Network Prominence, Bargaining Power, and the Allocation of Value Capturing Rights in High-Tech Alliance Contracts*

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ABSTRACT

We suggest and provide empirical evidence that the bargaining power of alliance partners stemming from their prominence in alliance networks influences the *ex-ante* allocation of value capturing rights in high-tech alliance contracts. Network prominence can enhance the availability of alternative partners for a firm, and thereby elevates the firm's bargaining power and enables the firm to receive *i)* more value capturing rights vis-à-vis its partner (i.e., more *net* value capturing rights) and *ii)* more rights to the unexpected outcomes vis-à-vis its partner. We empirically investigate the content of R&D collaboration contracts between biotech and pharmaceutical firms and show that as the prominence of the client (i.e., pharmaceutical firm) increases, it is able to attain *i)* more net value capturing rights to outcomes within the area of collaboration and ii) more rights to unexpected outcomes. By contrast, increased prominence of the R&D firm (i.e., biotech firm) decreases both the number of net value capturing rights the client receives as well as the rights to unexpected outcomes that the client captures in an alliance contract. The bargaining power that the R&D firm attains from its prominent position in alliance networks becomes less important during hot IPO markets, which provide the R&D firm more outside options to obtain financial resources. Hence, our paper documents that firms' network positions can be an important source of bargaining power, contributing to the literature on strategic alliances, bargaining, and contract design.

INTRODUCTION

Strategic alliances have become quite prevalent in recent decades, potentially delivering a wide array of well-known benefits to firms (e.g., Kogut, 1988; Powell, Koput, and Smith-Doer, 1996; Dyer and Singh, 1998; Gulati, 1998). Partners may at once design collaborative agreements to create more value and aim at positioning themselves to preferentially capture it (e.g., Argyres and Bercovitz. 2013; Ozmel and Guler, 2015). A recent and growing research stream highlights the role that contracts play in composing valuable collaborative exchange relations (Poppo and Zenger, 2002; Elfenbein and Lerner, 2003; Argyres and Mayer, 2007; Reuer and Arino, 2007; Lazzarini, Miller, and Zenger, 2004). In shaping exchange relationships through contracts, firms are however interested in both creating value and in capturing it (e.g., Lafontaine, 1992; Bhattacharyya and Lafontaine, 1995; Argyres and Berkowitz, 2013; Phene and Tallman, 2012). In this regard, contracts are both inputs that support value-creating cooperation between firms and artifactual outcomes of partners' efforts to compete for this value.

While substantial work in recent years analyzes the determinants of alliance contracts, considerably less work explores value appropriation through contracting, or the factors that determine the negotiated distribution of value between a focal firm and its partners (e.g., Lafontaine, 1992; Bhattacharyya and Lafontaine, 1995; Adegbesan and Higgins, 2011; Argyres and Berkovitz, 2013). In designing contracts, alliance partners must balance efforts to promote value creation with efforts to shape contractual terms to their specific benefit. These efforts to create and capture value do not play out sequentially, but occur simultaneously, beginning even during the early stages of alliance negotiations. While outcomes during alliance execution indicate the net effect of these efforts, contracts are enduring artifacts that reveal information about the initial efforts by firms to both create and, more importantly for our purposes, capture value during alliance negotiations.

The potential for diverging interests in regard to specific contractual provisions may be substantial, ultimately shaping partners' behaviors and outcomes in alliances (Gulati, 1995a, b; 1998; Dyer and Singh, 1998; Gans, Hsu and Stern, 2008; Dushnitsky and Lenox, 2006; Dushnitsky and Shaver,

2009; Phene and Tallman, 2012). Each partner's bargaining power may therefore play a central role in the structure of these provisions. We argue that a firm's network prominence, controlling for the network prominence of its partner, elevates the firm's bargaining power during alliance negotiations and may limit its partner's contractual rights to outcomes. Network prominence increases the availability of alternative partners and, therefore, elevates the firm's bargaining power vis-à-vis its current partner (Nash, 1953). This greater availability of outside options enables firms with prominent network positions to negotiate more favorable contract terms. Network prominence may affect the availability of a firm's alternative partners by signaling a firm's future prospects and resource quality (Gulati and Gargiulo, 1999; Ozmel et al., 2013a; McEvily, Zaheer, and Kamal, 2016), by certifying the resources and prospects of alliance partners (Stuart, Hoang, and Hybels, 1999; Nicholson, Danzon, and McCullough, 2005), or by helping the prominent firm access knowledge residing in its more expansive network of information channels (Powell et al., 1996; Gulati, 1998).

To illustrate our theory, consider a relationship where an R&D firm agrees to use its human capital and technological know-how to deliver an uncertain and difficult-to-specify output to a client firm, in exchange for financial or other resources. The uncertainty and difficulty in measuring output creates incentives for both parties to seek ownership claims not only on predictable or targeted outcomes, but also on the frequently unexpected outcomes that may be highly valuable. The client therefore seeks to craft a contract that enumerates ownership over both expected outcomes within the domain of the collaboration as well as unexpected outcomes. By contrast, the R&D firm, as the owner of residual rights, seeks a contract that minimizes the scope of any rights that are explicitly and contractually granted to the client (e.g., Grossman and Hart, 1986; Hart and Moore, 1990).

In our empirical context of the biopharmaceuticals industry, collaboration agreements are commonplace between clients, such as big pharmaceutical firms, and R&D firms, which are typically smaller biotech firms. The client firms seek contracts that grant expansive claims on the R&D firms' output. The R&D firms, by contrast, prefer contracts with more narrow claims granted to the pharma firm and with greater rights accruing to the R&D firm itself. Our central argument is, hence, that the allocation

of rights to expected and unexpected outcomes are negotiated into contracts in a way that reflects partners' bargaining power or outside options, as defined by their prominence in alliance networks.

We first analyze the impact of partners' network prominence on the "net value capturing rights", namely the rights assigned to the client in excess of the rights assigned to the R&D firm. These value capturing rights may encompass a wide scope of rights that include patents and intellectual property, licensing, manufacturing and marketing in the main collaboration area. Our primary measure evaluates the distribution of these rights and both complements and adds greater precision to the measures used by Lerner and Merges (1998) and Adegbesan and Higgins (2011). We also compose a novel measure that directly assesses the allocation of "rights to unexpected outcomes." We test our theory on a sample of alliance contracts between biotech and pharmaceutical firms. Our findings are consistent with network prominence affecting the allocation of value capturing rights and rights to unexpected outcomes through its effect on partners' bargaining power. We find that, controlling for the R&D firm's network prominence, when client's alliance network prominence is higher, the client obtains *i)* more extensive contractually-specified *net* value capturing rights –i.e., more value capturing rights in excess of the rights assigned to the R&D firm- and *ii)* stronger rights to unexpected outcomes. On the other hand, client obtains weaker rights when R&D firms' network prominence is higher. Indeed, the client's relative network prominence compared to that of the R&D firm's significantly increases the number of net value capture rights client receives as well as the rights to unexpected outcomes assigned to the client. These results are consistent with both parties using their bargaining power to pursue their divergent interests.

To further identify our hypothesized relationship between network prominence and bargaining power, we explore whether exogenous variation in financial markets influences this relationship. During attractive financial markets, R&D firms have more funding sources available beyond alliance partners (Lerner, Shane and Tsai, 2003). Given that alternative funding opportunities are substitutes for the funding that R&D firms receive from their clients (i.e., pharmaceutical firms) in alliances, when R&D firms have access to alternative financial means, their need to team up with pharmaceutical firms decreases (Stuart, Ozdemir and Ding, 2007). This substitution effect should influence the importance of

network prominence when bargaining in alliances. Therefore, in attractive financial markets, when alternative sources of funds are available to R&D firms, the R&D firms' ability to find alternative alliances partners and sources of funding through network prominence simply becomes less important, in shaping bargaining outcomes.

