Selected Abstracts

Abstract 1

Business Policy & Strategy:
Fabio Zambuto, Shyam Kumar, and Jonathan O'Brien
The Role of Firm Leverage in Alliance Formation
ACAD MANAGE PROC 2013 2013:1 11470;
doi:10.5465/AMBPP.2013.11470abstract
»**Abstract**

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Business Policy & Strategy

The Role of Firm Leverage in Alliance Formation

We contend that a firm's capital structure will impact a firm's attractiveness as an alliance partner. Alliances with leveraged firms are prone to unplanned termination due to financial distress, which puts at risk the relationship specific investments made by the partner. Hence, highly leveraged firms will be viewed as less desirable partners, and as such they will be constrained to primarily partner with either other highly levered firms or with lower quality ones. Furthermore, we show that alliances with leveraged firms are more likely to involve equity participation as a form of ex post protection for the partner's investments. Finally, we show that leverage is negatively related with the intensity of alliance activity, as firms also maintain lower leverage to attract potential partners.

Alliances **Leverage** **termination risk**

The role of firm capital structure in alliance formation

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The role of firm capital structure in alliance formation

INTRODUCTION

What role does a firm's financial health play in its alliancing activity? In the strategy literature, theoretical explanations of alliances (e.g. Teece, 1986) have typically highlighted their efficacy in enabling firms to acquire and access resources residing in other firms. Following these perspectives, key alliance decisions such as firm partnering choices (i.e., whom to partner with) and alliance governance (e.g. equity versus non equity) have usually been explained from the perspective of the resources and capabilities being combined by parent firms in the alliance, with the objective assumed to be to preserve and maximize the value of these resources over the course of the cooperation. In this paper, we develop a complementary perspective and argue that apart from these resources and capabilities, a firm's financial policies (i.e., its capital structure) also have an important bearing on various aspects of its alliancing activity. Empirically, we demonstrate that a firm's leverage has a systematic impact on the types of alliance partners it attracts as well as the choice of alliance governance. Moreover, we also show that the imperative to be perceived as an attractive alliance partner in the market for inter-firm collaboration can induce some firms to maintain lower leverage in their capital structures.

Our hypotheses are based on two central arguments. First, we propose that the role of financial policies in alliancing activity is important because of a critical *ex post* hazard in alliances: the risk of unplanned termination. Unplanned termination occurs when one partner unilaterally withdraws from the relationship before its objectives have been achieved (Sadowski and Duysters 2008, Reuer and Arino 2002, Reuer and Zollo 2005). The costs associated with such unanticipated termination can be substantial because the efforts devoted to the alliance and the resources developed within it (such as joint

technologies or marketing knowhow) are often sunk and cannot be fully recovered if the relationship is prematurely terminated. Moreover, such events can also be particularly frustrating because neither firm may wish to terminate the alliance, but one firm may simply be unable to continue to contribute effort to the alliance, thereby prevent strategic goals from being achieved.

Prior evidence points to a strong link between firm financial health and unplanned termination in alliances. Reports from the popular press indicate that firms often withdraw from an alliance and sell their stakes to their partners or to external firms to raise cash and pay down debt[a]. In a recent paper documenting the effects of bankruptcy of an alliance partner, Boone and Ivanov (2012) find that firms experience a significant negative stock price reaction when an alliance partner files for bankruptcy[b]. In addition they also find that the non-bankrupt alliance partners experienced a significant drop in profitability and investment levels in the subsequent two years. Taken together, the evidence suggests that financial constraints are an important cause of alliance termination and have potentially detrimental performance consequences.

Building on this perspective, our second argument is that leverage is an important determinant of partner attractiveness in numerous transactions, including alliances. The relationship between partner attractiveness and leverage has been previously highlighted by stakeholder theories of debt and capital structure. These theories were developed in response to Miller and Modigliani's (1958) work, which suggests that in the presence of corporate tax savings, firms should maximize debt in their capital structure while minimizing equity. To explain the limits on debt, stakeholder perspectives argue that as leverage increases, employees, customers and suppliers impose various costs on the firm (e.g. demanding higher compensation or paying lower prices) due to the increased probability of bankruptcy and financial distress (Cornell and Shapiro 1987). These costs ultimately induce firms to limit the amount of debt in

[a] For example, in 1997 Eli Lilly sold its 40% stake in its JV with Dow Chemical, named Dow Elanco, and used the proceeds of USD 900 million to pay down debt from a recent acquisition. Similarly, General Mills sold its stake in its European JV with Pepsico for USD 750 million as part of its debt reduction efforts.

[b] As an example, in 2005 the shares of brake manufacturer Pacifica fell by nearly 10 percent when its customer and joint venture partner, Delphi, filed for bankruptcy. A key part of Pacifica's operations was a plant that it operated jointly with Delphi to supply brakes to GM.

their capital structure. Thus, higher leverage makes a firm a less attractive transaction partner (Titman 1984) and creates disincentives for stakeholders to make relationship specific investments. Our study extends this reasoning to the context of alliances and argues that leverage similarly makes a firm an unattractive alliance partner since it increases the risk of unplanned termination.

Based on our central arguments that financial health and the implied risk of unplanned termination influence a firm's attractiveness as an alliance partner, we develop and test several hypotheses. First, we demonstrate that firms tend to form alliances with partners characterized by relatively similar levels of leverage. This double sided matching of leverage occurs in the market for collaboration because low leverage firms prefer other low leverage firms as partners, whereas high leverage firms are constrained to partner with other high leverage firms due to the risks of unanticipated termination. Our analyses confirm that firm leverage and partner leverage are positively associated. Moreover, we also hypothesize and find that a firm's leverage is negatively associated with its partners Tobin's Q, suggesting that levered firms are also constrained to partner with lower quality firms.

The second important result we obtain is that we also demonstrate that the propensity to use equity-based agreements in alliances increases both as a firms leverage increases and as the *difference* in leverage across the alliance partners increases. Prior literature extensively argues that equity is effective in aligning incentives and in containing appropriability hazards in an alliance relationship. We complement these studies and show that equity is also important because it provides an enforceable mechanism and a safeguard through which specific investments can be salvaged by a lower levered partner in the event of premature termination by a more leveraged firm (Pisano, 1989). Finally, we posit that a value maximizing firm interested in forming alliances would anticipate the costs of leverage and *ex ante* limit debt in its capital structure. Accordingly, we demonstrate that after controlling for potential endogeneity, a firm's leverage is negatively related to the number of alliances it forms. This result suggests alliance intensive firms maintain lower leverage in their capital structure, presumably to induce other firms to enter into partnerships with them and make relationship specific investments.

