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THE INTERPLAY OF COMPETITIVE AND COOPERATIVE BEHAVIOR AND DIFFERENTIAL BENEFITS IN ALLIANCES[1]

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Research Summary: Building on game theory and the transaction costs paradigm, this paper systematically examines the interplay between competitive and cooperative behavior and its effect on differential benefits in alliances. Cooperative behavior leads to joint value creation that yields common benefits, while competitive behavior is linked with value appropriation resulting in private benefits. Differential benefits arise when partners extract private benefits. Yet, private benefit extraction depends on the associated reduction in the common benefit potential of the alliance. This paper demonstrates that differential benefits decrease as partners refrain from private benefit extraction when the common benefit potential is high and common benefits are equally distributed. Differential benefits increase when a partner holds dominant operational control under high levels of task interdependence.

Managerial Summary: While alliances create synergy potential unavailable to individual firms, they may also lead to differential benefits to the partners. Since differential benefits may hurt a partner both within and outside the scope of the alliance, it is important to understand how they arise. A key source of differential benefits is private benefit extraction through the misappropriation of partner resources. Overall, private benefit extraction depends on the associated reduction in the common benefit potential of the alliance. The findings suggest that partners may refrain from private benefit extraction when the common benefit potential is high and when the expected common benefits are equally distributed among partners. In contrast, private benefits increase when one partner holds dominant operational control under high levels of task interdependence.

Keywords: strategic alliances; differential benefits; private benefits; game theory; joint ventures

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INTRODUCTION

Establishing robust cooperative relationships has been a core issue in strategic alliance research since strategic alliances face ongoing tensions between cooperative and competitive forces (Das and Teng, 2000). Cooperating partners enjoy common benefits resulting from synergistic value creation otherwise unavailable to individual partners. At the same time, however, an opportunistic partner can obtain private benefits by misappropriating its counterpart's resources. Opportunistic behavior toward private benefit extraction thus threatens alliance longevity (Hamel, 1991; Inkpen and Beamish, 1997) and performance (Parkhe, 1993; Luo, 2007a), and results in differential benefits among partners (Kumar, 2010b).

Differential benefits arise when an alliance partner gains more benefits than its counterpart which may stem from private benefit extraction and an unequal distribution of common benefits. This paper focuses on private benefits as a specific source of differential benefits.[2] In alliances, a partner can unilaterally extract private benefits since they are not initially obvious to the contracting parties (Dyer, Singh and Kale, 2008), and it is not possible to write complete contracts to prevent opportunistic behavior during the course of the alliance (Hennart, 1988). Private benefit extraction may engender unexpected adverse consequences for the disadvantaged partner both within and outside the scope of the alliance. Within the scope of the alliance, private benefit extraction may eliminate partner dependency over time and lead to detrimental outcomes for the disadvantaged partner, such as unfavorable renegotiation of the collaborative relationship or an

[2] Differential benefits may also arise due to the differences in partners' common benefits. The bargaining literature suggests that differences in common benefits result from differences in partners' bargaining power. During the formation of the alliance, the partner with greater bargaining power often obtains a higher share of the common benefit potential. A partner's bargaining power depends on the relative value of its contributions that, in turn, is determined by the productivity, strategic importance and scarcity of the contributed resources (Pfeffer and Salancik, 1978; Yan and Gray, 2001). Whether or not common benefits are unequally distributed among partners is beyond the scope of the paper, but it is taken into account in the measurement of differential benefits.

unwanted termination of the alliance before reaping its own expected benefits (Hamel, 1991; Inkpen and Beamish, 1997). Outside of the alliance, private benefit extraction may endanger the disadvantaged partner's relative competitive position (Dussauge, Garrette, and Mitchell, 2004) and create new competitors in its industry (Geringer and Herbert, 1989; Wang and Zajac, 2007).

Extant research examines differential benefits mainly from the perspective of the resource-based view and focuses on asymmetric private benefit potential for alliance partners. In this view, differential benefits arise when alliance partners differ in their resource endowments (Kumar, 2010b), relative scope (Khanna, Gulati, and Nohria, 1998), network resources (Dyer *et al.*, 2008), relative absorptive capacity (Lavie, 2006) and learning capabilities (Hamel, 1991). However, less attention has been paid to the trade-off between private benefit extraction and the common benefits of an alliance. Existing literature alludes to a potential trade-off between cooperation and competition within alliances by implying that the threat of opportunism limits the potential common benefits ex ante (Lavie, 2006) and threatens alliance stability (Inkpen and Beamish, 1997). However, this trade-off between private and common benefits has not yet been subject to systematic analysis, and outcomes arising from this trade-off remain understudied.

This paper aims to fill this gap by examining the alliance-level conditions under which the trade-off between private and common benefits serves to curb incentives for opportunistic behavior, thus diminishing inter-partner differences in alliance-related benefits. This paper argues that opportunistic behavior for private benefit extraction can have detrimental effects on the realization of the alliance's common benefit potential due to underinvestment of resources, overprotection of proprietary resources, and retaliation. Accordingly, private benefit extraction is less likely to occur when the associated reduction in the common benefits is high, thus countering incentives for private benefit extraction and, in turn, reducing differential benefits among partners.

This paper offers two contributions within strategic alliance research. First, it expands the literature on differential benefits in alliances by incorporating insights from game theory and the transaction costs paradigm for a systematic analysis of the interdependence between private and common benefits. Inclusion of the transaction costs paradigm is necessary because the existing literature on value appropriation relies heavily on arguments centered on opportunistic behavior (Lavie, 2006). Also, game theory helps define the alliance payoff structure to predict the choice of competitive behavior when private and common benefits are interdependent. While game theory and the transaction costs paradigm have been previously paired to study *overall* alliance performance (Parkhe, 1993), this paper extends these perspectives to examine *differential* benefits in alliances.[3]

Second, this paper takes the first step toward a better understanding of how competitive and cooperative behavior interact in alliances, rather than treating them as independent forces. This study offers insights on the interplay between competitive and cooperative behavior in alliances: while cooperative behavior is associated with value creation that results in common benefits, competitive behavior is linked with value appropriation that accrues private benefits. Private and common benefits are interdependent such that the competitive behavior for private benefit extraction inhibits the realization of the common benefit potential of the alliance, thus making private benefit extraction conditional on the associated counterproductive impact of competitive behavior on common benefits.

Hypotheses were tested in the context of 178 joint ventures (JVs) formed by U.S. public firms over the period between 1996 and 2010. The findings uncover the role of the common benefit

[3] Game theory and the transaction costs paradigm are compatible perspectives because they both focus on competitive behavior under the assumptions of self-interested behavior and information asymmetry. Together, they provide an integrated account of the interplay between cooperation and competition within alliances.

potential and its distribution among partners in aligning incentives and discouraging private benefit extraction. The findings also unveil the contingent effect of task interdependence on differential benefits. While greater levels of task interdependence may spur cooperation and decrease differential benefits under shared operational control, tendency toward private benefit extraction increases amid high levels of task interdependence when one partner has dominant operational control over the alliance.