Supporting our hypothesis, the associations between R&D firm's network prominence and both types of rights assigned to the client become less negative in more attractive markets. Thus, exogenous variation in the importance of bargaining power stemming from network prominence, helps us to identify that network prominence indeed affects the allocation of rights through bargaining power. We also take several additional steps to help with identification and mitigate any concerns with endogeneity, by instrumenting for R&D firm's network prominence, by controlling for many plausible alternative explanations, and conducting a Heckman selection model to mitigate any concerns with selection bias.

Our paper contributes to several related literatures on inter-organizational collaborations, bargaining power, and strategic alliances. Even though the links between a firm's position in interorganizational networks and firm performance, innovative capability, and formation of partnerships are well established (Powell *et al.,* 1996; Gulati, 1998; Ahuja, 2000a, b; Schilling and Phelps, 2007; Ozmel, Robinson and Stuart, 2013), to the best of our knowledge, this is the first paper to investigate network prominence as a source of a firm's bargaining power in strategic partnerships in general and in crafting contracts in R&D and technology commercialization alliances in particular.

In addition, we contribute to research on alliance contracts by offering new measures of firms' value capturing rights to unexpected outcomes outside the targeted area of collaboration. Relatedly, our paper contributes to recent studies on the tension between value generation, on one hand and firms' efforts to capture more of the value on the other hand. Hence, the theory we offer has the potential for broad application to research on different types of inter-organizational partnerships in various contexts analyzing the mechanisms through which firms can capture more value from their interfirm collaborations (e.g., Ozmel and Guler, 2015).

Finally, by documenting that network position shapes a firm's bargaining power, our paper contributes to studies that consider the availability of external funding (Higgins, 2007; Lerner and Merges, 1998; Lerner et al., 2003; Ozmel, 2016), the size of a firm's alliance portfolio (McGrath and Nerkar, 2004) and the existence of franchisee associations (Argyres and Bercovitz, 2013) as sources of a firm's bargaining power in its economic exchanges.

THEORY AND HYPOTHESES

Previous Studies on Bargaining Power and Contracts

Partners may at once design collaborative agreements to create more value and position themselves to preferentially capture it, often through the use of contract provisions (e.g., Bhattacharyya and Lafontaine, 1995; Gallini and Lutz, 1992; Lafontaine, 1992a, b; Lafontaine and Shaw, 1999; Lal, 1990; Mathewson and Winter, 1985; Sen, 1993; Reuer and Devarakonda, 2016). For instance, in franchising contracts, royalty rates are both used as monetary incentive generating value creating behavior and define the value that parties capture (Bhattacharyya and Lafontaine, 1995).

The bargaining power of alliance partners is an important determinant of their ability to capture value through contracts (e.g. Adegbesan and Higgins, 2011). For instance, bargaining power stemming from the existence of independent franchisee associations affects key features of these contracts (Argyres and Bercovitz, 2013). It is also documented that resource-constrained R&D firms have less bargaining power when the external funding environment is weak (Higgins, 2007; Lerner and Merges, 1998), and therefore they relinquish more control rights to their partners in alliance agreements (e.g., Lerner *et al*., 2003). Furthermore, pharmaceutical firms with more extensive alliance portfolios have more bargaining power relative to their partners because they are less reliant on any one firm (McGrath and Nerkar, 2004).

Network Prominence and Bargaining Power

Firms with many direct and indirect ties to other firms in their network of inter-firm relationships enjoy greater prominence (e.g., Gulati, 1998; Kogut, Shan and Walker, 1992; Stuart, 1998; 2000; Podolny, 2001; Hsu, 2006). Network prominence enhances the availability of alternative partners, and shapes a

firm's bargaining power, through a number of mechanisms. First, a firm's prominent network position signals to other firms that it possesses high quality resources and good future prospects (Ozmel et. al., 2013a; Podolny, 1993, 1994). As a result, a prominent firm's prospective partners face less adverse selection risk, enabling the prominent firm to expand its potential set of alliance partners (e.g., Hsu, 2006). Relatedly, firms with prominent positions in alliance networks also certify the resources and prospects of their alliance partners (Stuart, *et al.,* 1999; Ozmel and Guler, 2015), which might further increase the prominent firm's attractiveness and the number of potential partners seeking to collaborate with the firm (Nicholson, Danzon, and McCullough, 2005; Hsu, 2006).

Finally, prominent firms have timely access to the knowledge and other resources residing in other firms. Since valuable knowledge is often widely distributed across firms in high tech industries (Kogut *et al*., 1992; Powell, 1990; Powell *et, al.,* 1996), a prominent network position can increase a firm's chances of timely access to such knowledge (Powell *et. al.,* 1996). Thanks to extensive information channels, a prominent firm can also reduce the search costs associated with locating potential partners and assessing their quality (Walker, *et al.,* 1997; Gulati and Gargiulo, 1999). Furthermore, a prominent firm's extensive information channels also make the firm more visible to the other firms looking for an alliance partner (Sorenson and Stuart, 2001). In sum, as a firm's network prominence increases, it possesses more alternative partners (Gulati, 1998; Gulati and Gargiulo, 1999; Powell *et al.,* 1996; Stuart, 1998).

However, a firm that has more alternative alliance partners is less dependent on its current partner simply because these alternative partners provide alternative sources for critical resources (e.g., Lerner, Shane, and Tsai, 2003; Gulati and Sytch, 2007; Zaheer and Soda, 2009; Stuart, 1998). These alternative sources therefore elevate the firm's bargaining power at the alliance contracting stage (e.g., Bae and Gargiulo, 1999; Hsu, 2004; Stuart, 1998; Lavie, 2007; Ozmel and Guler, 2015; Yan and Gray, 1994). In particular, firms that have more alternative partners are more likely to possess a close next best partner, should negotiations with the first best exchange partner fail. This close alternative increases the firm's bargaining power vis-à-vis its current partner (Nash, 1953).

Bargaining Power and Alliance Contracts

To illustrate our theory, we focus on R&D alliances in the biotechnology industry. Alliance contracts between biotech firms (R&D firms) and pharmaceutical companies (client firms) provide an ideal setting to test our theory, for several reasons. First, alliances are pervasive in biopharmaceuticals, creating a setting in which an abundance of direct and indirect ties create variation in network positions that may shape firms' bargaining power. Second, biotech alliances are often complex with highly uncertain outcomes, rendering bargaining over expected and unexpected outcomes important in contract negotiations. Third, in this setting, interests diverge between R&D firms and clients regarding the allocation of value capturing rights.

In examining the role of network prominence for contract outcomes, we focus on two types of contractual rights that determine partners' ability to capture value through an alliance. The first contractual right examines the "*net* value capturing rights allocated to the client," namely the rights within the collaboration area that are assigned to the client *in excess* of the rights that are assigned to the R&D firm (Lerner and Merges, 1998). The second contractual right we analyze examines the "rights to unexpected outcomes" assigned to the client, namely the rights that are contractually assigned to the client and are related to the unexpected inventions and spillovers outside of the main collaboration area, but stemming from the current alliance. "Rights to unexpected outcomes" assigned to the client is inherently relative to the rights that are left with R&D firm simply because any rights that is left out of the contract belongs to the R&D firm as the owner of the residual rights, as we discuss below.

To begin with, each partner specifically seeks claims over a broad set of value capture rights. However, we argue that a firm with a more prominent network position, controlling for its partner's network prominence, will more successfully negotiate for these value capture rights. The client firm also seeks ownership claims, i.e., contractual rights, on the frequently unexpected outcomes of R&D activity. Otherwise, rights to unexpected outcomes (e.g., by-products, patents, etc.) not specified in the contract accrue to the R&D firm, consistent with the R&D firm owning the assets used in generating these outcomes. In other words, the R&D firm is entitled to any "residual rights"—i.e., rights that are not specifically allocated to the client (Grossman and Hart, 1986; Hart and Moore, 1990). In particular, prior

work suggests that accumulated experience in biotech industry projects often generates unexpected value that accrues to the R&D firm (Teece, 1981; Pisano, 1989). For example, while working on the development of a pharmaceutical compound efficacious for one disease, the R&D firm may discover a compound efficacious for another. If the client does not have rights specified in the contract to this serendipitous discovery, the R&D firm becomes the residual beneficiary . However, clients with high network prominence, controlling for the R&D firm's network prominence, may leverage their position to bargain for more contractual rights to the discoveries outside the main collaboration area.