Our research makes three important contributions to the literature. First, we highlight that financial constraints and capital structure have significant implications for alliancing activity. While it stands to reason that when entering into an alliance, partners will gauge each others attractiveness not just in terms of the resources they possess but also in terms of their ability to sustain the venture in financial terms, this intuition has neither been formalized nor its implications fully explored. We seek to fill this gap. Second, and relatedly, we show that financial constraints and leverage provide us with an enhanced understanding of how firms select their alliance partners and the form of governance they choose. Third, in the spirit of this special volume, our study also highlights a unique link between corporate strategy and corporate finance. While there has been a vast literature on the determinants of capital structure, this literature has so far not recognized the role of alliances in determining leverage. Our study adds to this stream and suggests that the desire to be perceived as an attractive strategic alliance partner is another potentially important factor that can cause firms to maintain a lower leverage in their capital structure.

THEORY AND HYPOTHESES

As noted at the outset, the literature on partner selection is vast and multi dimensional and has highlighted several factors. Central to these various streams is the theme that firms enter into alliances based on the resources and capabilities of the partner. While access to partner complementary resources may be a critical driver of alliance formation, the value of the collaboration might never be realized if financial distress by one partner disrupts the continuity of the alliance and undermines a partner's ability to devote consistent efforts. Thus, resource considerations should be traded off against the risk implied by partner financial health. Below, we develop this intuition further by integrating the alliance literature with insights from stakeholder theories of capital structure.

Stakeholder theories of capital structure have argued and shown that firm leverage can potentially impose costs on stakeholders such as employees, customers buying long-lived assets, dependent suppliers, or any other stakeholders exchanging unique products and services with the firm (Titman 1984, Kale and Sharur 2007, Banerjee et al. 2008). In particular, unique products and services often involve

investments that are relation-specific, whose value is maximized only as long as the two parties transact with each other (Williamson 1985). If the relationship is terminated due to financial distress or bankruptcy, these investments lose value. Thus, as higher leverage implies a greater risk of bankruptcy and financial distress, external stakeholders are often reluctant to invest in relation specific assets with highly levered firms unless they are compensated, *ex ante*, by better terms.

Investments involved in alliances with highly levered firms expose partners to similar costs and risks. Firms chose alliances when the interactions with a particular transacting partner are repeated and intense (Teece 1986). Such interactions call for close formal and informal coordination mechanisms that enable the flow of information, and are greatly facilitated by an alliance structure as opposed to by arms length transactions (Agarwal, Croson, and Mahoney 2010). While such interactions and coordination mechanisms facilitate innovation, they also inevitably build relationship specific assets such as shared knowledge or technologies. If one partner prematurely terminates the venture due to reasons such as financial distress, the value of the resources or shared knowledge is significantly diminished (Boone and Ivanov, 2012). Thus, despite its best intentions, a highly levered partner inevitably puts at risk the continuity of an alliance and the value of the investments undertaken by both sides because its weak financial position may result in unplanned termination.

In addition to loss of relationship specific assets, high leverage can also give rise to additional costs even when there is no immediate risk of bankruptcy because leverage influences a firms incentives to meet implicit commitments to stakeholders. Implicit commitments are too state-contingent to be reduced to a written form, and thus during periods of cash shortfalls a levered firm may have incentives to default on those claims in order to shore up its financial health (Cornell and Shapiro, 1987). Consequently, scholars have demonstrated that highly levered firms are more likely to provide their customers lower quality inputs and skimp on follow-up services for existing products (Cornell and

Shapiro 1987, Maksimovic and Titman 1991).[c] In the context of alliances, one important implicit claim is the commitment to provide high quality effort over the duration of the alliance. During financially tough times levered firms may reduce critical resource contributions to the alliance, such as cash flows and managerial resources and personnel (Inkpen, 2000; Khanna et al. 1998). Under these circumstances, the alliance partner is either faced with the prospect of terminating the alliance and losing its relationship specific assets or continuing the alliance despite the half-hearted efforts of the levered partner. This problem could be partially mitigated if effort levels could be contractually specified ex-ante, but such terms are difficult to write given the contingencies involved. Consequently, a leveraged firms commitment to provide high quality effort over the duration of the alliance remains an unenforceable implicit claim, which is a critical factor from the perspective of the partner in the alliance (although, as we note below, equity alliances may mitigate these concerns).

In addition to reduced effort, a lower levered firm is exposed to another form of *ex post* opportunism when partnering with a levered counterpart. A firm experiencing financial distress could try to extract concessions from a more financially healthy partner by threatening termination of the alliance and requesting either financial support or renegotiation for more favorable terms. Thus, a lower levered firm may once again be faced with the choice between terminating the alliance and losing the value of its relation-specific investments or perpetuating the alliance despite *ex post* opportunistic behavior (Reuer and Arino 2002, Arino et al. 2008) by subsidizing the levered partner in some manner[d].

It is important to note that while our first argument is that high leverage may cause unplanned termination despite partner best intentions, our last two arguments make the point that highly levered

[c] The short-term gains from such tactics would immediately benefit a firm's shareholders. On the other hand, if customers later detect opportunistic behavior and react by punishing the firm, the debt holders would bear most of the costs as they bear most of the downside risks of the firm.

[d] For example, in 2009 the financially constrained De Beers asked its joint venture partner, Mountain Province Diamond, for a renegotiation of their existing agreement. The new terms were less financially onerous for De Beers and required Mountain Province to reimburse De Beers a significant portion of historic sunk costs in exchange for increased control rights in the venture. Similarly, in October 2001, Telstra rescued its debt-laden joint venture partner Austar by providing additional funding for the venture, causing shares in Austar to soar 69 percent.

firms could also extract gains by being opportunistic. Alternatively, it could be argued that since highly levered firms are likely to face financial constraints, they may need to form more alliances in order to extricate themselves from their financial troubles. These pressures could make the desperate firm more (and not less) amenable to making the alliance work and thus be less opportunistic. However, as soon as concerns about financial distress arise and firm survival is put at threat, any such inter-firm commitments are rapidly undermined by the potential of extracting wealth from alliance partners. Hence, the overall effect of higher leverage is to increase risks related to partner commitment towards the alliance.

In summary, while alliances help firms access complementary partner resources, they also inevitably involve the presence of relationship specific assets, which raise the costs of premature termination. Partnering with highly leveraged firms not only increases the risk of premature termination, but also exposes the unlevered firm to various forms of *ex post* opportunism such as a lack of effort or bargaining for financial support and more favorable terms. Thus, even though a levered firm might be a source of valuable synergies, the potential value that can be obtained by combining complementary assets must be weighted against the risks posed by partner financial condition. Rational firms should anticipate these risks and take *ex ante* action by carefully selecting potential partners based on their leverage. This implies that, *ceteris paribus*, low leverage firms are generally more attractive partners and should have greater opportunities to find collaborators. At the same time, they are also likely to face additional opportunism when dealing with highly levered counterparts, and hence they would tend to avoid partnering with such firms. Conversely, highly levered firms will generally be constrained to partner with other highly levered firms because these firms are generally unable to attract low leveraged firms. Thus, we predict the following:

H1. Firms will tend to form alliances with partners characterized by similar levels of leverage.