THEORETICAL BACKGROUND

Competitive tensions within strategic alliances

Strategic alliances are formed to reap the benefits of cooperation: potential common benefits resulting from joint activities within the scope of the alliance. While realizing the common benefit potential of an alliance depends on cooperation, cooperation is far from certain. The transaction costs paradigm as applied to interfirm relationships suggests that partners' interests remain partially overlapped at best (Ouchi, 1980). Further, since firm identities remain distinct during the term of an alliance, partners retain *de facto* rights to pursue self-interests (Buckley and Casson, 1988). This imperfect alignment of incentives among partners gives way to a major transaction cost – the risk of opportunistic behavior geared towards extracting private benefits.

Within a strategic alliance, the most commonly acknowledged source of private benefits stems from one partner's misappropriation of the other's resources. A partner can extract private benefits by proactively internalizing the counterpart's knowledge, skills and capabilities, and by applying them outside the scope of the alliance to its own advantage (Khanna *et al*., 1998) in ways not agreed upon by the counterpart. Such resource misappropriation has been dubbed 'knowledge leakage' (Oxley and Sampson, 2004), 'resource transfer' (Das and Teng, 1998), 'knowledge spillover' (Cohen and Levinthal, 1990), or 'spillover rent' (Lavie, 2006). Some scholars even argue that this very type of private benefits is a major motivation behind forming strategic alliances (Kogut, 1988; Oxley, Sampson, Silverman, 2009).

Another type of opportunistic behavior involves unilaterally cutting resource commitments to joint activities while free-riding on partners' resources (Gulati and Singh, 1998; Oxley and Sampson, 2004). The opportunistic partner will not bear the full costs of such behavior since individual effort is often imperfectly linked with the collaborative output in joint projects (Alchian and Demsetz, 1972), and the opportunistic partner will suffer only a fraction of the costs of its behavior while enjoying all of the related benefits (Fama and Jensen, 1983).

Since a strategic alliance provides the potential for both common and private benefits, cooperative and competitive forces simultaneously exist within an alliance. According to the transaction costs paradigm, competitive tensions within an alliance are so fundamental that opportunistic hazards are deemed inevitable (Park and Ungson, 2001), and 'mutual forbearance' (Buckley and Casson, 1988) is hard to achieve. This view has prevailed in parallel to broad dissatisfaction of managers with alliance outcomes and their high failure rates (Geringer and Hebert, 1989; Makino *et al.*, 2007; Park and Ungson, 2001; Pearce, 1997). Likewise, game theory powerfully demonstrates the difficulty of restraining opportunistic behavior by 'the relentless logic of the prisoners' dilemma' (Williamson, 1983, p. 537) where the payoff structure assures mutual defection. Throughout the strategic alliances literature, the prisoners' dilemma has thus been widely used in describing the competitive tensions among alliance partners (Kogut, 1989; Parkhe, 1993; Gulati, Khanna, and Nohria, 1994; Zeng and Chen, 2003).

As a result, scholars have taken the view that opportunistic behavior within alliances can be only somewhat mitigated by the careful, extensive structuring of the inter-partner relationship. The leading suggestion within the transaction costs paradigm is to diminish competitive tensions by inducing contract-based penalties on opportunistic behavior, generally involving the exchange of mutual hostages (Williamson, 1983). For instance, the commitment of equity capital to a joint venture is considered a mutual hostage since it aligns the incentives of the partners and engenders higher commitment toward collaborative aims rather than private ones (Pisano, 1989). The same remedy has been featured through the lens of game theory in the form of ex ante, non-recoverable commitments to the alliance (Gulati *et al.*, 1994). In essence, this solution changes the payoff structure in a strategic alliance by inducing a punishment *after the fact* (Parkhe, 1993). In the next section, this paper develops the argument that, to the extent that private benefit extraction reduces the expected common benefits of the alliance, the interdependence between private and common benefits offers a different mechanism for diminishing opportunistic behavior.

The interdependence between private and common benefits

Differential benefits refer to differences in partners' total benefits from an alliance, and they may arise in two ways. First, differential benefits arise when the common benefits of an alliance are unequally distributed among partners due to differences in partners' bargaining power (Khanna *et al*., 1998). Differential benefits also arise when a partner extracts private benefits increasing its own alliance-related benefits unilaterally. Actions fostering common benefits are cooperative in nature as they involve the pursuit of mutual rather than individual interests (Das and Teng, 2000). Actions targeting private benefits, on the other hand, are competitive in nature insofar as competition entails pursuing one's own interest at the expense of partners.

Behavior aimed at private benefit extraction may jeopardize attainment of the common benefit potential of an alliance for at least three key reasons. First, while the internalization of a partner's knowledge and skills is the leading source of private benefits, it is a painstaking process requiring sizeable resources for accessing and retrieving knowledge from the partner (Inkpen, 2000), as well as for integrating that knowledge into an entire organization (Inkpen and Crossan, 1995). When partners allocate resources toward private benefit extraction, fewer resources remain available for joint activities. Thus, alliances fail to realize the full potential of common benefits (Chi, 2000). Also, when partners extract private benefits through free-riding, the reduced resource commitments spawn dis-synergies (Arend and Seale, 2005) and impede joint value creation.

Second, when partners perceive a high risk of opportunism, they limit the scope of cooperation and resource exchange (Lavie, 2006) and erect formal control barriers and extensive monitoring mechanisms (Hill, 1990). Partners can start overprotecting their resources and denying access to each other (Mjoen and Tallman, 1997). Such extensive monitoring and control measures can hamper the performance of the strategic alliance (Parkhe, 1993).

Lastly, partners can retaliate in the face opportunism to restore equity (Das and Teng, 1998), for instance, by cutting their own commitments (Johnson, Korsgaard and Sapienza, 2002). This, in turn, further jeopardizes joint value creation. Retaliation can also lead to a downward spiral in relationship quality, eventually leading to alliance termination before realizing its common benefit potential (Ariño and de la Torre, 1998).

Private and common benefits are thus interdependent such that private benefit extraction puts the realization of the alliance’s common benefit potential at risk. Therefore, despite having the opportunity to extract private benefits, partners may refrain from opportunistic behavior fearing the associated reduction in their common benefits. This suggests that, in addition to mutual hostage-taking, the trade-off between private and common benefits can offer an alternative incentive alignment mechanism to diminish opportunism within alliances. The next section develops this insight into hypotheses regarding private benefit extraction and the emergence of differential benefits among partners.

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HYPOTHESIS DEVELOPMENT

Table 1 outlines the payoff structure in alliances used to perform a comparative statics exercise where individual partners' private benefits (PB_x for Partner X and PB_y for Partner Y) and the common benefit potential of the alliance (CB) are represented in reduced forms rather than as functions of each other (Williamson, 1991).[4] Under mutual cooperation (MC), partners earn their respective shares ($s_{x/y}$) of the total expected common benefits ($s_{x/y}CB$). Under unilateral defection (UD), the defecting partner extracts private benefits ($PB_{x/y}$) in addition to its share in the alliance's common benefits. However, opportunistic behavior impairs the common benefits by a factor of p ($0<p<1$) such that the opportunistic partner's total benefits now add to [$PB_{x/y} + (1\text{-}p)s_{x/y}CB$]. Under UD, the cooperating partner earns simply its share in the alliance's expected common benefits, but in a reduced amount [$(1\text{-}p)s_{x/y}CB$]. Under mutual defection (MD), expected common benefits are further trimmed to [$(1\text{-}2p)s_{x/y}CB$] while each partner also earns its own private benefits, (PB_x) and (PB_y).