The foregoing discussion suggests that R&D firms and their clients may have divergent interests, and each may use its bargaining power, as afforded through network prominence, to influence the allocation of rights in contracts. Of course, both the R&D firm and client may enjoy network prominence, and thus the resulting allocation of contractual rights should reflect their relative bargaining power. As a result, controlling for the client's network prominence, *increasing R&D firm's network prominence* increases the R&D firm's relative bargaining power against the client, which leads to *i) fewer* net value capturing rights assigned to the *client* in excess of the rights assigned to R&D firm and *ii) fewer* rights to unexpected outcomes assigned to the *client* vis-à-vis R&D firm. On the other hand, controlling for the R&D firm's network prominence, *increasing client's network prominence* increases the client's relative bargaining power against the R&D firm, which leads to *i) more* net value capturing rights assigned to the *client* –in excess of the rights assigned to R&D firm- and *ii) more* rights to unexpected outcomes assigned to the client vis-à-vis R&D firm. Accordingly, we hypothesize:

Hypothesis 1: The greater a focal firm's network prominence, controlling for its partner's network prominence, i) the greater are the net value capturing rights the focal firm obtains in excess of the rights assigned to its partner and ii) the greater are the rights to unexpected outcomes the focal firm obtains vis-à-vis its partner.

Exploiting Exogenous Variation in the Effect of Network Prominence on Bargaining Power

One way of identifying that network prominence affects contract terms through bargaining power according to the foregoing theoretical discussion is to test how the relationship between network prominence and contractual outcomes changes with exogenous events, such as financial market conditions, that affect the importance of bargaining power stemming from network prominence.

Our argument relies first on the observation that the provision of funding for R&D is one of the primary roles that a client plays in R&D alliances (Lerner *et al.,* 2003). The R&D firm therefore has greater bargaining power if there are other potential clients that are also willing to provide funds. Hence, R&D firm's network prominence increases its bargaining power by increasing the availability of alternative alliance partners willing to provide financing (Gulati, 1998; Gulati and Gargiulo, 1999). Yet, during attractive financial market conditions, R&D firms have alternative funding sources that they can access such as venture capital financing or equity issuance (Lerner and Merges, 1998; Lerner, Shane, and Tsai, 2003). Consequently, by providing alternative funding opportunities, attractive financial market conditions elevate the bargaining power of R&D firms and hence allow R&D firms to capture more rights (Lerner *et al.,* 2003). Given a particular level of funding required, once that funding is obtained from one source, there is no need to obtain it from another source. In other words, funding from alternative sources available in attractive market conditions and funding from big pharmaceutical firms through alliance formation are substitutes. Indeed, when R&D firms have access to alternative funds, their need to partner with pharmaceutical firms decreases (Stuart, *et. al*., 2007).

More importantly, for our purposes, this substitution effect should influence the importance of network prominence in bargaining. Any means that aid searching for one type of financing (i.e., network prominence) is expected to become less important once another form of financing is received or an alternative form becomes more easily accessed. Therefore, in attractive financial markets, when alternative sources of funds are available to R&D firms, the R&D firms' ability to find alternative alliance partners and sources of funds through network prominence simply becomes less important for both securing the funding and bargaining for the value capture rights and rights to unexpected outcomes. On the other hand, in unattractive markets, where the funding game plays out primarily through attracting and

contracting with big pharmaceutical firms through alliances, increasing R&D firm's network prominence should have a higher marginal benefit on the R&D firm's overall ability to both secure funding and negotiate. We summarize these in the following hypothesis:

Hypothesis 2: Controlling for client's network prominence, the negative relationships between R&D firm's network prominence and i) the net value capturing rights assigned to the client in excess of the rights assigned to R&D firm, and ii) rights to unexpected outcomes assigned to the client vis-à-vis the R&D firm, are less pronounced when financial market conditions are more attractive.

METHODS

Sample and Data

We obtained biopharmaceutical alliance contract data from the Recap database for a randomly selected sample of 200 alliance contracts between 1980 and 2003. Even though Recap's choice of which alliance contracts to cover may not be random, Higgins (2007) argues that the direction and magnitude of any potential bias remains unclear. We merge contract data with patent data obtained from the NBER patent database for years prior to 2000 and from the USPTO files for all subsequent years.

Dependent Variables

As our first dependent variable, to examine the "relative" value capture rights the client obtains, we use the "net number of value capturing rights assigned to the client" *(net number of client's value capturing rights),* which is equal to the total number of value capturing rights assigned to the client minus total number of value capturing rights assigned to R&D firm. For this purpose, first we calculate the total number of value capturing rights for each of the client and the R&D firm by counting the total number of rights each party obtains as in Lerner and Merges (1998) and Adegbesan and Higgins (2011). We started with the list of the value capturing rights identified by Lerner and Merges (1998) and Adegbesan and Higgins (2011), but included additional details we deemed important in measuring the allocation of these value capturing rights. In supplemental analyses, we also use the existing measures of the allocation of

value-capturing rights between R&D and client firms (e.g., Lerner and Merges, 1998; Adegbesan and Higgins, 2011). We found qualitatively similar results. Also, in our calculations, given that exclusive rights include basic rights, we assign two points for exclusive rights. Following the previous literature, we count the number of value capturing rights, rather than trying to rank them, given that it is very difficult to evaluate which type of rights are more valuable.

Table 1 lists the value capturing rights that we have considered when constructing our measure in comparison to Lerner and Merges (1998) and Adegbesan and Higgins's (2011) measures. Table 1 also provides the probabilities that a particular value capturing right would be assigned to the client or R&D firm conditional on these rights being assigned in the contract. Certain rights, such as universal marketing rights, are always allocated to the client conditional on being allocated to a party. However, there is still substantial variation in whether these rights are assigned to any given client firm in the first place across our sample of contracts, which may be explained by the variation in the relative bargaining power of agents.

As a second dependent variable, we have also developed a new measure to operationalize the "rights to unexpected outcomes that are allocated to the client", namely *rights to unexpected outcomes*. Of course, decision to include such rights in the contract may be a function of the two partners' prior relationships and experiences (Ryall and Sampson 2009; Bercovitz and Tyler, 2014) as well as their bargaining power. Since we are unaware of any precedent for this measure in the literature, we consulted attorneys working in the field to create categories of rights to unexpected outcomes that might be allocated to client. Based on these consultations, we then developed seven categories that describe the scope of rights assigned to the client. We then placed each contract into one of these seven categories and assigned a corresponding score, as discussed below and presented in Table 2.

The first category consists of the cases where the contract specifies that rights to all unexpected outcomes outside of the collaboration area are specifically granted to the R&D firm, or cases in which the contract specifically mentions that the client has no rights to unexpected outcomes. For this category, we assign a score of zero for the rights to unexpected outcomes allocated to the client. We then assign a score

of 1 to contracts where nothing is specified. In this case, we assume that residual rights would accrue to the R&D firm as the owner of the research facilities and researchers (Grossman and Hart, 1986; Aghion and Tirole, 1994; Lerner and Merges, 1998), but that having this made explicit strengthens the position of the R&D firm legally. While prior work suggests that rights to unexpected value that arises in a biotech project accrues to the R&D firm (Teece, 1981; Pisano, 1989), our conversations with attorneys reveal that this allocation by default does not completely rule out the possibility that client threatens to sue for these rights. Therefore, we rank this category lower than the contracts with explicit clauses that require the client to be informed, and the contracts that give the client the right of first refusal, or contracts that grant outright allocation of these rights to the client, which are all mechanisms that strengthen the client's legal position in claiming these rights. To verify that this assumption is not driving our results, we conduct a separate analysis that excludes this category of contracts where rights to unexpected outcomes are not specified, as discussed below.