The influence of a firm's leverage on the risk of unplanned termination will also likely impact the quality of the alliance partners that a firm can attract. One of the primary reasons for engaging in alliances is to combine complementary assets and stimulate innovation. Firms possessing high quality resources are

the most valuable partners because they should be able to generate the most valuable synergies. Consequently, high quality firms have more bargaining power in the market for collaboration, which they can use in order to partner with the most desirable associates (Rodhes, Kropf and Robinson 2008). We contend that, due to their superior resources endowments, high quality firms will have the bargaining power to avoid the risks entailed by partnering with highly levered firms. Indeed, during cash flow fluctuations, the lack of incentives to devote consistent efforts by a highly leveraged firm could undermine the realization of synergies. Furthermore despite best intentions to devote effort, synergies would also not be realized if the alliance terminates prematurely because of a partner's financial difficulties. Thus, higher quality firms face a greater opportunity cost by partnering with highly leveraged counter-parts. As a result, high quality firms will thus tend to select lower levered counterparts.

H2. There is a negative relationship between a firm's leverage and the quality of its partners.

Thus far we have argued that highly leveraged firms are unattractive partners due to greater risks of financial distress and unplanned termination, which dissuades low levered and high quality firms from forming alliances with them. However, highly leveraged firms can *ex ante* offer various forms of protection and safeguards in order to attract desirable partners. One particular form of protection that is likely to be effective in this regard is structuring the alliance as an equity joint venture (JV). As Pisano (1989) observes, allocating equity in an alliance requires putting a value on the expected contributions of each firm prior to the commencement of the partnership. Typically it entails negotiations and explicitly drawing out agreements regarding such relative contributions. Once drawn out, these agreements can be legally enforced by the partner (Ryall and Sampson, 2009), which may prevent any subsequent reneging or scaling back of effort on the part of a levered firm. Moreover, any shirking by the leveraged firm reduces the value of the JV and the value of its equity position, which would lower the proceeds it could obtain should it attempt to raise funds by selling its stake in the JV to the partner or to a third party, which are common methods of JV termination (Villalonga and McGahan, 2005; Cuypers and Martin, 2007).

Equity participation and a JV structure also provide other advantages besides ensuring continuity of effort. Typically a JV has a board with members drawn from the constituent partners. Through such a structure, a partner can safeguard its investments by exercising better control and monitoring of the efforts of a highly leveraged firm on a more continuous basis. Moreover, such ongoing control also allows the partner to understand the joint ventures operations more intimately. In the event of an unplanned termination, the partner may be able to salvage its investments by taking over the venture entirely. The protection provided by equity and a JV structure is, however, also costly for both parties since it involves a greater commitment of resources from the outset (e.g., managerial resources in the form of human capital and employees specifically devoted to the alliance). For a highly leveraged firm, its willingness to devote such resources and human capital acts as a form of credible commitment to sustain the collaboration and devote consistent effort. Conversely, a JV structure should be desirable also from the counter-parts point of view (regardless of its leverage), since to the extent that there is value in collaborating with a leveraged partner, it may be willing to incur such costs upfront. Hence, we predict:

H3. Alliances involving highly levered firms are more likely to be equity-based.

As an extension of H3, we also posit that an alliance is more likely to take the form of a JV as the *difference in leverage* between the two partners grows. Although any alliance partner could potentially seek concessions or skimp on future resource commitments, the problem should be particularly acute when one firm is lowly levered and financially healthy while the other is highly levered. Under these conditions, the unlevered firm is particularly vulnerable to the threat that the levered firm may use its financially weak position as justification for renegotiation and extracting concessions. Consequently lower levered firms have greater incentives to require their highly levered counterparts to commit to the additional protections afforded by an equity JV. Conversely, the additional costs of a JV structure (described above) are less likely to be regarded as warranted when both firms are low leveraged due to the lower threat of opportunistic renegotiation and extracting concessions, given that both partners are financially healthy. Similarly, a JV is also less likely to occur when both firms are highly levered as the

weak financial positions of both partners reduce the risk of opportunism while making the additional costs of a JV difficult to afford. Hence, we argue the following:

H4. The greater the difference between partners leverage, the greater the probability that an alliance will take the form of a JV.

Thus far, our theory has focused on the alliance level of analysis by predicting patterns in partner selection and alliance governance. For our final hypothesis, we take a firm level perspective and argue that firms that make alliances a strategic priority will adopt lower leverage in order to improve their own attractiveness as an alliance partner. Stakeholder theories provide evidence that in conditions where customers and suppliers incur firm specific investments, firms maintain a lower level of leverage. In line with this reasoning, Titman and Wessels (1988) show that firms tend to have lower leverage when they operate in durable goods industries, where customers switching costs and relationship specific assets tend to be high. Banerjee et al. (2008) similarly show that firms with dedicated suppliers (*i.e.*, suppliers for whom more than 10% of sales come from the firm) and dedicated customers (*i.e.,* customers for whom the firm constitutes greater than 10% of sales) maintain lower leverage so that that they can induce these dedicated suppliers or customers to transact primarily with them and develop valuable firm specific assets. Similarly, Kale and Shahrur (2007) show that the R&D intensity of suppliers and customers is negatively associated with firm leverage, indicating that lower leverage stimulates these stakeholders to invest in technological resources that are likely to be relationship specific.

If financial health matters to alliance partners like it does to customers and suppliers, we would expect to observe that firms actively seeking alliance partners would similarly adopt lower leverage in order to induce other firms to form partnerships and make specific investments. Furthermore, existing

influential alliance partners may also encourage the firm to keep leverage low *ex post* or even to reduce it further, if necessary in order to protect their relationship specific investments. Accordingly, we predict:[e]

H5. A firm's leverage will be negatively related to its alliance intensity.

METHODS

Data and sample

We drew data on all alliances announced between the years 1988 and 2006 from the Securities Data Corporation (SDC) database on mergers, acquisitions, and alliances. We restricted our attention to two partner alliances to ease the comparison among partners' characteristics. In addition, we also excluded from our sample alliances involving financial firms, since leverage has a different interpretation in those industries. For alliances meeting these criteria information was retrieved on the partners' names, SIC codes, state of incorporation, descriptions of activities involved in the alliance, geographical locations, and other governance-related data such as the presence of equity-exchanges.

