 otherwise. Again, we expect each of these variables to be positively related to the incidence of equity alliances.

It may be more difficult to estimate the value of the final surplus in an alliance that operates in a high growth industry. Further, depending on market conditions and on how the growth options are utilized, the objective of these alliances are also more likely to evolve over their lives. Hence, we would expect alliances in high growth industries to rely more on equity linkages to mitigate contracting problems. Following Smith and Watts (1992) and Barclay and Smith (1995), we use *market to book ratio* of assets to measure growth options in a firm's investment opportunity set. Market to book ratio is defined as the ratio of book value of total assets minus book value of equity plus market value of equity to the book value of total assets. We use two other proxies of growth opportunity, ratio of *R&D expenditure to total assets* and ratio *of intangible assets to total assets*, as a robustness check. We expect alliances with higher growth options to have a higher likelihood of using equity to mitigate contracting problems.[2]

2.2.2. *Differential bargaining power*

We use several measures to capture contracting problems that arise due to the disparity in bargaining powers between the partners in an alliance. Relative bargaining power depends on

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[2] In the univariate analysis, we also use growth in sales from the year prior to the alliance formation to the year of the alliance formation as a measure of growth opportunities. This is a measure of short-term growth, while the market to book ratio is an indicator of long-term growth.

three factors -- the initial strengths and weaknesses of the partners, how these strengths and weaknesses change over time, and the potential for competitive conflict (Bleeke and Ernst, 1995). We measure relative bargaining power at the initiation of the alliance, since the decision to use equity is made at that point.

Although the bargaining power of each partner depends on their intrinsic characteristics and the purpose of the alliance itself, there are several other observable and measurable indicators of bargaining power such as firm size, market power, and the prospects for future growth. Larger firms are typically the dominant firms in an industry, have more resources under their control, and hence wield more clout in an alliance. The larger the difference in size between the partners, the weaker is the position of the smaller partner in negotiating its stake of the surplus in the event of a hold-up. *Relative size* is measured as the ratio of larger partner's total assets to the smaller partner's total assets. We expect relative size to be positively related to the likelihood of the use of equity in an alliance.

While relative size is one measure of bargaining power, it is possible that the smaller partner is a leading firm in its industry while the bigger partner is only a second-tier firm in its industry. It is also possible that the smaller partner's technological know-how is crucial to the success of the alliance. Relative size does not fully capture these effects. To control for the bargaining power of the smaller firm that may not be reflected in firm size, we use the ratio of the market shares of the two partners in the alliance to capture the magnitude of the difference in bargaining powers. *Ratio of market shares* is measured as high market share over low market share, where the *market share* of each partner is computed as the ratio of the firm's sales to the total sales of all the firms in its industry. We expect the ratio of market shares to be positively related to the incidence of equity alliances. In a similar vein, we also use *ratio of market-to-*

book, which is the ratio of the median market-to-book ratios of the industries of the two partners in an alliance. Since the partner operating in the industry with greater growth options would be especially crucial in the evolution and the efficient harvesting of the rewards from the alliance, we expect that partner to have a greater bargaining power in the alliance. This suggests that greater is the disparity in the growth options of the two industries, higher would be the incidence of equity usage to mitigate the contracting costs that arise due to bargaining power disparities.

Relative market power between partners may also be a function of the concentrations of the respective industries. We measure concentration of an industry using the *Herfindahl Index*.

Herfindahl Index $= \sum_{i=1}^{N} \alpha_i^2$, where α_i represents the market share of firm i within an industry with a total of N firms. This index is close to one for concentrated industries, while it is close to zero for competitive environments. Since smaller firms that operate in concentrated industries have a certain element of market power and hence relative importance that would offset size based bargaining disadvantages, we expect a negative relation between the Herfindahl index of the smaller partner's industry and the likelihood of the use of equity in alliances. In all our analyses, as in Graham, Lemmon, and Wolf (2002), we define industry according to 4-digit SIC code with the requirement that there be a minimum of 5 companies in the industry. If we find fewer than 5 companies using the 4-digit SIC code, we define industry using the 3-digit SIC code, again imposing the 5 company minimum requirement. We continue to apply this criterion until we find more than 5 companies in an industry or until we reach the 1-digit SIC code.[3]

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[3] As an alternative but coarser measure of bargaining power differences between partners, we analyze the number of other firms in each partners' industry. We expect that when there are fewer firms in any partner's industry then that partner's bargaining power is likely to be higher. Therefore, we would expect increased incidence of equity usage in such alliances to mitigate the *ex post* bargaining costs.

2.2.3. Capital constraints

To examine whether equity is used primarily as a source of capital for the capital constrained partner in an alliance, we use several corporate liquidity measures in our empirical analyses. Our first measure of capital constraints is *Cash/Total assets*, which is defined as the ratio of free cash flow to total assets of each partner in the year prior to the alliance formation. As in Lehn and Poulsen (1989), we define free cash flow as operating income before depreciation minus total taxes, interest expense, dividends on preferred and common stock. We expect to see higher incidences of equity usage in alliances where one of the partners has low levels of cash flow relative to the other partner. Additionally, the capital constraints hypothesis suggests that in equity alliances, cash flow will be higher for the selling firm compared to it's industry counterparts.

As a second measure of potential capital constraints we use *debt ratio* of the partners. Debt ratio is defined as the ratio of the debt to total assets, where debt is defined as long-term debt minus capital leases. In the presence of bankruptcy and debt related agency costs, highly levered firms are forced to rely on external equity to finance their operations. Reliance on external equity by highly levered firms is also consistent with Myers' (1984) pecking order theory of financing choices. To minimize the costs of external equity, especially the adverse selection costs, highly levered firms entering into alliances will prefer to place their equity privately with their partners. Thus, the capital constraints hypothesis suggests that in equity alliances, debt ratio will be higher for the selling firm compared to it's industry counterparts and compared to the buying firm.

Since firms with low earnings and/or cash flows may be capital constrained even if their debt ratios were low because their ability to raise additional debt capital is poor, debt ratio alone

may not be a complete indicator of capital constraints. To control for this problem, we also compute other measures of financial health and ability to raise capital. We use *interest coverage ratio*, *capital expenditure coverage ratio*, *profit margin*, and *return on assets* (ROA) as additional measures. Interest coverage ratio is defined as the ratio of EBIT to interest expense, and capital expenditure ratio is equal to income before extraordinary items plus depreciation minus dividends on common stocks over capital expenditures. Profit margin is the ratio of operating income before depreciation to sales, and return on assets is the ratio of operating income before depreciation to total assets. When one of the partners is significantly capital constrained, we would expect a higher likelihood of equity alliances. Also, the capital constraints hypothesis suggests that in equity alliances, all four measures will be lower for the selling firm compared to it's industry counterparts and compared to the buying firm.