We assign a score of 2 to cases where the R&D firm is required to inform the client about new discoveries and the client is given the right of first offer or right of first negotiation. In these cases, the R&D firm negotiates with the client in good faith, but is not required to accept the client's offer. Moreover, there are no restrictions to the R&D firm in seeking agreements with third parties if the client's offer is refused. We assign a score of 3 to cases where the client has the first right of refusal or right of first offer, but at the same time where third party transactions are restricted, for example by creating a lower limit on the price if the offer is refused. Restrictions on third party transactions are advantageous from the perspective of the client because it may reduce potential payment by the client (Bikhchandani, Lippman and Ryan, 2005) and may deter third parties from entry (Walker, 1999). We assign a score of 4 to cases where R&D and client firms hold joint rights over all unexpected outcomes. We assign a score of 5 to contracts that grant rights to the client that can be exercised by the client alone and that do not require the R&D firm's consent. In most of these cases, the client is required to compensate the R&D firm if they exercise their rights. Finally, a score of 6 is assigned to cases where all the rights pertaining to the

unexpected outcomes are clearly given to the client. In rare cases, if a client gets rights from multiple categories, we assign the highest score as the score for the *rights to unexpected outcomes* variable.

In measuring "*rights to unexpected outcomes"* allocated to the client, we used an ordinal ranking, where the score assigned to this variable increases with the value of rights, rather than a count of the number of rights for a number of reasons. First, as we described above, the rights to unexpected outcomes are fairly standard and can be ranked in terms of the extent to which a client receives such rights. Second, counting the number of rights is not possible when all rights to unexpected outcomes are assigned to the R&D firm or all the rights are assigned to the client. We also carry out three robustness analyses to evaluate our categorization of the rights and the rankings described above. First, due to some possible ambiguity regarding the ordinal ranking of categories with scores four and five, we merged these two categories and assigned both a score of 4; relatedly in this process we reassigned those in the highest ranking category a score of 5. We denote this alternative measure "*rights to unexpected outcomes-version2"*. In another robustness test, we generated a simple dichotomous classification separating contracts where the client receives some rights to unexpected outcomes from those where the client receives none. More precisely, we generated a dummy variable (denoted "*rights to unexpected outcomes-version3"*), which takes on a value of one if the score of the original variable is greater than or equal to 2, and zero otherwise. Finally, we reran our analyses dropping all contracts where nothing is specified regarding the rights to unexpected outcomes, which we define as "*rights to unexpected outcomes-version4"*).

Independent Variables

For our main theoretical variables, we operationalize a firm's prominence in the industry wide network of alliances. For this purpose, we first identify all alliances in the industry and for each year and firm we operationalize a firm's prominence using Bonacich's (1987) power centrality measure. Power centrality, or centrality, incorporates not only the firm's immediate ties, but also the indirect ties made by the firm's partners. (e.g. Gulati and Gargiulo, 1999; Podolny, 2001; Nerkar and Paruchuri, 2005; Ozmel, Reuer and Gulati, 2013). *Centrality* for a firm *i* as of year *t* is:

(1) $Centrality_{i,t} = \alpha(I - \delta_t R_t)^{-1} R_t * p$

where R_t is the relationship matrix in which the entry corresponding to i^{th} row and j^{th} column of R_t is the number of previous alliances between firms *i* and *j* within the past five years (from the end of *t-5 to the end of t*); *p* is the vector of ones; and δ_t is the weighting coefficient, which can be assigned an arbitrary number. Following previous literature (e.g. Robinson and Stuart, 2007), we set δ_t equal to three-quarters of the reciprocal of the largest eigenvalue of the R_t. Since the properties of the network may change over time, to allow comparability, we set α so that the maximum centrality for each year is equal to 1.

We calculate separate centrality scores for each of the two firms in the alliance – the biotech firm (i.e., *R&D firm's network prominence*) as well as the pharmaceutical firm (i.e., *Client's network prominence*). In addition, for robustness tests, we calculate *Client's relative prominence =log(1+ Client's network prominence/ R&D firm's network prominence).* In order to measure financial market conditions, or *Market heat*, we calculate for every month the ratio of the number of biotech companies that went through an IPO compared to the total number of private biotech companies in the previous 6 months (Ozmel, Robinson and Stuart, 2013), multiplied by 1000.

Control Variables

To address small numbers problem, we follow Pisano (1990) and include the number of R&D firms in the same therapeutic area *(R&D firms in therapeutic area)* and the number of client firms in the same therapeutic area *(client firms in therapeutic area)* in the last five years as controls. We control for the *stage of R&D firm's product pipeline,* which is a dummy variable taking on one if the venture's products have reached the clinical trials stage with the FDA. *R&D firm's patent count* and *Client's patent count* within the five years prior to forming the alliance are included to measure the innovative capability of an organizations in high-tech industries (e.g., Podolny, Stuart, and Hannan, 1996; Powell et al. 1996). We use *Prominence of the VC firms investing in the R&D firm* as another indicator of the firm's underlying, unobservable quality (Ozmel, et al., 2013b; Podolny, 1994; Ozmel and Guler, 2015). *R&D firm's size* and *Client's size* are included since size may be a proxy for resources available for each firm. We specifically use the log of each firm's total assets (*R&D firm's total assets* and *client's total assets*) at the contract

year for this purpose. We also control for the log of *R&D firm's age* and the *client's age* (Stinchcombe, 1965; Carroll and Hannan, 2000), *R&D firm's alliance count* and *Client's alliance count* during the past five years (Anand et al., 2010; Gulati, 1998; Mesquito, Anand, Brush, 2008; Ozmel et al., 2013b).

We also controlled for a variety of factors at the level of the current alliance. First, we control for the *stage of the alliance*. It takes on a value of one if the product in the alliance is in clinical trials stage, and zero otherwise. Furthermore, we control for the *number of previous alliances between R&D firm and client* in order to address the role of trust (Gulati, 1995a), coordination and learning (Mayer and Argyres 2004; Argyres, *et al.* 2007; Ryall and Sampson 2009; Bercovitz and Tyler, 2014) between alliance partners. In all specifications, we also control for the *R&D firm's alliance count with pharmaceutical firms*, as a direct measure of R&D firms' experience obtained through prior alliances. We include the *(equity amount invested)*, measured as the log of the dollar value of equity invested plus one, because such investments are viewed as an important means of governing alliances (Gulati, 1995a, Robinson and Stuart, 2007). We also included fixed effects for the *type of collaboration*, including dummy variables indicating for different categories of alliances (e.g., R&D, distribution, marketing, or licensing), using classifications provided by Recap. Finally, to control for any general time varying factors in alliance contracting, we include year dummy variables.

Estimation Approach

In order to control for selection bias since client firms and R&D firms choose with whom to partner, we use a two-stage selection model as in Heckman (1979). For the development of the first-stage selection model, for each year *t*, we form all possible pairs of alliances, both realized and unrealized, between firms in the biopharma industry (Sorensen, 2007; Bottazi, DaRin, and Hellman, 2008). Then, we estimate the formation of specific alliances between R&D firms and clients (Bottazzi *et al.*, 2008). Following Robinson and Stuart (2007), we use the number of the R&D firm's previous bio-university licensing alliances as the exclusion restriction. This variable may make the R&D firm an attractive partner, affecting the formation of alliances, yet it is not likely to be related to an R&D firm's quality because the product is not developed by the scientists employed by the R&D firm (Robinson and Stuart, 2007).

In the second stage regressions, we have adopted an ordered logit selection model, which is an application of Heckman (1979) for the ordered logit models (Cameron and Trivedi, 2005; Chiburis and Lokshin, 2007). Specifically, the second stage regression equation is specified as follows:

$$(3)\quad \text{Dependent Variable}_{i,j,t} = \alpha \text{Network Prominence}_{i,t} + \beta \text{Network Prominence}_{j,t} + \sum_{k=1}^{n} \delta_k P_{k,t} + \varepsilon_{i,j,t}$$

P is the matrix of the control variables where *n* is the number of control variables. The inverse mills ratio is included as one of the control variables to address the possible selection bias. Errors are clustered with respect to the client firm in order to address the possibility of heterogeneous contract design capabilities of different pharmaceutical firms (Argyres and Mayer, 2007).