Accounting and financial data on the partnering firms were gathered from Compustat. After combining all data, we were left with 4220 alliances involving 2074 distinct firms. On average, each of these 2074 focal firms is associated with 4.1 alliances in our final sample. Our final sample includes alliances in a wide variety of sectors. Adopting Fama and Frenchs twelve industry classification, the distributions of the alliance activity across industrial codes is as follows: computer, software and electronic equipment (48.1 percent); healthcare, medical equipment and drugs (8.45 percent); chemical and allied products (1.37 percent); manufacturing (2.84 percent); consumer durables (1.59 percent); telephone and television transmission (2.06 percent); wholesale, retail and related services (11 percent); and finance (8.65). All remaining industries account for minor percentages.

Dependent variables

In order to test hypothesis 1, which posits that firms with similar levels of leverage will partner with each other, we adopt two approaches. First, as we discuss in greater detail in the results section, we

[e] This implies that a firm's leverage and its alliance activity are jointly determined. Hence it is important to test the above argument by controlling for potential endogeneity, a point that we address in the Methods section.

compared differences in leverage among allied firms with the difference in leverage of random pairs of firms picked from the entire Compustat database. Second, and more formally, we tested the hypothesis by constructing a hierarchical linear regression model to regress partner leverage on alliance level variables and focal firm leverage. Since firms formed multiple alliances in our sample, we constructed our data set so that each alliance with its corresponding partner and alliance characteristics was nested within the firm. Thus, for the 2074 firms in our sample, a focal firms alliance appears as a nested observation within the partners observations, and correspondingly the same alliance appears as a nested observation within the focal firms observations. Accordingly, to test this relationship, we measured the partners market leverage (*PLEV*), where market leverage is computed as total debt divided by total market value of the firm, and the total market value of the firm is the sum of the book value of debt plus total market value of outstanding shares[f]. We similarly constructed a measure of the partners Tobin's Q to proxy for firm quality and test hypothesis 2, which posits that leveraged firms will attract lower quality partners. The variable *PQ* is computed as: (market value of equity + total assets - common equity) / (total assets).

Our third and fourth hypotheses relate partners leverage to the choice of the governance form of the alliance. We used a hierarchical model for this analysis as well, and we constructed a dummy variable (*JV*) which takes the value of one when the alliance is a joint venture and zero otherwise[g]. Finally, our last hypothesis relates a firm's alliance intensity with its own level of leverage. In order to test this hypothesis, we took the entire population of firms in Compustat and structured our sample as a panel data. We then regressed firm leverage (*LEV*) in a given year on the number of alliances formed during that year and other firm level controls, where leverage is defined as the firms market leverage.

Key Independent Variables

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[f] Results are qualitatively unchanged if we use the book value of total assets in the denominator.

[g] Following previous works on alliance governance, we exclude minority equity positions and define equity alliances as joint ventures only. However, our results are virtually unchanged when we also considered these arrangements as equity alliances.

The variables leverage (*LEV*) and partner leverage (*PLEV*) in the year of alliance formation were also used as independent variables to test hypotheses 1, 2 and 3. To test hypothesis 4, which pertains to the impact of differences in partner leverage on the choice of governance, we also constructed the variable *DELTA*, which is the absolute difference in market leverage between the two partners. Finally, for hypothesis 5, which relates to the effects of alliance intensity on the focal firm leverage, we constructed the variable *ALLIANCES* as a count of all alliances formed by the focal firm in a given year.

Models

Hypothesis 1 suggests a double sided matching in the market for collaboration, whereby a highly levered firm is more likely to form alliances with other highly levered firms, while a lower levered firm is more likely to ally with other conservatively financed partners. To test this prediction, the following equation is estimated:

(1) $PLEV_{ij} = a_{00} + a_{0i} + \gamma_1 PROA_{ij} + \gamma_2 PQ_{ij} + \gamma_3 PRD_{ij} + \gamma_4 PLASSET_{ij} + \gamma_5 LEV_{ij} + \gamma_6 ROA_{ij} + \gamma_7 Q_{ij} + \gamma_8 RD_{ij} + \gamma_9 LASSET_{ij} + \mu_{ij}$

As groups of alliances formed by the same focal firm are likely to possess common characteristics, and observations related to the same focal firm are likely to be correlated, we employed hierarchical models wherein alliances are nested within firms. Accordingly in (1) the variables denoted by P are partner characteristics and are at the alliance level, which are modeled as nested within the firm, Hence, for alliance *j* formed by focal firm *i* a random intercept term is included in order to capture these dependencies. Similarly, hypothesis 2 examines the impact of leverage on the quality of alliance partners a focal firm is able to attract. To test this hypothesis, we tested the following hierarchical model where, as before, alliances are nested within firms:

(2)$PQ_{ij} = a_{00} + a_{0i} + \gamma_1 PRD_{ij} + \gamma_2 PLASSET_{ij} + \gamma_3 PROA_{ij} + +\gamma_4 PLEV_{ij} + \gamma_4 RD_{ij} + \gamma_5 LASSET_{ij} + \gamma_6 ROA_{ij} + \gamma_7 Q_{ij} + \gamma_8 LEV_{ij} + \mu_{Ij}$

For both models above, we included several control variables that could impact either a firms leverage or the quality of the alliance partners it attracts. *ROA* and *PROA* are the focal and partner firms return on assets, respectively, where return on assets is defined as operating income divided by total assets. The partners Tobin's q (*PQ*) is also used as a control and is constructed as described above. We similarly construct a measure of the focal firms Tobin's q (*Q*) and include it as a control. We also controlled for the R&D intensity of both the partner firm (*PRD*) and the focal firm (*RD*), defined as the ratio of R&D expenses to total assets. Finally, we controlled for the size of both the partner firm (*PLASSETS*) and the focal firm (*LASSETS*) with the natural logarithm of each firms total assets.

Hypotheses 3 and 4 focus on the impact of leverage on the governance form of an alliance. In order to test these hypotheses we employ logit models where, as before, alliances are nested within focal firms. The following equations were estimated:

(3) $Prob(Y_{ij}= 1) = \alpha_i + \beta_1 RESEARCH_{ij} + \beta_2 MANUFACT_{ij} + \beta_3 MARKET_{ij} + \beta_4 SUPPLY_{ij} +$
$\beta_5 LICENS_{ij} + \beta_6 SUPRANATION_{ij} + \beta_7 SAMESTATE_{ij} + \beta_8 SAMEIND_{ij} + \beta_9 PRIORALL_{ij} +$
$\beta_{10} AVGASSET_{ij} + \beta_{11} RASSET_{ij} + \beta_{12} RDGAP_{ij} + \beta_{13} AVGROA_{ij} + \beta_{14} \boldsymbol{LEV_{ij}} + \beta_{15} \boldsymbol{PLEV_{ij}}$