3. Determinants of Equity Linkages in Alliances

In this section we examine the firm-specific and alliance-specific characteristics that explain the use of equity in alliances. We first analyze differences in the variables between the equity and non-equity alliances, and then attempt to explain the incidence of equity alliances using logistic regressions. Table 2 focuses on equity alliances, and presents the differences in financial and industry characteristics of the selling and buying partners in equity alliances. We find some evidence consistent with the implications of the differential bargaining power hypothesis that equity is more likely to be used when alliances pair firms that differ greatly in their size and market power. Panel A of Table 2 shows that in equity alliances, buying firms are significantly larger (mean of about $26 billion) than selling firms (mean of $784 million). Also, the buying firms command a greater market share in their respective industries. For a typical

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buying firm, it's market share is about 11.3% while a typical selling firm has a market share of only around 1.4%. These differences are significant at the 1% level of significance.

Consistent with the implications of the incomplete contracting hypothesis that equity is used when an alliance pairs high growth firms, we observe that in Table 2 both the buying and selling firms have higher growth options than their industry counterparts. From Panel B of Table 2, it may be noted that all proxies for growth opportunities, market-to-book ratio, sales growth, R&D/total assets, intangible assets/total assets, and capital expenditures/total assets are greater for the buying firms compared to their industry means. A similar observation may also be made for the selling firms. When we compare the buying firms with the selling firms, we do not find a consistent difference in the growth options of the two groups. Thus, the evidence suggests that equity alliances pair high growth firms. That is, unlike in mergers, there is not much evidence to suggest that low growth buyers are seeking high growth "targets" via equity alliances.

Perhaps the most significant difference between buying and selling firms is in the degree of capital constraints faced by the two partners. The evidence strongly supports the capital constraints hypothesis that the infusion of capital in equity alliances is, in part, driven by the capital constraints faced by the selling firm. From Panel A of Table 2, it may be seen that the buying firms are not only larger but are also older with an average age of 19.4 years, compared to the selling firms that average only 3.9 years. From Panel B of Table 2, we may see that the buying firms have substantially more cash flow and debt capacity, are more profitable with fewer capital constraints than the selling firms. The cash flow, profit margin, and ROA of the buying firms are not only significantly higher than that of the selling firms, they are also higher when compared to their own industry counterparts. These differences are all significant at the 1% level. Further, the interest coverage ratio and capital expenditure coverage ratio of the buying

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firms are also greater than the corresponding figures for the selling firms. These results indicate that in equity alliances, the larger, more profitable and cash-rich firms infuse equity capital into the smaller, capital constrained partners. Thus, consistent with the implications of the capital constraints hypothesis, equity alliances are not just product market partnerships but are also efficient financing partnerships.

Tables 3 and 4 compare the partners in equity alliances with the corresponding partners in non-equity alliances. We first focus on the selling firm in equity alliances. Since there is no sale of equity in non-equity alliances, it is not possible to identify the "corresponding" partner in a non-equity alliance. However, our results in Table 2 reveal that in equity alliances, the selling firm is on average smaller than the buying firm. Also, from further direct analysis of our data we find that in 92% of the equity alliances, the smaller partner is the partner selling the equity. Therefore, for our subsequent analyses we use firm size to match partners across alliances. So, in Table 3, we compare the set of all smaller partners in equity alliances with the set of all smaller partners in non-equity alliances.

The results in Table 3 highlight several fundamental differences between partners in equity versus non-equity alliances. The results are unambiguously consistent with the implications of the differential bargaining power and capital constraints hypotheses. We find that the smaller partners in equity alliances are significantly smaller with an average size of $707 million compared to the smaller partners in non-equity alliances who average about $2.4 billion in firm size, a difference that is significant at the 1% level. They are also younger and have lower market share than their counterparts in non-equity alliances. This suggests that equity linkages are more frequent when the smaller partner has lower market power, i.e., when the smaller firm is at a disadvantaged bargaining position in the alliance.

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More interestingly, from panel B of Table 3, it may be seen that the smaller partners in equity alliances have growth opportunities that are indistinguishable from those involved in non-equity alliances, but these firms are significantly more cash and capital constrained relative to their non-equity counterparts and industry peers. In particular, the different measures of growth prospects, market-to-book ratio, sales growth, R&D, and capital expenditures of the smaller partners in equity alliances are at least as high as the corresponding measures of their industry counterparts. However, the cash flow and interest coverage ratio of the smaller partners in equity alliances are significantly weaker than those of their peers. On the other hand, the smaller partners in non-equity alliances have higher growth, higher cash flow, stronger interest coverage, more debt capacity, and are overall more profitable than their industry peers.

Furthermore, a direct comparison of the smaller partners in equity and non-equity alliances reveal some important differences. The partners in equity alliances have similar growth prospects, higher R&D, and higher capital expenditures than their non-equity alliance counterparts. The smaller partners in equity alliances, however, are also more capital constrained. Unlike the smaller partners in non-equity alliances, the smaller partners in equity alliances have negative cash flow, very low interest coverage (despite low debt), very low capital expenditure coverage, and low profit margin and ROA. Thus, our results indicate that smaller partners that are capital constrained rely more on equity alliances than smaller partners that are more profitable and those that are not capital constrained.

In Table 4 we perform the equivalent analysis for the bigger partners in equity and non-equity alliances. As mentioned earlier, the bigger firms in equity alliances are most often (92% of the times) the buyers of equity in the alliance. Consistent with this fact, we find that bigger firms in equity alliances are bigger and older than corresponding firms in non-equity alliances.

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Panel A of Table 4 shows that the median firm in equity alliances is about $16.6 billion in firm size compared to a statistically significantly smaller $7.8 billion for the median firm in non-equity alliances. For the larger partners, the median age in equity alliances is also about 50% higher than the median age in non-equity alliances.

From Panel B of Table 4, it may be seen that the typical larger firm in equity alliances has a higher profit margin than the corresponding partner in non-equity alliances. Further, the larger partners in equity alliances have more cash flow, a lower debt ratio, a stronger interest coverage ratio, and higher profit margin and ROA than their industry counterparts. Similar characteristics are true of the larger partners in non-equity alliances as well. However, unlike the larger partners in equity alliances, the corresponding partners in non-equity alliances have more growth opportunities. Coupled with the evidence in Table 3 that smaller partners in equity alliances are more capital constrained, these results suggest that cash rich, larger partners with larger debt capacity seek out high growth but capital constrained partners for equity alliances. Thus, equity alliances are at least partly driven by the need for capital and typically pair capital constrained firms with cash-rich firms.