A firm's network prominence and bargaining power could both be explained by an omitted variable such as firm's resources. As a consequence, to address a potential endogeneity of network prominence, we first control for various factors both for the R&D firm and client firm such as the firm's size, patent count, alliance count, and age, which might affect both the firms' network prominence and bargaining power when designing contracts. Second, we conduct instrumental variable analyses, where we use 5-year lagged value of the R&D firm's number of licensing alliances with universities, i.e., the R&D firm's number of bio-university alliances as of time *t-5*, to instrument for the R&D firm's network prominence at time *t*. This lagged variable should affect alliance formation, which in turn shapes the R&D firm's alliance network prominence, yet it is not a measure of the underlying quality of researchers or research facilities owned by the R&D firm (Robinson and Stuart, 2007), and hence should not directly affect bargaining power. Finally, by using a 5 year lagged measure of the instrumental variable, we make sure that the time period in which instrumental variable is measured precedes the time period in which R&D firm's network prominence is calculated. For instrumental variable analysis, we use a two stage OLS regression with errors robust to heteroskedasticity and clustered at the client level.

RESULTS

Table 3 provides summary statistics of the main variables, and Table 4 provides pairwise correlations between these variables. The R&D firm's mean network prominence is 0.11, whereas the client's mean

network prominence is 0.31. As expected, client firms are more central and hence more prominent in the alliance network. In the first stage of selection models, we find that the instrumental variable, "number of R&D firms' bio-university licensing alliances", is significantly and positively ($p<0.01$) related to the probability of an R&D firm forming an alliance with a client firm. The results also indicate that the likelihood of alliance formation increases with the client's network prominence, and the previous ties between the firms (results are available upon request).

Table 5 shows the results of ordered logit regressions, where the dependent variable is the net number of value capturing rights obtained by the client. When we include both R&D firm and client prominence, as shown in Column 4, the estimation results indicate that an increase in the R&D firm's prominence, holding the client's prominence constant, is associated with the client firm receiving fewer net value capturing rights ($p<.01$). On the other hand, increases in the client firm's network prominence, holding the R&D firm's prominence constant, is associated with the client firm receiving more net value capturing rights ($p<0.01$). Consistent with this logic, Table 5's Column 5 also shows that as the prominence of the client relative to the prominence of the R&D firm increases, the client obtains more net value capturing rights ($p<.01$). These results are consistent with our Hypothesis 1. In robustness tests, we used alternative net value capturing rights calculated using Lerner and Merges' (1998) and Adegbesan and Higgins' (2011) methodologies. Our measure is highly correlated with both, with correlation coefficients higher than 0.90, and we obtain similar results with these alternative dependent variables. Among control variables, R&D firm's patent count and market heat positively and stage of the alliance negatively affect the bargaining power of the R&D firm.

In Table 6, Columns 1-5, we use rights to unexpected outcomes -assigned to the client- as our dependent variable. In column 4, we find that when the R&D firm's prominence increases, keeping client's prominence constant, clients are allocated less rights to unexpected outcomes ($p<.01$). On the other hand, when the client firm's prominence increases, controlling with R&D firm's prominence, client firm is allocated greater rights to unexpected outcomes ($p<.05$). Moreover, column 5 shows that as client's prominence relative to the R&D firm prominence increases, the client obtains more rights to

unexpected outcomes ($p<.01$). Again these results are consistent with Hypothesis 1. We obtain similar results in robustness tests when we use alternative versions of the right to unexpected outcomes variable (Table 6, Columns 6-8).

We find that a number of control variables are significant in explaining rights to unexpected outcomes that were not significant in explaining net value capture rights assigned to client. The stage of the R&D firm's product pipeline has a positive and significant coefficient perhaps because obtaining rights to unexpected outcomes is more important for prominent R&D firms in early stages when unexpected findings could be more likely. In addition, the number of previous alliances between R&D firms and clients seems to have a positive effect on the rights for unexpected outcomes allocated to the client. To the extent that unexpected outcomes could be considered as a contingent event, this finding is broadly consistent with repeated exchange between two agents resulting in more contingency planning (Mayer and Argyres 2004; Argyres *et al.* 2007; Ryall and Sampson 2009; Bercovitz and Tyler, 2014). On the other hand, the prominence of the VC firms endorsing the R&D firm has a negative and quite significant effect on the client's rights to the unexpected outcomes ($p<0.01$). This may suggest that R&D firms that are endorsed by prominent VCs may have higher bargaining power vis-a-vis their clients, perhaps due to increased access to alternative funding sources. Prominent VCs may have a stronger preference for keeping rights to unexpected outcomes (rather than value capture rights) within the R&D firms given their strong preference for choosing investments with high growth options (Gompers, 1995).

Identification with Exogenous Market Variation and Instrumental Variables Approach

Table 7's Panel A shows how the influence of bargaining power arising from R&D firm's network prominence on the allocation of contractual rights changes with exogenous variation in market heat. Please note that in all models we control for the client's network prominence along with all the other control variables. In both columns, the interaction between R&D firm's network prominence and the market heat variable produces a positive and significant coefficient, as expected. In other words, the *negative impacts* of an R&D firm's network prominence on *i)* the client's *net* value capturing rights and *ii)* the rights to unexpected outcomes assigned to the client, are both *less* pronounced when financial

market conditions are attractive. In both columns, the main effect of market heat is negative and highly significant ($p<0.01$) indicating that in attractive market conditions, R&D firms generally have higher bargaining power.

Figure 1 and Figure 2 show, when everything else is at their median levels, how the probability of net value capture rights assigned to the client being more than or equal to 4 and the probability of "rights to unexpected outcomes allocated to the client" being equal to or greater than 5, changes as a function of R&D firm prominence at various levels of market heat, respectively. In both figures, we find that the total effect of R&D firm prominence on both types of rights assigned to client is negative for all levels of market heat. More importantly, the slopes of the lines, which describe the relations between R&D firm prominence and the probability of client's obtaining rights, gets less negative as market heat increases. This shows that the sign of the interaction between market heat and R&D firm prominence is positive in both graphs. These results are consistent with Hypothesis 2 and help us identify the influence of R&D firm's network prominence on the allocation of rights, as a function of the bargaining power that network prominence provides.

To address the potential endogeneity of network prominence, we also conducted two stage OLS regressions, using R&D firm's 5-year lagged number of bio-university alliances as an instrumental variable for R&D firm's network prominence. Cragg-Donald (1993) Wald F-statistics indicates that the instrument is not weak with 5% significance (Stock and Yogo, 2005). Panel B of Table 7 reports second stage regressions for both measures of value capture, and this panel indicates qualitatively similar results to those reported in Tables 5 and 6.

DISCUSSION

Contributions and Implications

Firms entering into alliances are focused on both creating value and positioning themselves to capture it. Prior research has documented how a firms' position in interorganizational networks benefits firm performance, innovative capability, and formation of partnerships (e.g., Shan *et. al.,* 1994; Powell *et al.,*

1996; Gulati, 1998; Ahuja, 2000a, b; Stuart, 2000; Schilling and Phelps, 2007; Shipilov and Li, 2008). In this paper, we focus on mechanisms through which network positions affect bargaining power and division of value that is created. We show that a firm's prominence within alliance networks, controlling for the prominence of its partner, is an important source of the firm's bargaining power against its current alliance partner. The focal partner receives more of the net value capturing rights and more rights to unexpected outcomes as its network prominence increases.

Partnering with a prominent firm confers many advantages as shown in the previous literature (e.g., Gulati, 1998; Kogut, Shan and Walker, 1992; Stuart, 1998; 2000; Podolny, 2001; Ozmel and Guler, 2015). However, our results show that matching with more prominent actors also decreases relative bargaining power. Therefore, a novel implication of our results is that selecting a prominent partner creates a tradeoff between potentially greater value creation, yet weakened bargaining power for value capture.

Another important contribution of this paper is to theoretically suggest and provide empirical evidence that "rights to unexpected outcomes" is an important outcome of the bargaining between alliance partners. Previous studies on alliance contracts predominantly focus on the allocation of rights related to the particular area of collaboration at hand. We aim at filling this gap through our novel content-based measure of the rights to unexpected outcomes, which may be an especially important source of value in high-tech and high uncertainty alliances.