(4) $Prob(Y_{ij}= 1) = \alpha_i + \beta_1 RESEARCH_{ij} + \beta_2 MANUFACT_{ij} + \beta_3 MARKET_{ij} + \beta_4 SUPPLY_{ij} +$
$\beta_5 LICENS_{ij} + \beta_6 SUPRANATION_{ij} + \beta_7 SAMESTATE_{ij} + \beta_8 SAMEIND_{ij} + \beta_9 PRIORALL_{ij} +$
$\beta_{10} AVGASSET_{ij} + \beta_{11} RASSET_{ij} + \beta_{12} RDGAP_{ij} + \beta_{13} AVGROA_{ij} + \beta_{14} \boldsymbol{LEV_{ij}} + \beta_{15} \boldsymbol{DELTA_{ij}}$

In these models, α_i is the random intercept term, which takes into account dependencies among alliances pertaining to the same focal firm. To test hypothesis 3, we estimate a nested specification (equation 3) where we include both the focal firms and its partners' level of leverage as our main independent variables (*LEV* and *PLEV,* respectively). Hypothesis 3 implies that both coefficients on these variables will be positive, so that whenever one of the two firms is highly levered chances of a joint venture increase. Hypothesis 4 extends the previous argument by suggesting that equity governance will

also be preferred when the difference in leverage between partners is high, since under these conditions the lower levered firm would once again seek the protection that equity provides in terms of sustained commitment and protection of the value of alliance assets. To test this hypothesis we include the absolute difference among partners leverage (DELTA) as our main independent variable.

In these specifications, we also use other controls typically employed in studies of alliance governance form. Five dummy variables were constructed in order to indicate whether an alliance included research, marketing, manufacturing, supply and licensing activities (*RESEARCH, MANUFACT, MARKET, SUPPLY, LICENS,* respectively). Three dummy variables were also employed to denote if partners operated in the same industry, same geographical areas, or if the geographical scope of the alliance was supranational (*SAMEIND*, *SAMESTATE, SUPRANATION*). We also controlled for the level of partner uncertainty by computing the number of alliances between the two firms during the previous five years (*PRIORALL)*. To control for the effect of firm size and profitability we included the variables AVGASSET and AVGROA, computed as the average of partners total book assets and return on assets, respectively. Similarly, RASSET represents the partners relative assets, computed as the ratio of the smaller firms total assets over the larger firms total assets. In order to control for potential costs arising from capability gaps among partners, we included the variable RDGAP, computed as the absolute difference between firms R&D intensity. A series of dummy variables were also included to account for the SIC code of the alliance, with industrial codes being reclassified according to Fama and French's twelve industries classification. Finally, yearly dummies capture any time effects in the choice of particular governance forms.

Hypothesis 5 examines the relation between a firm's alliance activity and its own level of leverage. In order to test this prediction, we use the entire Compustat population of firms during the period 1988-2006 as our sample and built a panel data set where the unit of analysis is the *firm-year*. Firms operating

in financial sectors (SIC codes 6000-6999) were excluded as in other studies of capital structure. We employ fixed effects instrumental variables regression in order to estimate the following equation

(5) $LEV_{it} = a_0 + \gamma_1 RD_{it} + \gamma_2 Q_{it} + \gamma_3 TANGIBLES_{it} + \gamma_4 ROA_{it} + \gamma_5 LASSET_{it} + \gamma_6 CAPINTENS_{it} + \gamma_7 DIV_{it} + \gamma_8 ALLIANCES_{it} + \mu_{it}$

In this specification, the variable ALLIANCES is treated as endogenous because a firms capital structure decision and its alliance decisions could be jointly determined. The endogenous variable is instrumented in the first stage by the average number of alliances formed by firms in that industry each year (AVGINDALL). As the instrument is at the industry level, it should be exogenous with respect to firm leverage and should reflect the broader tendencies within the industry with respect to using alliances as a means for staying competitive. We also employ standard controls considered as determinants of capital structure in the literature. In addition to the variables used in the model for hypothesis 1, we include TANGIBLES to control for the level of assets that can be used as collateral. This variable is computed as the ratio of property, plant, and equipment to the total book value of assets. Similarly we also controlled for the firm capital intensity (CAPINTENS), computed as the ratio of the firms total book assets over total sales. In order to account for the effect of dividend policies we included the binary variable DIV, which takes the value of 1 when a firm distributes dividends. Finally, to minimize the effect of outliers, all variables that were not binary or logged were winsorized at the 1% level.

RESULTS

In the interest of space, we do not report correlation matrices because our data is structured into several distinct datasets and hence doing so would require multiple tables. While multicollinearity was not a concern with our data, some interesting correlations did exist amongst our variables. Focal firm leverage (LEV) was positively correlated (r = 0.199) with partner leverage (PLEV), while it shows a negative correlation (r = -0.113) with partner quality (PQ). Moreover, both partners leverage is positively associated with the presence of a JV (r= 0.195 and 0.180 for LEV and PLEV, respectively).

Before discussing the results of our formal hypothesis tests, we present some preliminary analyses in Table 1 which highlight noteworthy patterns in the data that are consistent with our hypotheses. Our primary thesis is that high leverage makes a firm a less attractive alliance partner. An ideal test of this argument would involve analyzing not only the leverage levels of partners among alliances that were actually formed, but also among pairs of firms which *did not enter* into alliances, potentially because leverage levels or high differences in levels of leverage made the alliance unattractive. If our hypotheses are correct, then firms with high levels of leverage as well as potential alliance pairings with high differences in leverage will systematically fall out of our sample of allied firms. This introduces a form of truncation in our sample, since the distribution of both observed partners leverage and differences in leverage is truncated from above and is predominantly observed below a certain threshold. As such, for some of our dependent variables (for example partner leverage in equation 1), our estimates are likely to be understated, and thus the results of the hypotheses tests from our models are likely to be conservatively biased due to the truncation[h]. That is, if alliances among firms characterized by high levels of leverage were more common, then the inclusion of those observations in our sample would strengthen our estimates of the impact of firm leverage on partner leverage.

To address the possibility that observed alliances are biased towards firms with lower leverage, we compared the absolute differences in partners leverage among observed alliance pairs with absolute differences from a sample of random pairs of firms drawn from Compustat. For each observed alliance in our sample, we constructed a random pair of firms from the same Fama-French industries in that year. This matched sample controls for industry and year effects and is representative of a population of alliances that might have potentially occurred if counterpart leverage did not matter. If leverage did not affect alliance formation, then there should be no significant difference in leverage between observed alliances and random pairings. Panel A of Table 1 reports the difference in leverage between allied pairs of firms and random pairings. Consistent with our arguments, in the sample of observed alliances the

[h] Hausman and Wise (1977) emphasize that OLS applied to a sample truncated from above generally produces estimators biased toward zero.

average difference in partners leverage is 15.9 percent, while the difference in the sample of random pairings is 22.1 percent, and a t-test confirms that the difference between the sample means is highly significant ($p<0.001$). Unreported Wilcoxon and binomial sign tests confirm that results are not driven by outliers. Aside from addressing self-selection bias, this preliminary evidence also tentatively corroborates the argument that when a firm looks for alliance partners, it tends to match with counter-parts possessing similar levels of leverage. Thus it appears lower levered firms systematically partner with each other, while high leverage firms are possibly constrained to partner with other high levered firms.