[Insert Table 1 around here]

Fundamental to the prisoners' dilemma in alliances is the competitive tension arising from a payoff structure where partners always gain more by defecting than cooperating, regardless of what their counterparts do. This condition can be expressed by two inequalities: UD > MC and MD > UC. For UD > MC to hold, the payoff structure should yield $PB_{x/y} + (1\text{-}p)s_{x/y}CB > s_{x/y}CB$. For MD > UC to hold, the payoff structure should yield $PB_{x/y} + (1\text{-}2p)s_{x/y}CB > (1\text{-}p)s_{x/y}CB$. In both instances, rearranging for $PB_{x/y}$ gives $PB_{x/y} > ps_{x/y}CB$ where p represents the rate of reduction in the expected common benefits due to opportunistic behavior and $s_{x/y}$ denotes the partners' shares

[4] I thank an anonymous reviewer for this point.

in common benefits. Accordingly, when private benefits fail to exceed the associated reduction in expected common benefits, the likelihood of opportunistic behavior decreases. This threshold is the basic condition for private benefit extraction and sets the stage for analyzing the interdependence between private and common benefits. The right-hand side of the inequality ($ps_{x/y}CB$) comprises three crucial factors: the expected common benefits of the alliance (CB), the partners' shares in common benefits ($s_{x/y}$), and the rate of reduction (p) in the common benefit potential arising from opportunistic behavior. The next section will address each of these factors and develop hypotheses for their effects on private benefit extraction and differential benefits.

The role of the common benefit potential of the alliance

For a partner to extract private benefits, private benefits should exceed the associated reduction in the common benefits that the partner expects to receive from the alliance – a condition captured by the inequality $PB_{x/y} > ps_{x/y}CB$. Assuming constant levels of *p* and *s* on the right-hand side of the inequality, private benefit extraction offers less positive net benefits to the opportunistic partner as the common benefit potential of the alliance (CB) grows. Instead, the expectation of high levels of common benefits reinforces cooperation within the alliance – exerting a 'mutual hostage' effect between partners (Aulakh, Kotabe, and Sahay, 1996; Oxley, 1997) which fosters commitment (Cullen, Johnson, and Sakano, 1995) and collective investment in the alliance (Agarwal, Croson, and Mahoney, 2010). In such a case, incentives for private benefits weaken, and common benefits dominate the partners' alliance-related benefits.

Since high levels of expected common benefit potential foster cooperation and discourage private benefit extraction, a negative relationship is hypothesized between the expected common benefit potential of the alliance and differential benefits stemming from private benefit extraction.

Hypothesis 1: Differential benefits will be negatively associated with the common benefit potential of the alliance.

The role of common-benefit sharing between partners

The second factor on the right-hand side of $PB_{x/y} > ps_{x/y}CB$ is the partners' respective shares ($s_{x/y}$) in the common benefits of the alliance. In general, sharing the expected common benefits of the alliance is an incentive alignment factor fostering mutual forbearance and deterring opportunistic behavior (Beamish and Banks, 1987; Oxley, 1997; Pisano, 1989). Yet, the way common benefits are shared also has vital implications for cooperative behavior (Li, Zhou, and Zajac, 2009).

As a partner's share in the common benefits of the alliance rises, that partner will be affected more adversely by the negative consequences of opportunistic behavior because that partner will incur a larger reduction in its expected common benefits. Therefore, the higher the partner's share in the common benefits of the alliance, the more likely that partner is to prioritize efforts toward joint value creation rather than private benefit extraction. However, as one partner's share in the common benefits of the alliance increases, the other partner's share inevitably decreases, unleashing heightened opportunistic tendencies of the latter. Thus, the partner with lower share in the alliance's common benefits will more likely channel its efforts toward private benefit extraction rather than to joint value creation. With an unbalanced distribution of common benefits, therefore, differential benefits will increase since the minority partner is more likely to extract private benefits while the majority partner is more likely to focus on realizing the common benefit potential of the alliance.

Hypothesis 2: Differential benefits will be higher under an unbalanced distribution of common benefits of the alliance.

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The role of task interdependence

The third factor influencing private benefit extraction, denoted as p in the inequality $PB_{x/y} > ps_{x/y}CB$, is the negative impact of private benefit extraction on the common benefit potential of the alliance. This reduction factor ($0<p<1$) in the common benefit potential arises from the counterproductive effects of opportunistic behavior. As p approaches 1, private benefit extraction will be associated with higher losses of common benefits, thus curbing opportunistic incentives.

The negative impact of opportunistic behavior on the alliance's common benefit potential grows with task interdependence among partners. Task interdependence refers to the extent to which partners' activities are linked by resource exchanges. Under high levels of task interdependence, joint output requires multiple exchanges of a variety of resources, and partners become increasingly dependent on mutual cooperation for the achievement of superior outcomes (Pearce, 1997). The relationship between resource commitments and joint output can strengthen to the point where the withdrawal of one partner's commitments toward the alliance will yield zero output (Amaldoss and Staelin, 2010). In contrast, alliances with low interdependence permit one partner to produce some output alone, albeit at a lower level or with lower profitability than initially expected. Therefore, at high levels of task interdependence, private benefit extraction disrupts the common benefit potential of the alliance at a faster rate. This, in turn, makes partners less likely to engage in opportunistic behavior for private benefit extraction. To the contrary, as task interdependence grows, partners gravitate towards cooperative behavior, collectively investing more resources in the joint activities (Amaldoss and Staelin, 2010).

Taken together, the arguments above suggest that under high levels of task interdependence, partners' focus will shift towards cooperation, reducing the likelihood of private benefit extraction. Thus, a negative relationship between task interdependence and differential benefits should arise.

Hypothesis 3: Differential benefits will be negatively associated with high levels of task interdependence.

While task interdependence may reinforce cooperation, it can also create opportunities for private benefit extraction. Under high levels of task interdependence, joint operations require higher levels of inter-partner coordination and information processing (Gulati and Singh, 1998). Increased coordination between partners broadens the interface through which the partners interact, allowing greater access to each other's resources, thereby opening opportunities for resource misappropriation.

The coordination requirements also make the allocation of operational control a central concern in alliance management, which involves assigning a hierarchy of managers with decision-making authority over mechanisms for behavior and output control (Ouchi, 1979) that include planning, setting performance goals, and establishing procedures and reward structures (Dekker, 2004). When one partner is assigned dominant operational control rights under high levels of task interdependence, that partner stands to extract more private benefits by designing and implementing mechanisms favoring its own resource misappropriation objectives. For instance, the controlling partner can create filing and information systems, initiate personnel rotation, and organize meetings and workshops specifically designed to access and transfer the other partner's knowledge (Makhija and Ganesh, 1997).

Notably, while extracting private benefits, the controlling partner is ideally positioned to preserve inter-partner cooperation. The controlling partner can create information asymmetry in its favor, placing its counterpart at a disadvantage to detect and respond to its opportunistic behavior. This informational disadvantage exacerbates under high levels of task interdependence since diagnosing the root cause of performance problems becomes increasingly difficult as the link between actions and outcomes becomes obscure (Simon 1962; Sorenson, 2003). It will be unclear whether and why one partner obtains more benefits than the other, thus making it harder to detect opportunistic behavior, and therefore lowering the likelihood of retaliation.