In Table 5 we further examine the impact of the differential bargaining power hypothesis, and the capital constraints hypothesis on equity usage in strategic alliances. Here, we classify all alliances into two groups based on several financial, industry, and other characteristics of the smaller partner in the sample of strategic alliances. We then report the proportion of equity alliances in each category. If equity usage in alliances mitigates contracting and bargaining costs due to bargaining power differences between the partners, we would expect more equity alliances in the subset of alliances where the smaller partner is ex-ante at a bargaining disadvantage. Consistent with the implications of the differential bargaining power hypothesis,

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we find that 15.2% of alliances use equity when the smaller partner's market power (proxied by market share) is low, while only 7.5% of alliances use equity when the smaller partner's market power is high. Similar results are also true when we classify alliances based on the smaller partner's age and firm size. 16.1% of alliances use equity when the smaller partner's age is below the median age of all smaller partners, while only 6.1% of alliances use equity in the complement subsample. Also, when the smaller partner's size is below median, 15.7% of alliances use equity, compared to 7% when the smaller partner's size is above median.

We would also expect that when an alliance is formed with a smaller partner that operates in a competitive industry, the alliance is more likely to involve equity usage since the smaller partner would be at a bargaining disadvantage vis-à-vis the larger partner. The results in Table 5 however, do not support this view. We do not find a difference in the proportion of alliances that use equity between the two subsamples formed based on the concentration level of the smaller partners' industry (measured by Herfindahl index).

In Table 5, we also examine the implications of the capital constraints hypothesis by classifying alliances into two groups based on five different measures of capital constraints and analyzing the proportion of equity alliances in each group. Consistent with the capital constraints hypothesis, we find that when the cash flow of the smaller partner is low, there is a significantly greater proportion of equity alliances than when the cash flow is high (17.2% versus 5.4%). Also, in the group where the smaller partner's interest coverage ratio is low, the proportion of equity alliances is 17.5% compared to just 3.1% in the group where the interest coverage ratio is high. Similar results are also true when we classify based on capital expenditure coverage ratio, another index of capital constraint. Additionally, when debt capacity is low, i.e., when the debt ratio is high and the interest coverage ratio is low, the proportion of

equity alliances is over three times larger than when the debt capacity is high (18.3% versus 5.4%). Thus, the evidence indicates that differential bargaining power and capital constraints are important determinants of equity usage in alliances.

In addition to the evidence from analysis based on partner-specific information described above, we also use alliance-specific information to examine the incomplete contracts hypothesis and the differential bargaining power hypothesis. In Table 6 we compare alliance-specific characteristics across equity and non-equity alliances. If contracting problems are higher when alliances bring together partners who operate in different lines of business (cross-industry alliances), then we would expect such alliances to use more equity. On the other hand, as Harrigan (1987) argues, partners operating in the same industry are direct competitors and any loss of revenues, market share, and future profitability of one firm is a more distinct advantage to the other. This may result in more opportunistic behavior that undermines the contractual performance of alliances. In this case we would expect same-industry alliances to use more equity. We analyze these competing claims in Table 6. Consistent with Harrigan (1987), the results indicate that among equity alliances 53.6% are cross-industry alliances while this percentage is 69.2% among non-equity alliances. This difference is significant at the 1% level.

As a specification check, we also examine the relation between the incidence of equity alliances and the two other measures of dissimilarity in the industry classification of the partners. The results in Table 6 indicate that among equity alliances, both the categorical and continuous distance measures are significantly smaller than among the non-equity alliances. The differences are more pronounced in the medians. All differences are significant at the 1% level. This indicates that partners that operate in similar industries rely more on equity alliances than partners that operate in different industries. This is consistent with the view that incomplete

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contracting problems are more severe in same-industry alliances, perhaps because of the direct competition between the partners and the potential opportunism that it may foster. Alternatively, this result suggests that when firms take an equity stake, they do so in focus-increasing transactions (same-industry alliances) than in focus-decreasing transactions.

We examine the incomplete contracting hypothesis by analyzing whether alliances where there is significant technology sharing such as R&D ventures, use equity more frequently to mitigate the contracting problems that arise due to the uncertainty in input and output sharing in such alliances. The results indicate that over 82% of equity alliances are technology related alliances compared to only 47% of non-equity alliances. This difference is statistically significant at the 1% level and is consistent with the implications of the incomplete contracting hypothesis.

We also examine whether alliances where the bargaining power differential is greater use more equity to mitigate contracting and hold-up problems. We measure bargaining power differences using the differences in firm size, and growth options of the partners. Specifically, we use the ratio of market-to-book, ratio of R&D intensities, and ratio of firm size of the two partners as an index of the difference in bargaining powers between the two partners in the alliances. We find that these variables are significantly higher for equity alliances than for non-equity alliances. In particular, for equity alliances, the mean ratio of market-to-book is 3.90 while for non-equity alliances it is a significantly lower 2.43. Similarly, relative size, which is the ratio of the size of larger partner to the size of the smaller partner, is significantly higher for the sample of equity alliances than for the sample of non-equity alliances. These results indicate that when the disparity in size and growth options between partners in an alliance is larger, potentially increasing the risk of hold-up for the weaker partner in the alliance, firms tend to use

more equity linkages to mitigate the adverse effects of differential bargaining powers. Overall, our results are consistent with the incomplete contracts hypothesis and the differential bargaining power hypothesis.

Table 7 presents logistic regressions that explain the incidence of equity usage in strategic alliances. In these regressions, the dependent variable is an indicator variable which is 1 if the alliance is an equity alliance and is 0 otherwise. The regressions across Panels A and B of Table 7 use different specifications for the capital constraints hypothesis. Within each panel, the different regressions use alternative proxies for the bargaining power differences. The regressions in Table 7 offer evidence to support the incomplete contracting, the differential bargaining power, and the capital constraints hypotheses. Consistent with the incomplete contracts hypothesis, the R&D dummy, technology dummy, and development dummy, which identify alliances that are most likely to have contracting problems have positive and significant coefficients in the regressions in panels A and B. Thus, even after controlling for other factors, equity usage is more likely in technology and R&D alliances.