Another novel feature of our study is to use exogenous variation in market conditions to better identify the effect of network prominence on bargaining power. Consistent with our theory, we find that during attractive financial markets, when funding from alternative sources is more abundant, the marginal value of network prominence as a source of bargaining power decreases. Controlling for the endogeneity of matching and network prominence does not change our conclusions.

Interestingly, even though there is a considerable set of studies on alliance contracts, there are relatively few studies aimed at analyzing the partners' attempts to appropriate more value through negotiating favorable contracts (e.g., Bhattacharyya and Lafontaine, 1995; Adegbesan and Higgins, 2011;

Argyres and Berkovitz, 2013). Our paper contributes to above set of recent studies by incorporating the role that firms' alliance network positions play in enhancing the firm's bargaining power to capture more contractual value appropriation rights. By doing this, our paper also illustrates that partners' efforts to create and capture value in an alliance indeed occur simultaneously, and these efforts start as early as the stage when partners negotiate contract terms.

Limitations and Future Research Directions

Our theory suggests that bargaining power arising from network prominence is an important determinant of contract design and the extent of value captured in alliance relationships. Moreover, how revenues and other sources of value are shared affects agents' incentives to exert effort, innovate and invest in relation specific assets (Marquez and Yavuz, 2013). Thus, bargaining power that arises from network prominence may also affect value creation in alliances, affecting the innovation outcome of the firms as well as the overall firm performance. Future studies, therefore, can analyze the implications of the firm's bargaining power and associated value capturing rights the firm receives through alliance contracts on the firm's innovation outcome and overall performance.

Considering that it is costly to form partnerships with prominent firms (e.g., Hsu, 2004) and forming partnerships with prominent firms does not guarantee sufficient access to partner's resources (Ozmel and Guler, 2015), it is critical to better understand the cost versus benefit of forming partnerships with prominent firms. Hence, future studies can follow our paper's path to further analyze the role of a firm's bargaining power in helping the firm to capture sufficient value in its partnerships so that the firm can gain more than the cost it has incurred in its partnership with prominent firms, and implications on the firm's innovation and performance.

In this study, we focus on the contract structure at the time of the alliance formation. However, as a firm's bargaining power with respect to its partner changes through time, the firm, or its partner, might be better positioned to re-negotiate some of the contract terms. Relatedly, it would be interesting to analyze how the effect of network prominence on contract terms evolves through time (see Mayer and Argyres, 2004; Argyres et al., 2007; Bercovitz and Tyler, 2014).

Further research on other sources, or dimensions, of technology firms' bargaining power can advance our understanding regarding the other mechanisms through which firms can enhance their bargaining power against their alliance partner and the implications on contracts. In addition, to the extent that a tech venture's bargaining power can help the venture extract more of its partner's resources, or limit its partner's capability to appropriate venture's technology and intellectual property, (e.g., Ozmel, 2016), the role of a tech venture's bargaining power against its venture capital/corporate venture investor and the effect on the tech firm's innovation also deserves further attention. We believe that future studies can also investigate possible differential impact of various sources/dimensions of bargaining power across a tech firms different types of inter-firm collaborations.

In this paper, we incorporate the role of exogenous variation in market conditions in moderating the importance of the firm's bargaining power stemming from its network prominence on alliance contracts. We believe that future studies can further analyze other contingencies under which a tech firm's bargaining power associated with its network position can be more or less important. Relatedly, given that later stage alliances might be more about accessing complementary assets rather than money (Teece, 1986), future studies can also investigate whether the dampening effect of the hot market conditions on the role of the alliance prominence in determining contractual rights might be less intense for later stage alliances.

To conclude, we hope that this paper encourages future research on the distributional consequences of networks of interfirm collaborations in various other settings and on the role of bargaining power in helping agents not only to generate more value, but also capture more of the value generated during contracting as well as execution stages of alliances and other interfirm collaborations.

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Table 1. List of Value Capturing Rights
The table lists the value capturing rights included in the study. The first column reports the conditional probability that these rights are assigned to the client given that these rights are assigned to a party in the contract. The second column indicates studies that have relied upon similar value capturing rights. We refer to Lerner and Merges (1998) as LM 1998 and Adegbesan and Higgins (2011) as AH 2011.

	Conditional probability that the right is assigned to Client	**Origin**
Patents and intellectual property rights		
Ownership of some patents.	0.43	
Joint ownership of all patents.	0.50	LM 1998, AH 2011
Ownership of all patents.	0.83	LM 1998, AH 2011
Right to use/transfer unpatented know how and/or other intellectual property.	0.39	LM 1998, AH 2011
Joint ownership of all unpatented know-how and intellectual property.	0.49	
Ownership of all unpatented know-how and intellectual property.	0.46	LM 1998, AH 2011
Licensing rights		
Right to grant sublicenses.	0.62	LM 1998, AH 2011
Perpetual license or option of continued licensing.	1.00	LM 1998, AH 2011
Exclusive license.	0.75	
Product Development and Manufacturing		
Right to manage clinical trials and process development.	1.00	LM 1998, AH 2011
Right to manufacture the final product.	0.74	LM 1998, AH 2011
Marketing Rights		
Basic marketing rights.	0.15	AH 2011
Universal marketing rights.	1.00	LM 1998, AH 2011
Exclusive marketing rights.	0.90	LM 1998, AH 2011

Table 2: Definition of "Rights to Unexpected Outcomes".

Rights to Unexpected Outcomes	Score
R&D firm is given all rights or client firm is specifically not given any rights.	0
Nothing is specified.	1
Client is entitled to be informed about new developments. Client is given right of first negotiation or right of first offer that does not restrict target's actions if the offer is refused.	2
Client has the right of first refusal. Client is given right of first offer or negotiation with restrictions on third party offers if declined.	3
Joint ownership of all rights.	4
Client is given rights to unexpected outcomes that can be exercised by the client unilaterally.	5
Client is given all rights.	6

Table 3. Summary Statistics

	Variable	Mean	Std. Dev.	Min	Max
1	Net number of client's value capturing rights	1.98	2.11	-3.00	8.00
2	Rights to unexpected outcomes	2.24	1.93	0.00	6.00
3	R&D firm's network prominence	0.11	0.11	0.00	1.00
4	Client's network prominence	0.31	0.26	0.00	1.00
5	Market Heat	3.17	2.58	0.00	10.71
6	R&D firms in therapeutic area	211.41	393.60	0.00	4588
7	Client firms in therapeutic area	151.54	251.63	0.00	2220
8	Stage of R&D firm's product pipeline	0.42	0.50	0.00	1.00
9	R&D firm's alliance count	5.85	5.59	1.00	35.00
10	Prominence of the VC firms investing in R&D firm	0.45	0.36	0.00	1.00
11	Stage of the alliance	0.34	0.48	0.00	1.00
12	Number of previous alliances between R&D firm and client	1.10	0.33	1.00	3.00
13	R&D firm's age	3.69	1.05	0.00	5.51
14	Equity invested in current alliance	0.98	1.11	0.00	3.71
15	R&D firm's patent count	5.01	10.68	0.00	93
16	R&D firm's total assets	3.00	1.11	-0.20	5.67
17	Client's total assets	7.96	1.91	0.88	10.74
18	Client's age	3.99	0.81	2.40	5.65
19	Client's alliance count	15.25	19.64	0.00	101
20	Client's patent count	375.82	578.75	0.00	3662
21	Number of client's value capture rights	3.84	2.12	0	9.00
22	Number of R&D firm's value capture rights	1.86	1.26	0	6.00