Under high levels of task interdependence, the controlling partner can obtain private benefits and mitigate the negative impact of private benefit extraction on the expected common benefits. These arguments suggest that dominant operational control renders task interdependence less effective in curbing opportunistic behavior, thus weakening the negative link between task interdependence and differences in partner benefits.

Hypothesis 4: The negative relationship between task interdependence and differential benefits will weaken under dominant operational control.

EMPIRICAL SETTING

Sample

The hypotheses were tested on a sample of two-partner JVs formed by U.S. public firms between 1996 and 2010. JVs are chosen for two reasons. First, JV contracts clearly specify partners' ownership shares constituting the partners' rights to the future residual income from JV activities. Since direct bargaining over future common benefit streams is unwieldy due to the unpredictability associated with joint value creation, firms instead bargain over the distribution of ownership ex ante (Adegbesan and Higgins, 2010). Thus, ownership shares in JVs offer useful information regarding the sharing of common benefits among partners. Such information is difficult to gather in non-equity alliances since the allocation of common benefits can prove multidimensional, complex and vague in non-equity alliances (e.g. Lerner and Merges, 1998; Adegbesan and Higgins, 2010). Second, unlike non-equity alliances, JVs are characterized by greater incentive alignment due to the mutual commitment of substantial resources that should provide a more stringent test of the hypotheses. Restricting the sample to JVs by only U.S. firms alleviated possible confounding effects of cultural and institutional differences among JV partners that may have spurred different tendencies toward cooperative or competitive behavior. Lastly, to obtain pairwise data, the sample was restricted to JVs where both partners were publicly listed.

The sample of JVs was obtained through the Securities Data Corporation (SDC) database on mergers, acquisitions, and alliances. LexisNexis news database was used to verify JV announcement dates and partnership shares, and to collect supplemental information on task interdependence and assignment of operational control rights. Stock price data were obtained from the Center for Research in Security Prices (CRSP), and financial data were retrieved from the Compustat database.

Dependent variable

To test the hypotheses, a measure of the alliance-related benefits for each partner was necessary. It is very hard, if not impossible, to obtain objective and systematic information on partner benefits from alliances. As a result, the strategic alliance literature relies heavily on abnormal stock returns to JV announcements as a proxy measure of partners' alliance-related benefits (e.g., Koh and Venkatraman, 1991; Reuer and Miller, 1997; Anand and Khanna, 2000; Merchant and Schendel, 2000; Kale, Dyer, and Singh, 2002; Kalaignanam, Shankar, and Varadarajan, 2007; Kumar, 2010a, 2010b). Assuming market efficiency, abnormal stock returns reflect the net present value of firm-specific future benefit streams linked with JV formation.

As a second step, the measure for differential benefits developed by Gulati and Wang (2003) was adopted with two modifications. The original, unadjusted measure for differential benefits in Gulati and Wang (2003) has been defined as:

$$\text{Differential Benefits}_{G\&W\,(2003)} = |\exp(car_x) - \exp(car_y)| / [\exp(car_x) + \exp(car_y)]$$

where car_X and car_Y denote the cumulative abnormal returns to partner X and Y, respectively. This measure corrects for the problem of a possible mix of positive and negative abnormal returns by using the exponential transformation of the returns. Furthermore, it allows for comparability among JVs since it reflects differential benefits as a ratio in terms of aggregate partner benefits. Still, in adopting this measure, two modifications were necessary. First, percentage abnormal stock returns were replaced with corresponding *dollar* returns obtained by multiplying event-window percentage returns by the firms' market capitalization 20 days before the JV announcement (Kalaignanam *et al.*, 2007). This adjustment was made since a 10 percent return on a billion-dollar firm reflects a much higher wealth creation effect than does a similar return on a million-dollar firm (Cuypers, Cuypers, and Martin, 2017). Second, the original measure fails to distinguish differential benefits stemming from private versus common benefits – a problem in JVs with unbalanced ownership where differential benefits might merely reflect a partner's larger ownership share in the expected common benefits. Therefore, the dependent variable was revised as follows:

$$\text{Differential Benefits} = |\exp(dcar_x*(share_y/share_x)) - \exp(dcar_y)| / [\exp(dcar_x*(share_y/share_x) + \exp(dcar_y)]$$

where $dcar_X$ and $dcar_Y$ denote cumulative abnormal returns in dollars to partner X and Y, respectively, calculated over the event window [-1,+1]. $Share_{x/y}$ reflects partner ownership shares in the JV. $Share_y/share_x$ accounts for weighting in the partners' ownership shares. This definition proves identical to the original measure for 50%-50% JVs. However, with an ownership imbalance, it provides a more accurate measure for differential benefits stemming from private benefit extraction. Specifically, the revised measure of differential benefits yields zero when partners obtain dollar returns in parallel to their ownership shares in the JV. For instance, when

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partners obtain 0.75 and 0.25 million dollar returns under a 75%-25% ownership structure, the numerator becomes |exp(0.75 * (0.25 / 0.75)) – exp(0.25)| = 0.[5]

This measure is aligned with the theory of the paper for three reasons. First, the measure is defined at the alliance level and does not change depending on the order of partners. This fits with the paper's theoretical perspective which explains the emergence of differential benefits in terms of alliance-level factors. Second, keeping the sum of partner returns constant, the measure increases consistently as one partner increases its benefits at the expense of the other firm. This captures the paper's conceptualization of private benefit extraction as a competitive behavior within the alliance. Most importantly, by controlling for the inter-partner distribution of common benefits, the measure duly reflects differential benefits from private benefit extraction rather than from differences in common benefits. This is more appropriate for this study since its theory focuses on private benefit extraction as the main source of differential benefits.

In measuring abnormal stock returns to JV announcements, the standard event-study methodology was used to estimate the market model over the period of 50 to 250 trading days before the announcement date (Kumar, 2010a; Reuer, 2001; Merchant and Schendel, 2000; Reuer and Miller, 1997; Reuer and Koza, 2000). Table 2 shows the statistics for daily abnormal returns. Mean abnormal returns are positive and statistically significant over the period of [-2, +1] with the highest mean return on the days of JV announcement (0.61%, p=0.000). An event window of three days was employed around the JV announcement [-1,+1] – consistent with prior studies (e.g. Reuer and Koza, 2000; Kalaignanam *et al*,. 2007). Analyses with alternate event windows were also run.

[5] In this case, the original G&W measure of differential benefits computes a *non-zero* value of |exp(0.75) – exp (0.25)| / (exp(0.75) + exp(0.25)) = 0.245 differential benefits.

The mean cumulative abnormal return for the [-1,+1] event window is 1.1% (Patell z=5.275; p=0.000).