We also find that the cross-industry dummy has a negative and significant coefficient in the regressions. Consistent with the univariate results, this suggests that partners that operate in the same industry are more likely to use equity to mitigate contracting costs that arise due to potential opportunism problems when firms competing in the same industry decide to cooperate through alliances. We also find some evidence to support the differential bargaining power hypothesis. The coefficients of log of relative size, market share ratio, and R&D intensity are all positive and significant in panels A and B of Table 7. Additionally, the variable measuring the number of firms in each partner's industry is negative and significant in all the regressions, suggesting that as the number of firms in a partners' industry decreases, there is more equity

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usage to mitigate the increased bargaining costs.[4] These results are consistent with the view that equity linkages are more likely to be used to mitigate hold-up costs in alliances where the bargaining power differences between the partners are high. The coefficient of the ratio of market-to-book is not significant in any of the regressions. This suggests that once we control for factors that measure incomplete contracting problems and capital constraints, the difference in growth opportunities between the two partners does not dictate the use of equity in alliances.

Finally, we also find evidence to support the capital constraints hypothesis. In panel A of Table 7 we find that the coefficient of the smaller partners' cash flow to total assets is negative and statistically significant in three of the four regressions. Similarly, from panel B, the coefficient of the capital expenditure coverage ratio of the smaller partners is negative and significant in three of the four regressions.[5] These results suggest that firms with low cash flow, low income relative to their capital expenditures, and firms with poor borrowing capacity rely more on equity alliances. Consistent with the results of our univariate analysis, these results suggest that capital constrained firms rely on equity infusions from alliance partners to finance their growth opportunities. This is also consistent with the view that the adverse selection costs of equity may be lower when equity is sourced from presumably well-informed alliance partners.

4. Wealth Effects of Equity and Non-equity Alliances

Chan, Kensinger, Keown, and Martin (1997) find positive abnormal returns around the announcement of strategic alliances. We confirm these returns by employing the event-study methodology used by Dodd and Warner (1983). We estimate a market model over a 155-day

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[4] Panels A and B in Table 7 report the results using the variable *number of firms in the smaller partner's industry*. Virtually identical results are obtained when we replace this variable with the variable *number of firms in the larger partner's industry*.

period ending 45 days before the announcement of the alliance. The CRSP value-weighted index is used as a proxy for the market portfolio. Table 8 summarizes the abnormal returns over different time intervals around the announcement date for the sample of firms that engaged in alliances. We obtain a significant two-day cumulative abnormal return of 1.75% in the window (-1,0), which is consistent with the findings of earlier studies on alliances.

We also examine the announcement period abnormal returns for the different types of alliances. We find that most of the positive abnormal returns are confined to equity alliances. The average abnormal returns for equity alliances is 6.57% while for non-equity alliances it is 1.15%. This is consistent with the argument that equity usage in alliances mitigates the contracting costs associated with incomplete contracting and differences in bargaining powers, and further benefits the capital constrained partners by reducing their adverse selection costs of equity. When we focus on equity alliances and analyze the wealth gains to the buying and selling partners, we find that the buying partners have no significant abnormal reaction, while the selling partners have 14.76% abnormal stock price reaction. This suggests that the market perceives that benefits of using equity in alliances accrue primarily to the selling partners. The result is also in contrast to the results regarding the announcement gains around toehold acquisitions prior to takeovers. Mikkelson and Ruback (1985), and Choi (1991) report that target firms experience a positive reaction of only about 2.1% around toehold announcements. Thus, the market views equity positions taken as part of a strategic alliance to be more beneficial than the gains to a potential takeover target. This evidence is consistent with the evidence in Allen and Phillips (2000) that block purchases accompanied by product market relationships are

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[5] We also used debt capacity of the smaller partners as an alternate specification for capital constraints in the logistic regressions. Since we obtained qualitatively similar results to those reported in panels A and B of Table 7, we do not present those results here. The results are available from the authors upon request.

associated with higher abnormal returns (9.1%) than block purchases without product market relationships. Additionally, as in our sample, the excess returns in Allen and Phillips (2000) were confined to the selling firms, with the buyers experiencing no significant abnormal returns.

The evidence also indicates that the positive announcement period reaction in equity alliances is mainly confined to technology alliances. This suggests that the wealth gains accrue mainly in technology alliances where the benefits of mitigating the incomplete contracting costs are high. Additionally, the gains are confined mostly to the selling partners, where they experience a 15% abnormal reaction to the announcement of equity alliances. Even among non-equity alliances, only the smaller partners experience a positive stock price reaction. This reaction averages 2.17%. Here, both technology and non-technology alliances experience small but significant price reactions of 1.25% and 1.06% respectively. Among non-equity alliances, the largest gains accrue to the small partners engaging in technology alliances. Overall our results indicate that though the product market agreements in alliances create value, the financing arrangements and the enhanced efficiency of contracting achieved through equity alliances actually create higher value.

5. Conclusion

In this paper, we analyze the incidence of equity linkages in strategic alliances using a large sample of alliances formed during the period 1989 through 1997. A strategic alliance is a business form in which two or more firms agree to pool their resources to pursue a common objective. It is a hybrid organizational form that is between an arms length contract and a full-fledged merger. In some alliances firms take a minority equity stake in the partner firm. We refer to these as equity alliances. Using data on 759 alliances, we examine the motivation for the use of equity in strategic alliances. We examine whether the use of equity in alliances is

intended to strengthen the contractual performance of the alliance and whether it is a means of financing for the capital constrained partner in the alliance. In particular, we study the role of incomplete contracts, bargaining power differences between partners, and capital constraints in explaining the incidence of equity alliances. Consistent with the incomplete contracts theory, equity is more likely to be used when an alliance pairs high growth partners or when the alliance is a technology or R&D alliance. Typically, these are alliances where the exact nature and the sharing of the output is ambiguous. The evidence is not consistent with the view that partners in dissimilar industries use equity to mitigate any contracting problems. In fact, the evidence shows that when firms take an equity stake, they are more likely to do so in focus increasing alliances (i.e., same industry alliances).

We also find that equity is used when the difference in bargaining powers between the partners is higher, such as when the partners differ significantly in size, market power, or growth opportunities. Finally, we find that equity alliances are especially likely when the smaller partner (which is almost always the selling partner) is high growth but is liquidity constrained. Thus, equity is used as a means of providing financing to the capital constrained partner in the alliance. We further find that the selling partners in equity alliances are typically high growth but capital constrained firms that have poor borrowing capacity. By engaging in an equity alliance, these firms forge a finance partnership along with their product market agreements with their alliance partners. Sourcing equity from a well-informed product market partner reduces the adverse selection costs of raising equity capital for these firms.

The stock price reaction to alliances is positive, and technology alliances account for a significant part of the positive reaction in the sample. Consistent with the view that equity usage mitigates contracting costs or capital constraints, the market reaction to equity alliances is

significantly large. For the firm selling the equity, the announcement period abnormal returns are 14.76%, while it is insignificant for the buying firms. Thus, our evidence suggests that the market views equity investments in strategic alliances as more valuable than toeholds taken by potential acquirers where the abnormal reaction in the target firm stock is only around 2.2%. Overall our results also indicate that though the product market agreements in alliances create value, the financing arrangements and the efficient contracting in equity alliances may actually create even higher value.