Table 4. Correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Net # of client's value capt. rights	1																		
2	Rights to unexp. Outcomes	**0.10**	1																	
3	R&D firm's network prom.	**-0.11**	**-0.06**	1																
4	Client's network prominence	**0.17**	**0.27**	0.02	1															
5	Market Heat	**-0.14**	**-0.12**	0.02	-0.03	1														
6	R&D firms in therap. area	-0.04	**-0.06**	**-0.06**	-0.10	-0.02	1													
7	Client firms in therap. area	**-0.08**	**-0.10**	**-0.06**	**-0.07**	-0.03	**0.68**	1												
8	Stage of R&D firm's products	0.02	**0.10**	0.01	0.05	**-0.19**	0.00	**0.07**	1											
9	R&D firm's alliance count	-0.02	0.00	**0.46**	-0.01	-0.03	0.00	0.03	**0.25**	1										
10	Prominence of the VC firms	-0.02	**-0.17**	0.03	-0.03	0.00	**0.06**	0.05	0.05	0.02	1									
11	Stage of the alliance	**.06**	**-0.14**	**-0.26**	**-0.15**	.05	**.15**	**.18**	.01	**-0.22**	-.02	1								
12	Number of prev. alliances	-0.01	**0.10**	**0.07**	**0.12**	**0.07**	-0.03	-0.03	**0.06**	**0.23**	0.02	-0.02	1							
13	R&D firm's age	**-0.07**	**-0.12**	0.01	0.00	**-0.21**	0.1	**0.10**	**0.13**	0.05	**0.32**	-0.02	-0.03	1						
14	Equity invested	-0.02	**0.09**	**-0.07**	-0.02	**-0.11**	-0.01	-0.02	**0.15**	-0.04	**-0.12**	**-0.15**	**0.06**	0.03	1					
15	R&D firm's patent count	**-0.10**	-0.04	-0.01	0.03	-0.04	0.04	**0.06**	**0.11**	**0.16**	**0.15**	**.06**	**0.23**	**0.23**	-0.01	1				
16	R&D firm's total assets	**-0.10**	-0.04	**0.19**	-0.04	-0.03	**0.16**	**0.19**	**0.07**	**0.17**	**0.13**	**0.07**	**0.06**	**0.09**	**0.11**	**0.28**	1			
17	Client's total assets	0.04	**0.10**	**-0.06**	**0.28**	**-0.08**	**-0.18**	**-0.22**	**0.07**	-0.03	0.04	**-0.14**	**0.09**	**0.07**	**0.18**	**0.07**	0.04	1		
18	Client's age	-0.04	0.01	**0.06**	**0.15**	0.05	**-0.22**	**-0.26**	**0.09**	**-0.06**	**0.09**	**-0.16**	**0.14**	0.02	**0.07**	0.02	**-0.07**	**0.64**	1	
19	Client's # alliances	**0.06**	**0.14**	**-0.13**	**0.67**	**-0.06**	0.05	**0.07**	**0.13**	**0.07**	**0.08**	**-0.06**	**0.10**	**0.07**	**-0.07**	**0.17**	0.05	**0.32**	**0.25**	1
20	Client's # patents	**-0.07**	-0.02	**-0.06**	**0.22**	**-0.14**	-0.10	**-0.09**	0.04	-0.03	0.08	-0.02	**0.09**	0.03	-0.05	**0.07**	0.02	**0.48**	**0.31**	**0.25**

(Correlations in bold are significant at 10% or better. Variable names are shortened to fit into the table. Full variable names are reported in Table 3).

Table 5: Net Number of Client's Value Capturing Rights

	1	2	3	4	5
R&D firm's network prominence		-3.85*		-4.26**	
		(1.54)		(1.42)	
Client's network prominence			2.19*	2.43**	
			(0.92)	(0.90)	
Client's relative prominence					0.92**
					(0.26)
Market heat	-0.23*	-0.22+	-0.23*	-0.22+	-0.21+
	(0.11)	(0.12)	(0.11)	(0.12)	(0.12)
R&D firm's alliance count	0.02	0.07	0.03	0.09*	0.09*
	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)
Client's alliance count	0.02*	0.02**	-0.01	-0.01	-0.00
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
R&D firms in therapeutic area	-0.00	-0.00	-0.00	0.00	0.00+
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Client firms in therapeutic area	-0.00	-0.00	-0.00	-0.00	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R&D firm's age	-0.00	0.06	-0.08	-0.02	-0.04
	(0.15)	(0.16)	(0.16)	(0.17)	(0.17)
Client's age	-0.55*	-0.52*	-0.37	-0.31	-0.41+
	(0.25)	(0.25)	(0.26)	(0.26)	(0.26)
R&D firm's total assets	-0.06	-0.01	-0.05	0.00	0.04
	(0.20)	(0.19)	(0.20)	(0.19)	(0.18)
Client's total assets	0.23*	0.20	0.21+	0.18	0.20
	(0.14)	(0.14)	(0.12)	(0.12)	(0.13)
R&D firm's patent count	-0.03	-0.03+	-0.02	-0.03+	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Client's patent count	-0.00*	-0.00*	-0.00*	-0.00*	-0.00+
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Prominence of the VC firms investing in R&D firm	0.53	0.49	0.67	0.64	0.53
	(0.50)	(0.49)	(0.54)	(0.54)	(0.50)
Stage of the alliance	0.92*	0.86*	1.06**	1.02**	0.80*
	(0.37)	(0.37)	(0.38)	(0.37)	(0.38)
Number of previous alliances between R&D firm and client	0.01	0.01	-0.22	-0.25	-0.22
	(0.62)	(0.58)	(0.58)	(0.54)	(0.66)
Equity invested in current alliance	-0.18	-0.23	-0.17	-0.22	-0.23
	(0.15)	(0.15)	(0.16)	(0.16)	(0.16)
Stage of R&D firm's product pipeline	0.26	0.28	0.19	0.22	0.09
	(0.42)	(0.43)	(0.41)	(0.42)	(0.42)
Inverse Mills Ratio	0.00	-0.00	0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Time dummies	yes	yes	yes	yes	yes
Alliance type dummies	yes	yes	yes	yes	yes
Log pseudo-likelihood	-365.10	-362.69	-362.43	-359.40	-359.23

Robust standard errors clustered at the client firm level are reported in parentheses. **, *, + represent significance at 1%, 5%, 10% levels, respectively.

Table 6: Rights to Unexpected Outcomes Assigned to the Client

In column 6, categories with scores 4 and 5 are merged. In column 7 the dependent variable is one if the score is >=2, o/w =zero. In column 8, category with score=1 is dropped.

	1	2	3	4	5	6	7	8
R&D firm's network prominence		-7.45**		-8.78**		-8.82**	-4.37*	-8.99**
		(2.67)		(2.69)		(2.68)	(1.79)	(3.32)
Client's network prominence			2.46*	3.10*		3.07*	2.25*	2.78*
			(1.20)	(1.25)		(1.22)	(0.94)	(1.12)
Client's relative prominence					0.95**			
					0.34			
Market heat	-0.23*	-0.26*	-0.22*	-0.25*	-0.24*	-0.24*	-0.16**	-0.27*
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.06)	(0.12)
R&D firm's alliance count	-0.04	0.04	-0.03	0.07+	0.02	0.07*	0.02	0.04
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.06)
Client's alliance count	0.03**	0.03**	0.00	-0.00	0.01	-0.01	-0.01	0.01
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
R&D firms in therapeutic area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Client firms in therapeutic area	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R&D firm's age	-0.06	0.00	-0.14	-0.09	-0.09	-0.07	-0.11	-0.11
	(0.21)	(0.21)	(0.22)	(0.22)	(0.21)	(0.22)	(0.13)	(0.29)
Client's age	-0.43+	-0.43	-0.20	-0.12	-0.28	-0.12	0.02	-0.49
	(0.24)	(0.28)	(0.27)	(0.31)	(0.25)	(0.30)	(0.22)	(0.33)
R&D firm's total assets	0.16	0.22	0.13	0.20	0.25	0.21	0.15	0.20
	(0.19)	(0.21)	(0.19)	(0.21)	(0.20)	(0.21)	(0.13)	(0.28)
Client's total assets	0.10	0.08	0.06	0.04	0.04	0.03	0.02	0.05
	(0.11)	(0.12)	(0.11)	(0.12)	(0.11)	(0.12)	(0.09)	(0.22)
R&D firm's patent count	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Client's patent count	-0.00+	-0.00	-0.00*	-0.00+	-0.00	-0.00+	-0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Prominence of VC firms	-1.08*	-1.22*	-0.95+	-1.08*	-1.09*	-1.04*	-0.82*	-1.33+
	(0.52)	(0.51)	(0.54)	(0.52)	(0.51)	(0.53)	(0.38)	(0.71)
Stage of the alliance	-0.16	-0.32	-0.04	-0.19	-0.33	-0.23	-0.30	-0.60
	(0.38)	(0.38)	(0.40)	(0.39)	(0.38)	(0.39)	(0.28)	(0.57)
Number of previous alliances	1.01**	0.85*	0.85*	0.62	0.80*	0.71	0.82*	0.61
	(0.38)	(0.40)	(0.41)	(0.46)	(0.37)	(0.44)	(0.37)	(0.55)
Equity invested in current alliance	-0.19	-0.25+	-0.19	-0.26+	-0.21	-0.24+	-0.11	-0.35*
	(0.14)	(0.14)	(0.14)	(0.14)	(0.13)	(0.14)	(0.11)	(0.16)
Stage of R&D firm's pipeline	0.76*	0.78*	0.72+	0.71*	0.61	0.68+	0.67**	1.11**
	(0.36)	(0.36)	(0.37)	(0.37)	0.40	(0.37)	(0.25)	(0.47)
Inverse Mills Ratio	0.00	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	0.02
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Alliance type dummies	yes	yes	yes	yes	yes	yes	yes	yes
Log pseudo-likelihood	-307.87	-303.07	-304.96	-298.77	-302.34	-281.24	-86.05	-189.85