In Panel B of Table 1 we show a similar pattern *within* the observed sample of alliances. We divided all 11,112 firms in our sample into three groups according to observed percentiles of leverage, and then for each group we computed the mean and median value of the partners Tobin's *q* and leverage. For firms with the lower observed leverage (0-33 percentiles) the median level of partners Tobin's q and leverage are 2.44 and 4.1 percent, respectively. Conversely, for firms with the highest observed leverage (66-99 percentiles) the median partners Tobin's q drops to 1.73, while average level of partner leverage rises to 12.5 percent. These statistics are again consistent with our first argument that highly levered firms are less attractive partners and that they tend to form alliances with partners characterized by higher leverage as well as lower quality, thus supporting hypotheses 1-2.

Finally, Panels C and D provide insight into the extent to which a firm's leverage determines the choice of governance form in an alliance. For Panel C, we first computed the median leverage for all firms in the Compustat population, and then compared the number of alliances formed by firms above and below the median. We divided the sample according to the level of leverage of the first partner listed in the alliance, as it appears on SDC[i]. Results show that more highly leveraged firms are substantially less likely to form alliances, even though some research has suggested they may have a greater need to form alliances under some circumstances (Patzel et al. 2008). Furthermore, 24.6% of alliances involving a highly leveraged firm were structured as a JV, whereas only 9.2% of alliances involving a low leveraged firm were structured as JVs. This difference of 15.4% is also highly statistically significant ($p<0.001$).

[i] Results are qualitatively unchanged when the second partner is considered.

Panel D examines how the *difference* in leverage across the two alliance partners relates to the likelihood that an alliance will be structured as a JV. We divided alliances into three groups according to observed percentiles of the absolute differences in leverage. JVs appear to be more likely for alliances characterized by relatively higher differences in leverage, increasing from 8.5% when the difference is relatively small to 18.1% when the difference is relatively large. The results of Panels C and D are consistent with our argument that when a firm has high leverage, an alliance is more likely to involve equity as a form of protection and safeguard for lower levered firms. The overall patterns of Table 1 are also consistent with our general argument that firms pay attention to the financial health of alliance partners, and that they structure their transactions in the market for collaboration accordingly.

INSERT TABLE 1 ABOUT HERE

Before presenting our regression results, we discuss some alternative explanations that may motivate patterns of leverage among allying firms. Perhaps, the underlying issue could be not whether leverage matters, but what factors influence leverage which in turn also impact partner attractiveness and alliance deals. For instance, prior research suggests leverage is negatively related to innovation as the latter produces mostly intangible assets with low collateral value (Simerly and Li, 2000; Vicente-Lorente, 2001). Hence, one potential alternative explanation could simply be that our results are reflecting highly innovative firms partnering with other highly innovative firms, rather than matching due to leverage. However, high-innovation/high-leverage firms are not unusual. To examine these issues, we divided our sample of firms into 4 cells according to two dimensions: firms with high/low R&D and firms with high/low leverage. High (low) R&D firms were defined as firms that have R&D intensity greater (lower) than the overall Compustat population median. Similarly, we defined categories for high/low leverage based on Compustat median values. After defining the 4 categories, next we randomly chose one partner (the first listed partner in SDC) and examined the leverage/R&D distribution of these firms. When considering the first listed partner in the alliance, it appears that 81 percent of our sample of alliances

involves high R&D firms. It is noteworthy that amongst these firms, almost 19% had above median leverage. Moreover, if innovation explained our results, leverage should make no difference to the alliances of R&D intensive firms, and the chances of an equity JV should be roughly the same irrespective of whether a high R&D firm has low leverage or high leverage. However, while high R&D-low leverage firms form JVs in only 5.3 percent of the cases, this fraction increases to 12.1 percent for high R&D-high leverage firms. This pattern cannot be explained by R&D intensity and it is consistent with the idea that high leverage also introduces further hazards in the alliance[j].

Alternatively, it could also be argued that highly levered firms tend partner with lowly levered ones quite often as a result of resource considerations, thus violating our proposed matching among partners characterized by similar leverage. For instance, in biotech-pharma alliances, while the biotech firm's intangible assets may prevent it from adopting higher leverage, the pharma partner can usually take on significant amounts of debt due to its greater tangible assets and cash flows (Gopalakrishnan et al. 2008). Accordingly, most alliances should occur between firms possessing very different levels of leverage (due to their different underlying assets), while alliances between firms with similar leverage (high-high or low-low) should be less common. Again, our results in Panel A of Table 1 are inconsistent with this explanation, as observed differences in partners leverage are systematically smaller (and not greater) than differences computed for random pairs.

Table 2 presents the results for our hierarchical regression models that are used to test hypotheses 1 and 2. Note that while Table 1 was based on all 5556 observed alliances for which both partners leverage and Tobin's *q* figures are available, the results in Tables 2 and 3 are based on a reduced sample of 4220 alliances due to a loss in observations because of missing data for other controls and independent variables. In column 1 of Table 2 the dependent variable is partner leverage (PLEV), and in column 2 the dependent variable is partner quality (PQ). The likelihood ratio tests confirm that in both models the inclusion of a random intercept for each focal firm offers significant improvement over a linear regression

[j] Chances of a JV also increase after taking into account alliance partner level of innovativeness. For example, when considering only alliances involving two high R&D firms, chances of a JV increase from 4.5 percent for low leverage firms to 10.5 percent for high leverage firms.

model with fixed effects ($p<0.001$). Hypothesis 1 predicts that firms will tend to form alliances with partners possessing similar levels of leverage. Consistent with hypothesis 1, column 1 reveals that firm leverage (LEV) is positively related to partner leverage ($p<0.001$). Thus, the higher (lower) a focal firms leverage, the higher (lower) the levels of leverage of its counter-parts.

The second column of Table 2 tests hypothesis 2, which argued that alliances with highly levered firms entail significant risks for good quality firms looking to derive valuable synergies. Thus, good quality firms tend to avoid high leverage partners and, all else being equal, the latter are constrained to partner with firms of relatively lower quality. Consistent with this argument, the coefficient on the variable LEV is negative and significant at the $p<0.05$ level, implying that higher leverage for a firm generally translates into lower quality alliance partners. In terms of the controls in model (1), at the focal firms level the variable LASSETS showed a significant negative impact on partner leverage, suggesting that bigger firms tend to avoid high leverage firms, possibly by virtue of their wider choice of alliance partners. Conversely, the positive and significant coefficient on ROA indicates that high leverage partners in our sample also tend to match with more profitable firms, possibly because of the latters readily available financial resources. Results in model (2) indicate that at the focal firm level, higher Q firms tend to partner with other high quality partners. Similarly, bigger firms also tend to partner with high Q firms, possibly in order to access the latters growth opportunities. In addition, R&D intensive firm (which may possess higher growth opportunities) appear to look for partners characterized by lower levels of Q in order to access their tangible assets in place. Similarly, after controlling for the effect of Q, more profitable firms also tend partner with lower quality firms, potentially for access to assets in place.