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Table 1

Distribution of Strategic Alliances by Formation Year and Alliance-Type

Panel A presents the distribution of 759 alliances formed during the period 1989 to 1997. The table classifies alliances into equity and non-equity alliances and specifies the number and proportion of each type of alliance in each year. Panel B classifies the alliances based on the type of agreement or contract between the partners. In panel B the total number of alliances add up to more than 759 since alliances with more than one objective are included multiple times. This panel also classifies the alliances as technology or non-technology alliances, where technology alliances are those that involve any R&D, technology, development and manufacturing, or multiple types of agreements.

Panel A

Year	Number of Alliances	Number of Non-Equity Alliances	Proportion	Number of Equity Alliances	Proportion
1989	19	16	84.20%	3	15.8%
1990	22	18	81.80%	4	18.2%
1991	33	27	81.80%	6	18.2%
1992	48	40	83.30%	8	16.7%
1993	72	63	87.50%	9	12.5%
1994	81	70	86.40%	11	13.6%
1995	116	102	87.90%	14	12.1%
1996	173	154	89.00%	19	11.0%
1997	195	172	88.20%	23	11.8%
Total	**759**	**662**	**87.20%**	**97**	**12.8%**

Panel B

Type of contract	Number of alliances	Proportion of equity alliances
R&D	38	55.30%
Multiple	259	25.50%
Technology	119	16.80%
Dev. & Manuf.	215	15.80%
Marketing	460	10.40%
Supply	93	17.20%
Licensing	62	27.42%
Not identified	45	17.80%
	1291	**17.82%**
Technology	367	19.9%
Non-technology	347	4.6%
Not identified	45	17.8%
Total	**759**	**12.8%**

Table 2

Descriptive Statistics of the Buying and Selling Partners in Equity Alliances

Panel A presents descriptive statistics comparison between the buyer and seller of equity in equity alliances during the period 1989 to 1997. The mean and median (below) are presented for selected variables. The last column reports the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. Panel B presents descriptive statistics comparison for the buyer firm and the seller firm with their respective industry counterparts. Columns 3 and 6 show the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. The last column provides the p-values for these same tests but for the differences between the buyer and seller firm involved in an equity alliance.

Firm value is equal to book value of assets minus book value of equity plus market value of equity. It is given in millions of dollars. Market share is equal to firm net sales divided by the summation of net sales in the firm's industry where industry is based on the 4-digit SIC code with the requirement that there be a minimum of 5 companies in the industry. If we find fewer than 5 companies using the 4-digit SIC code, we define industry using the 3-digit SIC code, again imposing the 5 companies minimum requirement. We continue to apply this criterion until we find more than 5 companies in an industry or until we reach the 1-digit SIC code. The same industry definition is also used for the Herfindahl index calculation. For each company, age is defined as the difference between the year of the alliance formation minus the year when company information began appearing on CRSP. Market to book is the ratio of firm value over book value of assets. Sales growth is the one-year percentage change in net sales just before the alliance formation. R&D, Intangible assets, and cash flow are obtained from Compustat in the year before the alliance formation. Cash is defined as operating income before depreciation minus total income taxes, interest expense, dividends on preferred and common stock. Debt ratio is defined as debt over book value of assets where debt is long-term debt minus capital leases. Interest coverage is EBIT over interest expenses. Capital expenditure coverage is equal to income before extraordinary items plus depreciation minus dividends on common stocks over capital expenditures. Profit margin is operating income before depreciation over net sales. Asset turnover is sales over book value of assets. ROA is defined as operating income before depreciation over total assets. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A	*Buyer*	*Seller*	*p-value*
Firm value	26039.37	784.3758	0.0001***
	12906.71	131.97	0.0001***
Market share	0.1131	0.0141	0.0001***
	0.0568	0.0006	0.0001***
Herfindahl index	0.1703	0.1682	0.9053
	0.1025	0.1095	0.5814
Age	19.3625	3.875	0.0001***
	24.0000	1.000	0.0001***

Panel B	Buyer			Seller			Difference
	Firm	*Industry*	*p-value*	*Firm*	*Industry*	*p-value*	*p-value*
Market to book	2.9262	2.5868	0.0518*	3.4924	2.6824	0.0707*	0.5010
	2.1547	1.8194	0.0920*	2.7329	1.9376	0.1181	0.2541
Sales growth	0.2499	0.1568	0.0445**	0.8638	0.1656	0.0825*	0.5563
	0.1286	0.0842	0.1702	0.2151	0.0903	0.0663*	0.2571
R&D / Total assets	0.0946	0.0831	0.0019***	0.2821	0.2237	0.0075***	0.0001***
	0.0977	0.0367	0.0001***	0.2126	0.1286	0.0055***	0.0001***
Intangibles /	0.1463	0.0775	0.0005***	0.1181	0.0591	0.1106	0.0329**
Total assets	0.1167	0.0327	0.0112**	0.0290	0.0189	0.7595	0.0133**
Capital expenditure /	0.0827	0.0744	0.0608*	0.0907	0.0603	0.0851*	0.2276
Total assets	0.0712	0.0586	0.1809	0.0658	0.0445	0.1057	0.6583
Cash / Total assets	0.1189	0.0134	0.0001***	-0.2736	-0.0586	0.0005***	0.0001***
	0.1116	0.0594	0.0001***	-0.2649	0.0510	0.0002***	0.0001***
Debt ratio	0.1480	0.2312	0.0029***	0.0914	0.2661	0.0001***	0.0001***
	0.0893	0.1989	0.0870*	0.0089	0.109	0.0002***	0.0004***
Interest coverage	18.9611	36.9349	0.4494	-88.4935	62.9553	0.0001***	0.0001***
	7.2578	6.2308	0.1960	-27.4186	9.3113	0.0001***	0.0001***
Capital expenditure	1.4917	-3.4019	0.0001***	-12.3287	-15.8438	0.0001***	0.0001***
coverage	1.3161	0.4485	0.0005***	-3.0989	-0.9279	0.0001***	0.0001***
Profit margin	0.2198	-0.9819	0.0001***	-6.170	-1.0112	0.0121**	0.0001***
	0.2191	0.0695	0.0001***	-0.2522	0.0157	0.0118**	0.0001***
ROA	0.1922	0.0105	0.0001***	-0.2585	-0.1114	0.0097***	0.0001***
	0.1834	0.1012	0.0008***	-0.2355	0.0542	0.0015***	0.0001***

Table 3

**Differences in Characteristics of the Smaller Partner between
Equity and Non-Equity Alliances**

Panel A presents descriptive statistics comparison for the small partners that are involved in an equity and non-equity alliance during the period 1989 to 1997. The mean and median (below) are presented for selected variables. The last column reports the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. Panel B presents descriptive statistics comparison for the buyer firm and the seller firm with their respective industry counterparts.   Columns 3 and 6 show the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. The last column provides the p-values for these same tests but for the differences between the buyer and seller firm involved in an equity alliance.