[Insert Table 2 around here]

Explanatory variables

Common benefit potential of the JV: The common benefit potential of a JV stems from the attractiveness of the JV's focal business and the complementary nature of the combination of partner resources (Kumar, 2010a). For this paper, JV industry attractiveness was used since it is an exogenous indicator of the common benefit potential of the JV, independent from partners' choices of competitive or cooperative behavior after the formation of the JV.[6] The literature suggests that industry attractiveness arises from industry profitability and growth (Harrigan, 1988). Partners will perceive the JV's common benefit potential to be higher when the JV industry is growing or profitable (Kumar, 2010b). Thus, the common benefit potential of a JV was operationalized using two proxies: (a) average profitability (measured as the return on equity) and (b) average sales growth in the JV's 3-digit SIC industry during the three years before the JV formation. Three-year averages attenuate any potentially confounding effects of transient, atypical industry profitability or growth. Using growth and profitability data for just one year preceding JV formation did not markedly change the results. Because this measure is defined at the industry-year level, it demonstrated sufficient variance throughout the sample featuring 144 unique industry-year combinations across 178 observations. Further analysis, reported in the online appendix, revealed that industry growth and profitability are positively associated with JV formation in the industry, confirming the proxy measures for common benefits.

[6] Complementarity was not used to test Hypothesis 1 since it can have both negative and positive effects on differential benefits. Instead, it is included as a control variable in the analyses.

Distribution of common benefits: The dichotomous variable, *Unbalanced Distribution of Common Benefits*, was coded '0' for JVs in which the ownership shares are equally distributed and coded '1' to indicate any distribution imbalance. In the sample, partners have equal ownership shares in 100 JVs while the remaining 78 JVs disclose unbalanced distribution of ownership shares.

Task Interdependence: In this paper, the measure developed by Gulati and Singh (1998) was used, which infers the type of task interdependence from the purpose of the alliance formation. Any alliance formed to share complementary technology, reduce the time needed for innovation, or develop new technology was categorized as demonstrating *Reciprocal Interdependence*. Market-access alliances were labeled as those with *Sequential Interdependence*. Finally, alliances formed to share high costs, risks, and financial resources were categorized as those with pooled interdependence.

Dominant Operational Control: Operational control rights predominantly feature the appointment of top management in the alliance (Yan and Gray, 2001). In their detailed survey of JV contracts, Bai, Tao and Wu (2004) found that contracts devote special attention to the CEO appointment. As a result, *Dominant Operational Control* was operationalized as a dichotomous variable taking the value of '1' if one of the partners appointed the CEO of the JV, and '0' otherwise.

Control variables

The first set of control variables address resource-based explanations for differential benefits. First, *Complementarity* was defined as the ratio of the number of non-shared businesses among partners to the number of all businesses in which the partners operate. Complementarity was set to '0' if the JV partners did not operate in at least one common industry (Mitsuhashi and Greve, 2009). High complementarity denotes a greater potential of synergies resulting from the combination of partners' proprietary resources. Second, *Related Scope* measures the extent to which partners owned related but different resources that raised the likelihood of knowledge leakage due to similar knowledge bases. Related Scope was measured as the count of partners' shared 3-digit SICs excluding any overlaps at 4-digit SICs. Third, the findings of Kumar (2010b) suggest that highly valuable partner resources, measured as Tobin's Q, constitute a potential for private benefit extraction for the partner with less valuable resources. Therefore, *Relative Partner Resources*, measured as the ratio of the larger to the lower of the partners' Tobin's Q, is included. Fourth, differential benefits can arise when one partner benefits from the other's reputation and status (Kalaignanam *et al.*, 2007; Polidoro, Ahuja, and Mitchell, 2011). To capture differences in partner status, *Relative Status* was defined as the absolute difference between the Bonacich's eigenvector centrality measure for each partner (Yang, Lin, and Lin, 2010). UCINET was used to construct the eigenvector centrality measures within five-year moving windows of JV networks among U.S. firms (Rosenkopf and Padula, 2008; Sorenson and Stuart, 2008). Fifth, *Joint Centrality* controls for informational advantages in regard to each partner's network status and was defined as the geometric mean of the partners' eigenvector centrality scores divided by the network maximum (Gulati and Gargiulo, 1999). Lastly, JV management capabilities equip a partner to more successfully maneuver JV resources for private benefit extraction (Kale *et al.*, 2002; Anand and Khanna, 2000). *Relative JV Experience,* defined as the absolute difference between the number of JVs formed by each partner in the five years preceding the JV announcement, controls for differences in partners' JV capabilities.

Prior research suggests that alliances among direct competitors are subject to higher levels of opportunistic hazards (Park and Russo, 1996). To control for this, *Horizontal JV* is included, assigned the value of '1' when both partners operated in the same industry, and '0' otherwise. Also included was *Relative Firm Size* measured as the ratio of the number of employees of the larger partner to the number of employees of the smaller. Variation in size capture the differences of partners' dependence on JV success which often leads to differences in cooperative intentions (Das, Sen, and Sengupta, 1998; Kalaignanam *et al.*, 2007).

A significant body of strategic alliance literature has observed that relational embeddedness can limit opportunistic behavior by encouraging norms of reciprocity and equity among firms. Relationally embedded firms are more likely to develop trust and emphasize mutual benefits over individual aims (Gulati and Wang, 2003). Control variables for relational embeddedness are: (a) *Prior Ties*, measured as the number of JVs formed by the partners within five years before the JV announcement, and (b) *Common Ties*, measured as the number of common partners with which the partnering firms established JVs within five years before the focal JV.

Industry Competition, measured using the Herfindahl-Hirschmann Index of market shares, controls for a possible effect of competitive pressures in the JV industry on the inter-partner competition within the JV. This measure is calculated using Compustat data on all public firms' revenues in the JV industry within the year before JV formation. Lastly, *JV Density,* defined as the ratio of the number of JVs formed in the last five years to the number of possible firm-pairs in the industry, controls for the reliance on JVs within that related industry sector.

Methodology

Literature on alliance formation notes that firms do not select alliance partners randomly (e.g. Gulati and Gargiulo, 1999; Ahuja, Polidoro, and Mitchell, 2009; Mitsuhashi and Greve, 2009). This might result in biased estimates in the analyses to the extent that firms choose their alliance partners to maximize their private benefits. To correct for this selection bias, the Heckman selection model with maximum likelihood estimation (Heckman, 1979) was used. The results did not change when the two-step OLS estimator was used.

Estimating the selection equation required generating a set of unrealized JVs as a control group. For each industry-year pair, all U.S. firms that entered into a JV in that industry during a two-year moving window were listed. Next, the set of all possible JVs among these firms was constructed where JVs were later categorized as realized or unrealized. This approach mimics the 'triangle' sampling design in Sorenson and Stuart (2001, 2008) where two firms were coupled to meet in a setting. The advantage of the design is to eliminate firms that did not form a JV in an industry within a two-year window, assuming that they were never in the risk set.[7] As a result, 11% of the observations in the selection equation consists of realized JVs, surpassing the 5% cut-off for a rare-events analysis (King and Zeng, 2001).

The selection equation, reported in Table 4, includes *Geographical Distance* as the exclusion restriction, which does not appear in the main equation. *Geographical Distance* is measured as the length of the shortest curve between the headquarter states of partners (Reuer and Lahiri, 2014). It has a non-zero coefficient in the selection equation and additional analysis confirmed that it does not have a statistically significant effect on differential benefits.

RESULTS

Descriptive statistics and correlations are reported in Table 3. In five cases, the correlations among independent variables are high. To check for multicollinearity, variance inflation factors (VIFs) were computed. The highest VIF was 2.27 in the model without the interaction terms, and it was 8.91 for the interaction term between sequential interdependence and dominant operational control, both below the recommended threshold of 10 for risk of multicollinearity.