Robust standard errors clustered at the client firm level are reported in parentheses. **, *, + represent significance at 1%, 5%, 10% levels, respectively.

Table 7: Identification with Exogenous Market Variation and Instrumental Variables Approach

	Panel A: Market Heat		**Panel B: Instrumental Variable**	
	Net number of Client's value capturing rights	Rights to unexpected outcomes	Net number of Client's value capturing rights	Rights to unexpected outcomes
R&D firm's network prominence	-10.01**	-14.32**	-36.66+	-17.26*
	(2.68)	(4.32)	(19.03)	(7.84)
Client's network prominence	2.76**	3.36*	3.77**	2.87*
	(0.92)	(1.38)	(1.42)	(1.21)
R&D firm's network prominence x Market heat	1.96*	2.37+		
	(0.83)	(1.38)		
Market heat	-0.44**	-0.46**	-0.00	-0.17+
	(0.15)	(0.13)	(0.18)	(0.10)
R&D firm's alliance count	0.10*	0.07+	0.37*	0.14+
	(0.04)	(0.04)	(0.15)	(0.07)
Client's alliance count	-0.01	-0.01	-0.03	-0.00
	(0.01)	(0.02)	(0.02)	(0.02)
R&D firms in therapeutic area	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Client firms in therapeutic area	-0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
R&D firm's age	0.01	0.01	0.38	-0.00
	(0.19)	(0.23)	(0.30)	(0.20)
Client's age	-0.24	-0.08	0.13	-0.04
	(0.26)	(0.32)	(0.38)	(0.32)
R&D firm's total assets	-0.05	0.16	0.38	0.33
	(0.20)	(0.21)	(0.35)	(0.21)
Client's total assets	0.15	-0.00	-0.09	-0.08
	(0.13)	(0.13)	(0.20)	(0.13)
R&D firm's patent count	-0.03+	-0.01	-0.03	-0.02
	(0.02)	(0.01)	(0.02)	(0.01)
Client's patent count	-0.00*	-0.00*	-0.00*	-0.00+
	(0.00)	(0.00)	(0.00)	(0.00)
Prominence of the VC firms investing in R&D firm	0.70	-1.18**	0.16	-0.97*
	(0.57)	(0.53)	(0.81)	(0.43)
Stage of the alliance	1.10**	-0.17	0.33	-0.41
	(0.38)	(0.39)	(0.63)	(0.35)
Number of previous alliances between R&D firm and client	-0.25	0.60	-0.27	0.85*
	(0.54)	(0.45)	(0.68)	(0.38)
Equity invested in current alliance	-0.18	-0.22	-0.49+	-0.30*
	(0.16)	(0.14)	(0.28)	(0.15)
Stage of R&D firm's product pipeline	0.18	0.68+	0.24	0.60+
	(0.41)	(0.39)	(0.44)	(0.33)
Inverse Mills Ratio	-0.00	-0.00		
	(0.01)	(0.00)		
Time dummies	yes	yes	yes	yes
Alliance type dummies	yes	yes	yes	yes
Log pseudo-likelihood	-356.08	-296.27		
Wald Chi-squared			1598.75	54103.64
Adjusted R-sqr	0.11	0.13	--	.15

Robust standard errors clustered at the client firm level are reported in parentheses. **, *, + represent significance at 1%, 5%, 10% .

Figure 1

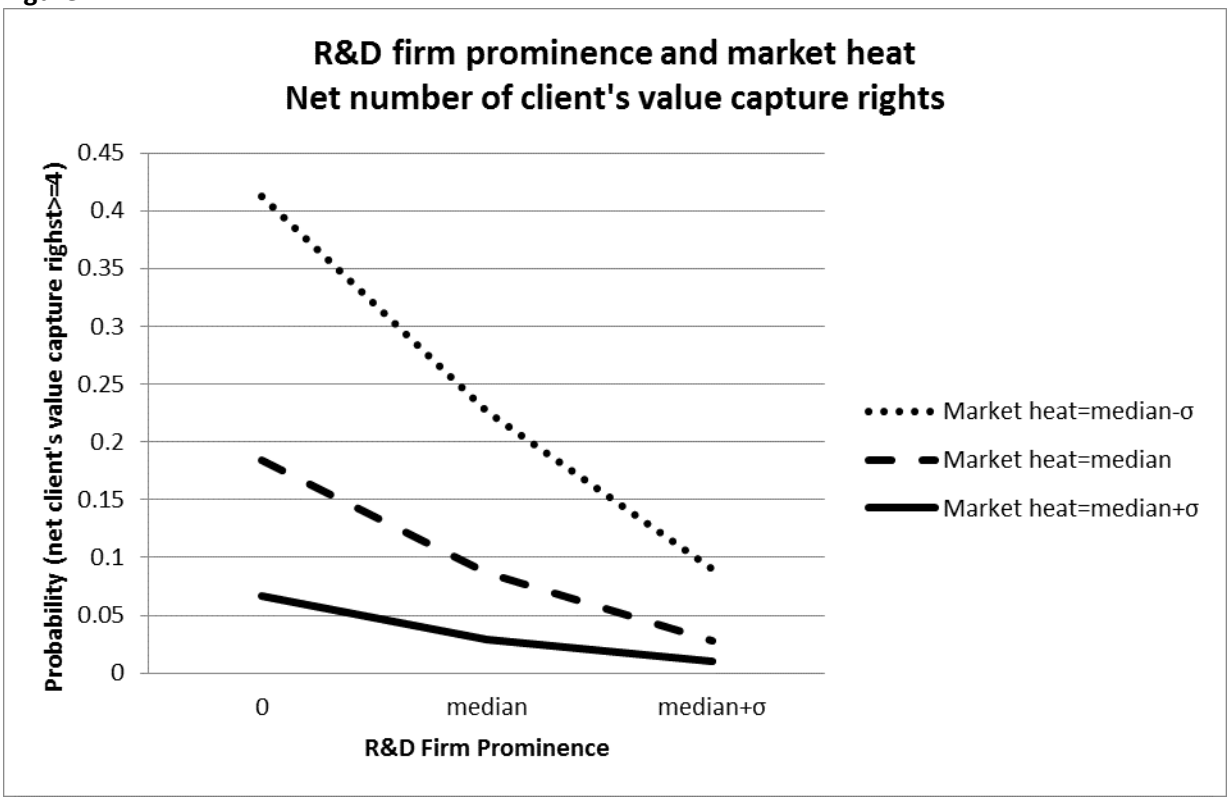

Figure 2