Firm value is equal to book value of assets minus book value of equity plus market value of equity. It is given in millions of dollars. Market share is equal to firm net sales divided by the summation of net sales in the firm's industry where industry is based on the 4-digit SIC code with the requirement that there be a minimum of 5 companies in the industry. If we find fewer than 5 companies using the 4-digit SIC code, we define industry using the 3-digit SIC code, again imposing the 5 companies minimum requirement. We continue to apply this criterion until we find more than 5 companies in an industry or until we reach the 1-digit SIC code. The same industry definition is also used for the Herfindahl index calculation. For each company, age is defined as the difference between the year of the alliance formation minus the year when company information began appearing on CRSP. Market to book is the ratio of firm value over book value of assets. Sales growth is the one-year percentage change in net sales just before the alliance formation. R&D, Intangible assets, and cash flow are obtained from Compustat in the year before the alliance formation. Cash is defined as operating income before depreciation minus total income taxes, interest expense, dividends on preferred and common stock. Debt ratio is defined as debt over book value of assets where debt is long-term debt minus capital leases. Interest coverage is EBIT over interest expenses. Capital expenditure coverage is equal to income before extraordinary items plus depreciation minus dividends on common stocks over capital expenditures. Profit margin is operating income before depreciation over net sales. Asset turnover is sales over book value of assets. ROA is defined as operating income before depreciation over total assets. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A	*Equity*	*Non-equity*	*p-value*
Firm value	707.1535	2398.1860	0.0036***
	129.5645	365.8563	0.0032***
Market share	0.02303	0.0456	0.0013***
	0.0025	0.0070	0.0173**
Herfindahl index	0.1669	0.1865	0.7142
	0.1213	0.1149	1.0000
Age	6.0961	9.2797	0.0033***
	3.5000	6.0000	0.0003***

Panel B	Equity			Non-equity			Difference
	Firm	*Industry*	*p-value*	*Firm*	*Industry*	*p-value*	*p-value*
Market to book	3.8424	2.5940	0.0672*	3.1295	2.6844	0.0003***	0.2525
	2.5472	1.9376	0.2416	2.1429	1.6565	0.0031***	0.5561
Sales growth	0.8526	0.1321	0.0329**	1.0332	0.1978	0.0001***	0.5441
	0.2432	0.0556	0.0578*	0.2462	0.1661	0.0004***	0.8905
R&D / Total assets	0.2125	0.2503	0.4044	0.1338	0.1130	0.0001***	0.0039***
	0.1614	0.1321	0.4719	0.1091	0.0845	0.0001***	0.0343**
Intangibles /	0.1070	0.0562	0.2085	0.1163	0.0422	0.0001***	0.1763
Total assets	0.0251	0.0260	1.0000	0.0571	0.0032	0.0001***	0.1445
Capital expenditure /	0.0702	0.0595	0.9343	0.0688	0.0640	0.8770	0.0421**
Total assets	0.0316	0.0439	0.3770	0.0507	0.0491	0.5723	0.0421**
Cash / Total assets	-0.156	-0.1184	0.0650*	0.0532	-0.1487	0.0001***	0.0001***
	-0.1125	0.0493	0.0372**	0.0849	0.0501	0.0001***	0.0002***
Debt ratio	0.0851	0.2546	0.0002***	0.0915	0.1814	0.0001***	0.5114
	0.0179	0.1529	0.0001***	0.0258	0.1244	0.0001***	0.5598
Interest coverage	-85.6729	41.1579	0.0001***	40.4954	56.9141	0.0001***	0.0001***
	-15.089	6.1663	0.0001***	5.0459	12.6814	0.0001***	0.0001***
Capital expenditure	-13.1226	-20.2529	0.4421	0.6383	-18.3286	0.0001***	0.0001***
coverage	-2.2603	0.0386	0.2325	1.2812	0.6278	0.0002***	0.0001***
Profit margin	-2.1444	-1.2890	0.5011	-0.0469	-1.4921	0.0001***	0.0001***
	-0.0252	-0.0068	1.0000	0.1104	0.0767	0.0001***	0.0023***
ROA	-0.1224	-0.1397	0.3113	0.0923	-0.0466	0.0001***	0.0001***
	-0.0604	0.0400	0.0953*	0.1227	0.0905	0.0001***	0.0002***

Table 4

Differences in Characteristics of the Larger Partner between Equity and Non-Equity Alliances

Panel A presents descriptive statistics comparison for the large partners that are involved in an equity and non-equity alliance during the period 1989 to 1997. The mean and median (below) are presented for selected variables. The last column reports the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. Panel B presents descriptive statistics comparison for the buyer firm and the seller firm with their respective industry counterparts. Columns 3 and 6 show the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. The last column provides the p-values for these same tests but for the differences between the buyer and seller firm involved in an equity alliance.

Firm value is equal to book value of assets minus book value of equity plus market value of equity. It is given in millions of dollars. Market share is equal to firm net sales divided by the summation of net sales in the firm's industry where industry is based on the 4-digit SIC code with the requirement that there be a minimum of 5 companies in the industry. If we find fewer than 5 companies using the 4-digit SIC code, we define industry using the 3-digit SIC code, again imposing the 5 companies minimum requirement. We continue to apply this criterion until we find more than 5 companies in an industry or until we reach the 1-digit SIC code. The same industry definition is also used for the Herfindahl index calculation. For each company, age is defined as the difference between the year of the alliance formation minus the year when company information began appearing on CRSP. Market to book is the ratio of firm value over book value of assets. Sales growth is the one-year percentage change in net sales just before the alliance formation. R&D, Intangible assets, and cash flow are obtained from Compustat in the year before the alliance formation. Cash is defined as operating income before depreciation minus total income taxes, interest expense, dividends on preferred and common stock. Debt ratio is defined as debt over book value of assets where debt is long-term debt minus capital leases. Interest coverage is EBIT over interest expenses. Capital expenditure coverage is equal to income before extraordinary items plus depreciation minus dividends on common stocks over capital expenditures. Profit margin is operating income before depreciation over net sales. Asset turnover is sales over book value of assets. ROA is defined as operating income before depreciation over total assets. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A	*Equity*	*Non-equity*	*p-value*
Firm value	33722.32	26844.56	0.0290**
	16556.17	7797.731	0.0081***
Market share	0.1766	0.1540	0.2338
	0.0971	0.0784	0.5448
Herfindahl index	0.1876	0.1993	0.9768
	0.0980	0.1273	0.2380
Age	24.1730	19.0618	0.0121**
	27.5000	19.0000	0.0026***