[Insert Table 3 around here]

[7] An unrestricted sample of all possible pairs of all firms would have violated the assumption of independence across observations that would have produced biased estimates (Sorenson and Stuart, 2001, 2008).

Table 4 presents the results of the Heckman analyses in three models. The first model contains only control variables. Models 2 and 3 introduce the main effects and the interactions of independent variables of interest, respectively. The Model 3 proved superior to both Model 1 (χ^2=20.35, p=0.009) and Model 2 (χ^2=5.19, p=0.075) according to the likelihood ratio test.

[Insert Table 4 around here]

Hypothesis 1 predicts a negative relationship between the common benefit potential of the alliance and differential benefits. Both proxies for common benefit potential, JV industry profitability (b=−0.055, se=0.014, p=0.000) and growth (b=-0.204, se=0.104, p=0.050), exhibit negative and statistically significant effects on differential benefits in support for Hypothesis 1. As such, one standard deviation increase in JV industry profitability decreases differential benefits by 0.044, and one standard deviation increase in JV industry growth also decreases differential benefits by 0.041, corresponding to 16.3% and 15.2% shrinkage below the mean of the differential benefits, respectively.

According to Hypothesis 2, when common benefits are unequally distributed among partners, differential benefits rise due to misaligned partner incentives. In line with this hypothesis, the coefficient of unbalanced distribution of common benefits is positive (b=0.064), but marginally significant (se=0.038, p=0.096) based on Model 3. In Model 2, the coefficient is positive (b=0.068), but not statistically significant (se=0.042, p=0.104). Thus, the findings provide weak support for Hypothesis 2. Based on Model 3, compared to JVs with balanced distribution of common benefits, JVs with unbalanced distributions of common benefits are expected to result in 0.068 increase in differential benefits, corresponding to a 25.2% increase above the mean of differential benefits.

Hypothesis 3 predicts a negative relationship between high levels of task interdependence and differential benefits. The results reported in Model 2 show that sequential interdependence is negatively associated with differential benefits (b=-0.064, se=0.038, p=0.090). Yet, contrary to Hypothesis 3, the coefficient estimate for reciprocal interdependence is positive (b=0.003, se=0.051, p=0.954), but not statistically significant. Therefore, the results support Hypothesis 3 only for sequential interdependence. Under sequential interdependence, differential benefits are expected to decrease by 0.064, representing a 23.7% decrease below the mean of differential benefits.

Hypothesis 4 proposes that the effect of task interdependence on differential benefits hinges on the allocation of operational control among JV partners such that the negative relationship between task interdependence and differential benefits will weaken under dominant operational control. The results reported in Model 3 demonstrate significant interaction effects between high levels of task interdependence and dominant operational control (b=0.252, se=0.090, p=0.005 for sequential, and b=0.157, se=0.089, p=0.079 for reciprocal interdependence). Sequential interdependence under shared operational control is associated with a -0.267 decrease in differential benefits, while the effect softens to -0.015 under dominant operational control. Similarly, the effect of reciprocal interdependence reverses from -0.109 under shared operational control to 0.048 under dominant operational control. Thus, in line with Hypothesis 4, the negative effect of task interdependence weakens under both sequential and reciprocal interdependence. Figure 1 depicts the interaction effect. Accordingly, expected differential benefits under both sequential and reciprocal interdependence rise when one partner exerts dominant operational control, with the higher sensitivity observed for sequential interdependence. The effect of reciprocal interdependence on differential benefits even becomes positive under dominant

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operational control, which suggests that reciprocal interdependence gives way to significant private benefit potential.

[Insert Figure 1 around here]

Among control variables for the relative resource positions of partners, complementarity, related scope, relative resources, and relative experience display positive (b=0.280, b=0.041, b=0.006, and b=0.019, respectively) and statistically significant effects on differential benefits (p=0.003, p=0.010, p=0.021, and p=0.061, respectively), lending support for the argument that alliances are vehicles for resource spillovers (Lavie, 2006). Furthermore, the coefficient of joint centrality is positive and statistically significant (b=0.367, se=0.127, p=0.004), indicating that private benefit opportunities rise with informational advantages from a central network position.

Robustness checks and post-hoc analyses

To check the sensitivity of the results to choices in the research design, the following robustness checks were carried out. First, to assess whether the results are robust to the measurement of differential benefits, analyses on the original measure by Gulati and Wang (2003) as well as on the absolute difference between partners' dollar abnormal stock returns $|dcar_x\text{-}dcar_y|$ were performed, reported in Table 5 under Model 4 and 5, respectively. The specification of the dependent variable does not markedly change the results except for loss of statistical significance in the interaction terms for reciprocal interdependence under dominant control in Model 4 and sequential interdependence under dominant control in Model 5. Further analyses for 4-day [-2,+1] and 2-day [0,+1] event windows reported in Models 6 and 7 prove largely consistent with the results for the [-1,+1] event window – only the coefficient of unbalanced distribution of common benefits loses statistical significance.

[Insert Table 5 around here]

Model 8 features an alternative measure for unbalanced distribution of common benefits to test whether the extent of deviation from equal distribution is important. This new measure is coded ‘0’ for 50%-50% JVs (n=100), ‘1’ for JVs where the difference in common benefits were less than or equal to 2% (n=21), and ‘2’ for higher gaps in common benefit distribution (n=57). The results suggest that even tiny deviations from equal distribution of common benefits yield an increase in differential benefits (b=0.119, se=0.059, p=0.045), while the effect of larger gaps, though positive, were small and not statistically significant (b=0.036, se=0.045, p=0.423). The coefficient for large gaps does not differ significantly from that for low gaps (χ^2=1.48, p=0.224).

Lastly, differential benefits were examined for important effects on JV trajectories *after* their formation. Research has noted that distributive justice issues have important implications for relationship quality (Ariño and de la Torre, 1998) and alliance performance (Luo, 2007b). Accordingly, differential benefits are likely to jeopardize the inter-partner relationship and result in the abrupt termination of the JV. To test the effect of differential benefits on JV termination, data were collected on when and how the JVs in the sample terminated to conduct a probit regression on the likelihood of abrupt JV termination within the first year after formation. Results reported in Table 6 indicate that differential benefits increase the likelihood of abrupt JV termination (b=1.306, se=0.709, p=0.065) when partners have equal ownership shares. The findings indicate the opposite under unbalanced ownership. Overall, these results suggest that differential benefits have important implications for JV survival. Still, more research is needed to better understand how differential benefits affect JV longevity.

[Insert Table 6 around here]

DISCUSSION AND CONCLUSION

This paper advances research on differential benefits in alliances by systematically examining the interplay between competition and cooperation within alliances. Cooperation between partners results in common benefits shared by both partners. Competition within the alliance spawns private benefits extracted unilaterally by misappropriation of partner resources. Prior research has partially considered the conditions under which private benefit extraction leads to differential benefits among partners with a focus limited primarily on sources of private benefits. This paper extends this area of research by examining the role of the interdependence between private and common benefits in the emergence of differential benefits.