INSERT TABLE 2 ABOUT HERE

Table 3 reports results from the hierarchical logit models used to test the impact of leverage on the choice of governance form. Hypothesis 3 argues that alliance partners are more likely to opt for the added protections afforded by a JV structure when the partners are highly levered. The positive and significant

($p<0.001$) coefficients on the variables LEV and PLEV in model 1 of Table 3 support this hypothesis. Hypothesis 4 further argues that the costs of allying with a high leverage firm can be especially high for low leverage counter-parts, and thus alliances characterized by greater *difference* among partners leverage are more likely to take the form of a JV. In model 2 we test this prediction by including the absolute difference between the partners leverage (DELTA). As expected, the coefficient on this variable is positive and significant ($p<0.001$), supporting hypothesis 4. As a robustness check, we also estimated this model with a standard (i.e., non-hierarchical) logit model computed for the sample of 4220 alliances and results are qualitatively unchanged.

In terms of the controls, most of the coefficients on our dummies accounting for the activities involved in the collaboration (RESEARCH, MANUFACT, SUPPLY, LICENS) and the coefficients on the variables SUPRANATION and SAMEIND mirror previous studies on alliance governance (Casciaro 2003, Pisano et al. 1988, Oxley 1997, Oxley and Sampson 2004). However, the variable MARKET was found to have a negative impact in our study, while extant literature finds no significant effect. Similarly, the variable SAMESTATE had no significant effect in our analysis, while extant literature documents a significant negative relationship (Oxley and Sampson 2004). The coefficient on the variable PRIORALL is consistent with studies showing that partners with repeated ties tend to adopt more complex contractual forms of governance (Van de Vrande et al. 2009, Oxley and Sampson 2004, Casciaro 2003). The negative impact of RDGAP mirrors Kogut and Chang (1991) and suggests firms with similar levels of sophisticated technological capabilities adopt equity JVs, potentially to share surplus related to the knowledge generated. Both AVGASSET and RASSET appear to have a significant positive influence, while previous studies report conflicting findings (Oxley 1997).

INSERT TABLE 3 ABOUT HERE

Finally, Table 4 reports results for our leverage model related to hypothesis 5. In this model, the variable ALLIANCES is treated as endogenous and it was instrumented in the first stage by the average

number of alliances that firms form in an industry in a given year. Results from the second stage fixed-effects IV regression show that after accounting for endogeneity, ALLIANCES has a significant ($p<0.001$) negative coefficient, thus corroborating hypothesis 5. Hence, it appears that firms intensively engaging in alliances tend to adopt lower levels of leverage, presumably to be considered more attractive partners and to encourage relation specific investments. The control variables produced results consistent with typical models of capital structure (Banerjee et al. 2008).

INSERT TABLE 4 ABOUT HERE

DISCUSSION AND CONCLUSIONS

In this research we show that financial health and leverage are important considerations in selecting alliance partners. We argue that highly levered partners are less attractive in the context of an alliance for multiple reasons. First, highly leveraged partners are more prone to liquidation and bankruptcy risks, and thus they expose the alliance (and all investments involved) to the threat of unplanned termination, potentially even despite the firms best intentions. Second, we also argued that even when liquidation is not imminent, highly levered firms have incentives default on their implicit claims and reduce their efforts towards the alliance. Finally a high leverage firm facing financial distress may threaten to prematurely terminate an alliance in order to obtain more favorable terms. Rational firms will anticipate these ex-post risks ex-ante and hence will evaluate each other's level of leverage when structuring transactions in the market for collaboration.

Using a large sample of strategic alliances, we show several empirical patterns consistent with this theoretical framework. The first part of our analysis clearly suggests that counter-part leverage is critical during the process of partner selection. A double sided matching of leverage levels emerges, whereby low leverage firms partner with other low leverage firms and high leverage firms seem to be constrained to partner with other high leverage firms. Similarly, we also find that after controlling for partner quality,

highly levered firms tend to ally with relatively lower quality counter-parts. These findings provide additional insight to recent works applying the theory of marriage to the context of the market for collaboration (Rodhes, Kropf and Robinson 2008). This literature shows that firms tend to acquire targets possessing similar levels of resource quality, and that this matching occurs in order to minimize the costs of *ex post* integration while maximizing value. Our results show that in the context of alliances, partner attractiveness is not determined exclusively by its resource endowments but also by its financial health, as firms appear to take into account both aspects when scanning for potential partners.

Our second set of results reveals an important link between firm leverage and the choice of governance form in alliances. Our findings show that leverage increases the probability of an alliance being structured as a JV. Equally interestingly, JVs appear to be more likely in the presence of greater difference among partners leverage. Stakeholder theories of capital structure point out that high leverage makes firms less attractive transacting partners without suggesting any *ex post* mechanisms to mitigate concerns related to capital structure decisions. In this respect, our study has important implications because it provides additional insight by theorizing the importance of governance structures as an *ex post* contractual solution to such a situation. Leveraged firms can adopt equity in order to support their exchanges in the face of termination risks. Thus, equity-based governance induces relation specific investments not only by aligning incentives through shared surplus, but also by providing an enforceable mechanism to mitigate the hazards posed by high leverage partners.

This evidence also has interesting implications for research analyzing alliance governance from a transaction cost perspective and from a real option perspective. From a transaction cost view, our analysis shows that leverage is a critical source of relational uncertainty at the transaction level. Thus, in contrast to work that has explained governance choices by looking only at appropriability hazards (e.g. Pisano, 1989), our analysis calls for a broader view by showing that some exchange hazards may also arise from firm-level characteristics such as leverage which may lead to the adoption of equity governance.

From a real options perspective, our results also provide additional insight into the dueling options often inherent in the tradeoff between flexibility and commitment (Folta and OBrien, 2004). According to

a real options logic, firms value flexibility when faced with high uncertainty (Steensma and Corley 2001, Santoro and McGill 2005, Cuypers and Martin, 2007, Tong Reuer and Peng 2008). Thus, they prefer less hierarchical governance modes in order to avoid the opportunity costs of irreversible investments in a shared venture. However, our study suggests that firms may be willing to commit to a more hierarchical form when faced with uncertainty arising from a partners bankruptcy risks. By increasing barriers to exit with a JV structure, a firm mitigates the uncertainty associated with a leveraged partner as any potential scaling back of commitment from the relationship becomes more expensive. Although this sacrifices the deferment option, it also provides the low leverage firm with the option to take on the venture in the event of unplanned termination by the partner. As a result, although it comes with an *ex ante* cost, this lack of flexibility reduces *ex post* sunk costs much more effectively as compared to a non-equity agreement in the presence of a high leverage firm.