Panel B	Equity			Non-equity			Difference
	Firm	Industry	p-value	Firm	Industry	p-value	p-value
Market to book	2.4789	2.4310	0.4220	2.8560	2.7121	0.0001***	0.7846
	1.8279	1.7650	0.6963	1.9428	1.5897	0.0114**	0.5561
Sales growth	0.1519	0.1141	0.1020	0.3038	0.1839	0.0022***	0.0916*
	0.0944	0.0613	0.0510*	0.1527	0.1242	0.2749	0.0926*
R&D / Total assets	0.0830	0.0968	0.0996*	0.0990	0.0980	0.0002***	0.2227
	0.0877	0.0367	0.0039***	0.0987	0.0589	0.0001***	0.1867
Intangibles /	0.1471	0.0630	0.0021***	0.1072	0.0421	0.0001***	0.1081
Total assets	0.1050	0.0327	0.0765*	0.0543	0.0030	0.0001***	0.2903
Capital expenditure /	0.0782	0.0613	0.0227**	0.0779	0.0676	0.0344**	0.5199
Total assets	0.0709	0.0540	0.0063***	0.0655	0.0568	0.0662*	0.3009
Cash / Total assets	0.1127	0.0279	0.0033***	0.1100	-0.2034	0.0001***	0.7763
	0.1050	0.0746	0.0053***	0.1083	0.0502	0.0001***	0.7643
Debt ratio	0.1407	0.1930	0.0450**	0.1317	0.2047	0.0001***	0.5087
	0.0959	0.1982	0.2321	0.1050	0.1840	0.0016***	0.7727
Interest coverage	15.9557	13.4283	0.0284**	38.2976	45.0373	0.3980	0.5103
	8.0560	5.1391	0.0075***	7.2636	7.3998	0.9702	0.4479
Capital expenditure	1.7063	0.5112	0.0015***	1.7168	-14.9629	0.0001***	0.8922
coverage	1.6279	0.8736	0.0013***	1.4009	0.9716	0.0001***	0.3758
Profit margin	0.2227	-1.3689	0.0001***	0.1787	-2.2480	0.0001***	0.0108**
	0.2125	0.0369	0.0001***	0.1671	0.0792	0.0001***	0.0982*
ROA	0.1935	0.0042	0.0001***	0.1695	-0.0206	0.0001***	0.2058
	0.1763	0.1014	0.0001***	0.1711	0.0905	0.0001***	0.2987

Table 5

Impact of Bargaining Power Differences and Liquidity Constraints on Equity Usage in Strategic Alliances

Each cell in each column presents the percentage of equity alliances relative to the total number of alliances in that cell. For each alliance, the small partner is classified as either low or high based on the variables specified in the panels. The small partner is said to have low levels of a variable if the value of the variable is lower than the median value of the variable of all firms in the sample of alliances, and is said to have high levels of the variable otherwise.

Cash is defined as operating income before depreciation minus total income taxes, interest expense, dividends on preferred and common stock. Debt ratio is defined as debt over book value of assets where debt is long-term debt minus capital leases. Debt capacity is a dummy that takes the value of 1 if the interest coverage is above and the debt ratio is below the median value in the sample of small firms engaged in alliances and 0 otherwise. Interest coverage is EBIT over interest expenses. Capital expenditure coverage is equal to income before extraordinary items plus depreciation minus dividends on common stocks over capital expenditures. Market share is equal to firm net sales divided by the summation of net sales in the firm's industry where industry is based on the 4-digit SIC code with the requirement that there be a minimum of 5 companies in the industry. If we find fewer than 5 companies using the 4-digit SIC code, we define industry using the 3-digit SIC code, again imposing the 5 companies minimum requirement. We continue to apply this criterion until we find more than 5 companies in an industry or until we reach the 1-digit SIC code. The same industry definition is also used for the Herfindahl index calculation. For each company, age is defined as the difference between the year of the alliance formation minus the year when company information began appearing in CRSP. Firm value is equal to book value of assets minus book value of equity plus market value of equity. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Category	*Low*	*High*
Cash / Total assets	17.2	5.4
Debt ratio	12.3	10.5
Debt capacity	18.3	5.4
Interest coverage	17.5	3.1
Capital expenditure coverage	17.3	5.3
Market share	15.2	7.5
Herfindahl index	11.4	11.4
Age	16.1	6.1
Firm value	15.7	7

Table 6

Differences in Characteristics between Equity and Non-Equity Alliances

The second and third columns present the mean, median of different financial and industry characteristics for the sample 759 strategic alliances formed during the period 1989 to 1997. The last column reports the p-values for the Wilcoxon test of difference in means, and the test of difference in medians. Cross-industry alliance is a dummy variable that is 1 if the partners are in different industries based on the 3-digit SIC code, and is 0 otherwise. There are two measures of distance – Distance (categorical) is 1, 2, 3, or 4 depending on whether the partners in the alliance differ in their 4-digit, 3 digit, 2-digit, or 1-digit SIC codes, respectively. This variable is 0 otherwise. Distance (continuous) is defined as follows. If the partner firms have the same 4-digit SIC code, the distance is 0. If they have the same 3-digit code but different 4-digit code, distance is equal to the absolute value of the difference in the 4th digit. If they have the same 2-digit code but different 3-digit code, distance is equal to the absolute value of the difference in the 3rd digit multiplied by 10. If they have the same 1-digit code but different 2-digit code, then distance is the difference in the 2nd digit multiplied by 100. Finally, if the firms differ in their 1-digit code, then we assign a distance of 1000, since a smaller difference in the 1st digit does not imply any similarity in the products of the two industries. The Technology dummy takes the value of 1 if the contract involves R&D, development, technology or multiple type of agreements. The Ratio of market to book divides the larger market-to-book ratio in the two partners over the smaller market-to-book ratio. Ratio of R&D intensities (R&D/Assets), the ratio of market value of assets, and the ratio of market shares are defined similarly. For the last two ratios we present the log value due to the dispersion of the data. Similar results obtain even without taking logs. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	Equity Alliances	Non-Equity Alliances	p-value
Cross-industry alliance	0.5360	0.6918	0.0023***
	1.0000	1.0000	0.0023***
Distance (Categorical)	2.1134	2.7054	0.0008***
	2.0000	4.0000	0.0019***
Distance (Continuous)	410.0417	572.5204	0.0010***
	20.0000	1000.0000	0.0024***
Technology Dummy	0.8202	0.4704	0.0001***
	1.0000	0.0000	0.0001***
Ratio of market to books	3.8979	2.4322	0.0064***
	1.2301	1.5605	0.0103**
Ratio of R&D intensities	10.8419	4.2628	0.0436**
	2.9514	2.0647	0.0213**
Relative Size	238.0535	131.1221	0.0001***
	59.2758	11.8548	0.0001***
Log of ratio of market value of assets	4.1112	2.8047	0.0001***
	4.0809	2.4727	0.0001***
Log of ratio of market shares	4.2162	2.7826	0.0001***
	4.2548	2.3739	0.0001***