This paper sheds light on the mechanism of how opportunistic behavior towards private benefit extraction undermines the common benefit potential of the alliance, thus leading to a trade-off between private and common benefits. While some studies allude to such a trade-off (Lavie, 2006; Kumar, 2010a), they provide little insight into why the trade-off exists and how it impacts partners' choices between opportunistic and cooperative behavior. This paper argues that opportunistic behavior toward private benefit extraction leads to underinvestment in joint activities, overprotection of proprietary resources against leakage, and retaliation to restore equity. As a result, private benefit extraction hinders the achievement of the common benefit potential. Furthermore, by incorporating game theory and the transaction costs paradigm, the paper explains that private benefit extraction is not automatic, but conditional on the associated reduction in the common benefit potential of the alliance. The analysis in this paper reveals the importance of three factors for a partner's consideration of private benefit extraction: the level of expected common benefits of the alliance, the distribution of partners' shares in the common benefits, and task interdependence.

Results indicate that as the common benefit potential of an alliance rises, differential benefits decrease because partners become more likely to prioritize joint value creation and place less emphasis on private benefits. Common benefit potential may therefore supplement or even replace 'the exchange of mutual hostages' (Williamson, 1983) by serving as an alternative mechanism for easing competitive tensions and aligning partners' incentives in alliances. Findings also suggest that in alliances with an unbalanced distribution of common benefits, interest alignment between partners erodes and private benefits take center stage, resulting in higher differential benefits.

Furthermore, this study reveals the contingent effect of task interdependence on differential benefits. On the one hand, under high levels of task interdependence, private benefit extraction reduces the common benefit potential of the alliance to such a degree that it counters a partner's propensity for opportunistic behavior, thus curbing differential benefits. On the other hand, high levels of task interdependence provide greater access to partners' resources, increasing differential benefits. Findings show that the link between differential benefits and task interdependence depends on how operational control is distributed among partners. More specifically, when one partner holds dominant operational control rights, the negative relationship between task interdependence and differential benefits weakens. This indicates that under high levels of task interdependence, dominant operational control favors the controlling partner in seizing the opportunity for private benefits while limiting the negative impact of private benefit extraction on common benefits.

Future research may address some of the limitations of this study. First, the arguments in this paper discuss private benefits obtained via deliberate, harmful opportunistic behavior. There may also be cases in which private benefits accrue unintentionally. In alliances between large and small firms, for instance, smaller firms stand to gain from the spillover of reputation and legitimacy from their larger partners. Here, the detrimental effects of small firms' private benefits may be less clear or even otherwise unimportant to the larger partner. Alternatively, partners can extract private benefits from inter-partner learning which may naturally occur as a result of knowledge integration needed for realizing the alliance objectives. Then, such learning benefits may not be perceived as intentionally opportunistic and relational frictions may be avoided. More research is needed to understand if and when a firm will tolerate *unintended* private benefit extraction by a partner. Tolerance for private benefit extraction may be limited in alliances where partners' concerns about their relative competitive positions are heightened, for instance, in alliances among direct competitors, among firms with high market overlap, or under conditions of high environmental volatility (Luo, 2007a).

Second, while the premise that alliances are vehicles of knowledge transfer has found strong support in the literature, scholars have also raised the possibility that firms may form alliances for accessing rather than internalizing external knowledge (Mowery, Oxley, and Silverman, 1996; Grant and Baden-Fuller, 2004). By partnering with firms possessing complementary knowledge, firms can trim knowledge internalization costs while boosting the utilization of their knowledge bases. In these cases, partners may choose not to extract private benefits and even refrain from knowledge transfers in order to reap the benefits of specialization in their own domains (Nakamura, Shaver, and Yeung, 1996). Future research may examine the generalizability of this paper's framework to knowledge-access alliances that may exhibit smaller differential benefits despite factors that typically promote private benefit extraction.

Third, this paper opens up the question of why firms enter into alliances that are likely to result in differential benefits. One potential explanation is that partners are overoptimistic about their potential benefits from the alliance (Park and Russo, 1996) or they may underestimate the private benefit potential for their partners. In-depth studies can more effectively address this issue by shedding light on partners' perceptions of each other's private benefits both before and after alliance formation.

Fourth, to measure differential benefits, abnormal stock returns associated with the JV announcements were used. While previous studies have shown that abnormal stock returns are positively correlated with ex post managerial assessments of alliance performance (Kale *et al.*, 2002; Koh and Venkatraman, 1991), they may not capture ex post contingencies such as changes in firm strategy (Cui, Calantone, and Griffith, 2011), which can change the outlook for differential benefits. Another limitation is that the dependent variable does not directly quantify but infers opportunism. This issue permeates related research due to the associated empirical difficulties in measuring resource transfer and opportunism (e.g. Balakrishnan and Koza, 1993; Park and Kim, 1997; Merchant and Schendel, 2000; Gulati, Lavie and Singh, 2009; Kumar 2010a, 2010b). Further research is needed to supplement the findings of this study with more nuanced measures of the distribution of benefits in alliances.

Lastly, this paper views alliances as economic exchanges. Yet, the literature characterizes alliances also as social exchanges where the social context of the inter-partner relationship may play an important role in partner behavior (Das and Teng, 2002). Social remedies, such as creating group identity and norms (Zeng and Chen; 2003), building trust (Das and Teng, 1998; Inkpen and Currall, 2004), and enhancing communication (Mohr and Spekman, 1994) can relax the competitive tensions. Likewise, prior ties among partners can generate trust and inhibit opportunistic behavior. However, while prior ties can increase alliance announcement returns (Gulati *et al.*, 2009), it remains unclear whether they reduce differential benefits among partners

(Gulati and Wang; 2003). Precisely how the social context tilts the interdependence between private and common benefits remains an interesting avenue for future research.

This paper advances research on competition and cooperation within alliances by examining the interdependence between private benefits extracted through competitive behavior and the common benefits generated by cooperative behavior. The paper explains that differential benefits among alliance partners are related to a complex trade-off between private and common benefits. The trade-off stems from the counterproductive impact that competitive behavior inflicts on the common benefit potential of the alliance through resource underinvestment, overprotection and retaliation. In sum, private benefit extraction is not simply an independent, stand-alone decision, but a pursuit conditional on the degree of associated reduction in the common benefits of the alliance.

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Table 1. Payoff structure in strategic alliances

	Partner Y	
Partner X	*Cooperate*	*Defect*
Cooperate	Mutual Cooperation **[s_xCB*, s_yCB]****	Unilateral Defection for Y Unilateral Cooperation for X **[(1-p)s_xCB , PB_y + (1-p)s_yCB]**
Defect	Unilateral Defection for X Unilateral Cooperation for Y **[PB_x + (1-p)s_xCB , (1-p)s_yCB]**	Mutual Defection **[PB_x + (1-2p)s_xCB , PB_y + (1-2p)s_yCB]**

* CB denotes Common Benefits and PB Private Benefits where subscripts indicate the related partner.
**The first expression in brackets represents the payoffs to Partner X, the second to Partner Y.