Our analysis also documents the impact of alliances on firm leverage decisions. Our findings corroborate the idea that high leverage introduces additional risks in an alliance, and thus leverage limits a firms ability to transact in the market for collaboration. Accordingly, we found that alliance-intensive firms tend to adopt lower levels of leverage, potentially to attract better partners and induce specific investments. This is an important result because we believe that in a world where alliances have become an increasingly critical element of corporate strategic choices, more debate should be encouraged to understand their implications for firm characteristics, including such important decisions as capital structure. In this respect, our study is important not only because it provides preliminary evidence that alliance activity matters for leverage decisions, but it also demonstrates implications of leverage in terms of partner selection and contractual governance.

Future research could extend the present work in several ways. First, it would be worth exploring the importance of alliance heterogeneity with respect to its impact on leverage decisions in greater depth. Alliances substantially differ in terms of specificity of investments involved, partner and strategic uncertainty, and organizational structure. As a result, it would be useful to examine the capital structure implications of alliances from a portfolio perspective, rather than just an individual alliance perspective as

we have done. Another interesting avenue for future research is to analyze whether bankruptcy risks influence other contractual characteristics of alliances as well. For example, firms allying with highly levered counterparts may prefer agreements with a predetermined duration or with a limited scope in order to limit the dependence on the counterpart. While lack of detailed data on our sample of alliances prevented us from studying these issues, future research on these topics could prove highly insightful.

Finally, we note an important limitation of our study in that we only analyzed the negative aspects of partner leverage. To a certain extent, we overcome this limitation when we show that high leverage firms offer equity participation as a form of commitment towards the alliance in order to attract better partners. However, there may be also other benefits associated with highly levered partners. Extant literature suggests that financially constrained (*i.e.*, highly levered) firms are more prone to form alliances in order to develop projects that they would not be able to pursue independently (Patzel et al. 2008, Lerner et al. 2003). Thus, while bringing instability, leverage could also force firms to externalize valuable projects that would be otherwise lost, and non-levered firms may be able to capitalize upon these opportunities. Future work could study the circumstances under which this may happen, such as how the liquidity of the market impacts alliancing behavior. Overall, our study takes an important first step at demonstrating a link between capital structure, financial health and alliance activity.

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Table 1. Preliminary analysis

Panel A: Comparison of differences in leverage

Variable	Mean Value		t(diff.)	p-value
	Alliances	Non-alliances		
|Δ Leverage|	0.15927	0.22190	-14.6268	<0.001

n = 4030

Panel B: Focal firm's leverage and characteristics of partners

Percentiles of leverage	Mean		Median	
	Partner Leverage	Partner Q	Partner Leverage	Partner Q
0-33	0.110	4.36	0.041	2.44
33-66	0.131	3.85	0.058	2.31
66-99	0.195	2.80	0.125	1.73

n = 11,112

Panel C: Joint ventures activity across levels of focal firms' leverage

Focal Firm leverage	Total alliances	JVs	Percent of JVs
Below the median	4167	385	9.24
Above the median	1389	342	24.62
All observations	5556	727	13.08

Panel D: Joint venture activity across levels of |Δ Leverage|

Percentiles of |Δ Leverage|	Perc. of JVs
0-33	8.53
33-66	12.76
66-99	18.10

n=5556

Table 2. Hierarchical Models for Partners' Leverage and Partners' Quality

Dependent Variable:	(1) PLEV	(2) PQ
Partner variables		
PLEV	_	-6.443***
		(0.282)
PQ*	-0.00875***	_
	(0.000395)	
PRD*	-0.384***	3.052***
	(0.0175)	(0.475)
PLASSETS	0.0239***	-0.147***
	(0.000697)	(0.0197)
PROA*	-0.240***	0.338
	(0.00793)	(0.222)
Focal firm variables		
LEV	0.158***	-0.684*
	(0.0130)	(0.314)
Q*	-0.000189	0.233***
	(0.000457)	(0.0112)
RD*	0.00899	-2.179***
	(0.0201)	(0.351)
LASSETS	-0.00547***	0.129***
	(0.00107)	(0.0230)
ROA*	0.0458***	-1.194***
	(0.00930)	(0.229)
Intercept	0.0469***	3.773***
	(0.00961)	(0.225)
N	8440	8440
Groups	2074	2074
Avg. n. of obs per group	4.1	4.1

Standard errors in parentheses $^{+}$ $p < 0.10$. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Table 3. Hierarchical Logit Models for Governance Choice (JV)

	(1)	(2)
RESEARCH	-0.155	-0.224^{+}
	(0.120)	(0.119)
MANUFACTUR	1.472***	1.520***
	(0.115)	(0.115)
MARKET	-0.283*	-0.341**
	(0.118)	(0.118)
SUPPLY	-1.962***	-1.842***
	(0.396)	(0.395)
LICENSING	-2.266***	-2.335***
	(0.204)	(0.203)
SUPRANATION	-1.366***	-1.394***
	(0.227)	(0.228)
SAMESTATE	0.131	0.137
	(0.127)	(0.126)
SAMEIND	-0.235^{+}	-0.195
	(0.133)	(0.131)
PRIORALL	0.484***	0.512***
	(0.138)	(0.137)
AVGASSET	6.64e-08	6.30e-06**
	(2.07e-06)	(1.95e-06)
RASSET	0.747***	0.805***
	(0.186)	(0.185)
RDGAP	-0.920^{+}	-1.422**
	(0.482)	(0.502)
AVGROA	0.415	-0.0156
	(0.493)	(0.472)
LEV	1.946***	
	(0.276)	
PLEV	1.722***	
	(0.283)	
DELTA		1.044***
		(0.298)
Intercept	-4.099***	-3.890***
	(0.423)	(0.428)
N	8440	8440
Groups	2074	2074
Avg. n. of obs per group	4.1	4.1

Standard errors in parentheses $^{+}$ $p < 0.10$. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Table 4. Fixed effects instrumental variable regression on firm's leverage

	(1)
ALLIANCES	-0.0149***
	(0.00376)
RD	-0.119***
	(0.00891)
Q	-0.0159***
	(0.000359)
TANGIBLES	0.124***
	(0.00371)
ROA	-0.126***
	(0.00374)
LASSETS	0.0184***
	(0.000979)
CAPINTENS	-0.000555***
	(0.000104)
DIV	-0.0525***
	(0.00308)
Intercept	0.112***
	(0.00560)
N	61017
Prob>F (test u_i=0)	0.000

Standard errors in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$