Table 7

Logistic Regressions to Explain the Incidence of Equity Alliances

The dependent variable is 1 for equity alliances and 0 otherwise. Cross-industry dummy takes de value of 1 if the two partners are in different industries at the 3-digit SIC code and zero otherwise. The R&D, Technology, and Development dummies take the value of 1 if the contract specifies any R&D, technology or technology transfer, and product development, respectively. Ratio of Market to Book divides the larger industry median market-to-book from the two partners over the smaller industry median market-to-book. Ratio of R&D intensities (R&D/Total Assets), the ratio of market value of assets, and the ratio of market shares are defined similarly. For the last two ratios we present logs values. Three proxies for capital constraint are presented. The small partner's cash flow over total assets, the small partner's capital expenditure coverage, and the debt capacity variable. Debt capacity equals 1 if the interest coverage and the debt ratio of the smaller partner in an alliance are below and above the median in its industry, respectively and 0 otherwise. Panels A, B, and C present a series of logistic regressions by changing the capital constraint variables in the models across the panels. P-values are presented in parentheses. $*$, $**$, and $***$ represent significance at the 10%, 5%, and 1% levels, respectively.

Panel A

Regressions	(1)	(2)	(3)	(4)
Constant	-2.8941	-2.5275	-2.0518	-2.4115
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Cross-Industry Dummy	-0.4258	-0.7468**	-0.7373**	-0.4907
	(0.2556)	(0.0333)	(0.0315)	(0.2347)
R&D Dummy	2.4298***	2.3738***	2.6383***	3.1910***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Technology dummy	1.0436**	1.0998***	1.1132***	1.1693**
	(0.0173)	(0.0082)	(0.0072)	(0.0195)
Development Dummy	0.9352**	0.8843**	0.7844**	1.0912**
	(0.0152)	(0.0172)	(0.0338)	(0.0155)
Log of relative size	0.1929**			
	(0.0428)			
Log of ratio of market shares		0.2072***		
		(0.0096)		
Ratio of market-to-books			0.0117	
			(0.4296)	
Ratio of R&D intensity				0.0194*
				(0.0911)
Number of firms in small partner's industry	-0.0042**	-0.0055***	-0.0041**	-0.00487**
	(0.0317)	(0.0070)	(0.0197)	(0.0255)
Small Partner's Cash Flow / Total Assets	-2.1909***	-0.6531	-1.3131**	-1.4599**
	(0.0079)	(0.1648)	(0.0115)	(0.0283)

Table 7 (continued)

Logistic Regressions to Explain the Incidence of Equity Alliances

Panel B

Regressions	(1)	(2)	(3)	(4)
Constant	-2.9023	-2.4159	-1.7805	-2.1678
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Cross-Industry Dummy	-0.6203*	-0.7126**	-0.7623**	-0.3852
	(0.0941)	(0.0178)	(0.0103)	(0.2966)
R&D Dummy	2.8646***	2.1318***	2.5077***	3.0292***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Technology dummy	1.0458**	0.7647**	0.7568**	0.8751**
	(0.0169)	(0.0359)	(0.0361)	(0.0470)
Development Dummy	1.0823***	0.7908**	0.5370	0.8503**
	(0.0051)	(0.0163)	(0.1019)	(0.0354)
Log of relative size	0.2350***			
	(0.0085)			
Log of ratio of market shares		0.2197***		
		(0.0006)		
Ratio of market-to-book			0.00958	
			(0.5045)	
Ratio of R&D intensity				0.0171*
				(0.0964)
Number of firms in small partner's industry	-0.00527**	-0.00440***	-0.00340**	-0.00488***
	(0.0103)	(0.0025)	(0.0108)	(0.0070)
Small partner's capital expenditure coverage	-0.0200*	-0.00666	-0.0133**	-0.0138**
	(0.1000)	(0.2562)	(0.0130)	(0.0236)

Table 8
Announcement Period Abnormal Returns for Strategic Alliances
sorted by Alliance-Type

The tables presents the abnormal returns over the (-1,0) and (0,0) intervals around the announcement date for the sample of firms that engaged in alliances. We report the announcement period abnormal returns for the different types of alliances. We employ the event-study methodology used by Dodd and Warner (1983) in computing the abnormal returns. The market model is estimated over a 155-day period ending 45 days before the announcement of the alliance. The CRSP value-weighted index is used as a proxy for the market portfolio. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(-1,0)		(0,0)	
	Mean	Median	Mean	Median
All alliances	0.0175***	0.0047***	0.0155***	0.0042***
Equity	0.0657***	0.0130***	0.0606***	0.0122***
Non-equity	0.0115***	0.0033***	0.0098***	0.0035***
Equity				
Buying	0.0017	-0.0014	0.0028	-0.0036
Selling	0.1476***	0.1472***	0.1319***	0.0919***
Technology	0.0638***	0.0127***	0.0583***	0.0122***
Non-technology	0.0883	0.0252	0.0862	0.0042
Buying and Technology	-0.0060	-0.0027	-0.0043*	-0.0037*
Buying and Non-Technology	0.0995	0.0200	0.0939	0.0162
Selling and Technology	0.1500***	0.1556***	0.1327	0.1037
Selling and Non-Technology	0.1199	0.0305	0.1225	-0.0077
Non-equity				
Big Partner	0.0011	-0.0008	0.0027**	0.0016**
Small Partner	0.0217***	0.0099***	0.0168***	0.0064***
Technology	0.0125***	0.0044***	0.0102***	0.0045***
Non-Technology	0.0106***	0.0030***	0.0095***	0.0029***
Big Partner and Technology	0.0019	0.0002	0.0037*	0.0011*
Big Partner and Non-Technology	0.0004	-0.0012	0.0019	0.0022
Small Partner and Technology	0.0230***	0.0100***	0.0167***	0.0077***
Small Partner and Non-Technology	0.0206***	0.0099***	0.0169***	0.0047***