Table 2. Daily abnormal returns to JV announcements

Day	Mean abnormal return	Standardized t-statistic	p-value	Patell Z	p-value
-3	0.04%	-0.553	0.290	-0.587	0.279
-2	0.10%	1.321	0.094	1.572	0.058
-1	0.18%	1.272	0.102	1.412	0.079
0	0.61%	3.725	0.000	5.209	0.000
1	0.29%	1.948	0.026	2.474	0.007
2	-0.03%	0.225	0.411	0.269	0.394
3	-0.16%	-0.008	0.497	-0.009	0.496

Table 3. Descriptive statistics and correlations

		Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)
1	Differential benefits	0.27	0.32	0.00	1.00	1.00					
2	JV industry profitability	-0.32	0.80	-8.24	3.38	-0.25	1.00				
3	JV industry growth	0.20	0.20	-0.23	0.94	-0.06	-0.21	1.00			
4	Unbalanced distribution of common benefits	0.44	0.50	0.00	1.00	0.19	-0.12	0.19	1.00		
5	Sequential interdependence	0.29	0.45	0.00	1.00	0.00	-0.15	-0.01	0.07	1.00	
6	Reciprocal interdependence	0.33	0.47	0.00	1.00	0.28	-0.10	-0.04	-0.08	-0.44	1.00
7	Dominant operational control	0.79	0.41	0.00	1.00	0.07	-0.03	0.03	0.24	0.09	-0.08
8	Complementarity	0.85	0.20	0.00	1.00	0.18	-0.08	0.05	0.07	0.18	0.08
9	Relative scope	0.99	1.83	0.00	10.00	0.33	-0.01	-0.21	-0.02	-0.06	0.26
10	Relative resources	2.87	4.66	1.00	40.79	0.29	-0.14	0.24	0.15	-0.02	0.23
11	Relative size	50.6	181.8	1.01	1726	-0.03	0.00	0.05	0.02	0.14	-0.01
12	Joint centrality	0.12	0.21	0.00	0.63	0.40	-0.11	0.10	0.10	0.09	0.20
13	Relative status	0.02	0.06	0.00	0.37	0.40	-0.10	-0.05	0.10	-0.05	0.30
14	Relative JV experience	1.76	2.83	0.00	18.00	0.43	-0.10	0.00	0.21	0.03	0.14
15	Prior ties	0.06	0.24	0.00	1.00	0.12	-0.10	0.06	0.06	-0.06	0.12
16	Common ties	0.05	0.24	0.00	2.00	0.10	-0.02	0.05	-0.04	-0.08	0.15
17	Horizontal JV	0.21	0.41	0.00	1.00	-0.16	0.09	-0.02	0.02	-0.11	-0.21
18	Industry competition	0.16	0.15	0.02	0.85	-0.06	0.09	0.01	-0.01	-0.08	0.00
19	JV density	0.05	0.18	0.00	1.00	-0.14	0.08	-0.18	0.01	0.14	-0.10

		(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
8	Complementarity	0.07	1.00										
9	Relative scope	-0.03	-0.02	1.00									
10	Relative resources	0.04	0.12	-0.01	1.00								
11	Relative size	0.09	0.09	-0.08	0.07	1.00							
12	Joint centrality	0.04	0.09	0.19	0.14	-0.01	1.00						
13	Relative status	-0.01	0.07	0.38	0.07	0.01	0.57	1.00					
14	Relative JV experience	0.11	0.10	0.35	0.15	0.00	0.42	0.60	1.00				
15	Prior ties	0.08	-0.04	-0.01	0.19	-0.06	0.24	0.13	0.20	1.00			
16	Common ties	-0.12	0.03	-0.10	0.23	-0.05	0.11	0.13	0.23	0.33	1.00		
17	Horizontal JV	0.03	-0.63	-0.04	-0.12	-0.08	-0.05	-0.11	-0.06	0.16	-0.11	1.00	
18	Industry competition	0.11	0.07	0.03	-0.10	-0.05	-0.09	-0.06	0.00	0.14	0.14	0.01	1.00
19	JV density	-0.09	0.07	0.01	-0.06	-0.05	-0.05	-0.08	-0.10	-0.05	-0.05	-0.09	0.09

Table 4. The results of the Heckman selection model for differential benefits

	(1)	(2)	(3)
JV industry profitability		-0.058	-0.055
		0.015 / 0.000	0.014 / 0.000
JV industry growth		-0.212	-0.204
		0.106 / 0.047	0.104 / 0.050
Unbalanced distribution of common		0.068	0.064
benefits		0.042 / 0.104	0.038 / 0.096
Sequential interdependence		-0.064	-0.267
		0.038 / 0.090	0.074 / 0.000
Reciprocal interdependence		0.003	-0.109
		0.051 / 0.954	0.078 / 0.161
Dominant operational control		0.055	-0.056
		0.043 / 0.206	0.056 / 0.323
Sequential interdependence			0.252
X dominant operational control			0.090 / 0.005
Reciprocal interdependence			0.157
X dominant operational control			0.089 / 0.079
Complementarity	0.257	0.244	0.280
	0.109 / 0.019	0.086 / 0.004	0.093 / 0.003
Related scope	0.037	0.043	0.041
	0.012 / 0.002	0.015 / 0.005	0.016 / 0.010
Relative resources	0.001	0.008	0.006
	0.002 / 0.511	0.003 / 0.002	0.003 / 0.021
Relative size	0.000	0.000	0.000
	0.000 / 0.488	0.000 / 0.620	0.000 / 0.499
Joint centrality	0.242	0.381	0.367
	0.097 / 0.013	0.130 / 0.003	0.127 / 0.004
Relative status	-0.046	-0.049	-0.019
	0.602 / 0.939	0.469 / 0.916	0.455 / 0.967
Relative JV experience	0.039	0.018	0.019
	0.008 / 0.000	0.010 / 0.062	0.010 / 0.061
Prior ties	0.122	0.072	0.094
	0.031 / 0.000	0.080 / 0.372	0.078 / 0.225
Common ties	-0.037	-0.025	-0.032
	0.064 / 0.561	0.049 / 0.615	0.061 / 0.601
Horizontal JV	0.002	0.010	0.024
	0.031 / 0.940	0.040 / 0.807	0.042 / 0.563
JV density	-0.055	-0.031	0.008
	0.063 / 0.386	0.112 / 0.784	0.117 / 0.946
Industry competition	-0.089	-0.076	-0.087
	0.097 / 0.362	0.114 / 0.505	0.109 / 0.426
Year fixed effects	Yes	Yes	Yes
Constant	-0.205	-0.278	-0.219
	0.112 / 0.068	0.112 / 0.013	0.121 / 0.070

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Selection Equation			
Prior ties	1.09	1.197	1.195
	0.370 / 0.003	0.425 / 0.005	0.424 / 0.005
Common ties	-0.379	-0.34	-0.34
	0.174 / 0.030	0.144 / 0.018	0.144 / 0.018
Geographic distance	-0.013	-0.012	-0.012
	0.001 / 0.000	0.001 / 0.000	0.001 / 0.000
Related scope	0.246	0.27	0.27
	0.031 / 0.000	0.036 / 0.000	0.036 / 0.000
JV density	17.379	16.329	16.347
	5.946 / 0.003	5.628 / 0.004	5.636 / 0.004
Relative JV experience	0.024	0.043	0.042
	0.036 / 0.504	0.030 / 0.157	0.030 / 0.163
Joint centrality	2.799	2.831	2.86
	0.839 / 0.001	0.876 / 0.001	0.883 / 0.001
Relative status	-4.392	-5.242	-5.232
	1.293 / 0.001	1.191 / 0.000	1.190 / 0.000
Constant	-1.104	-1.257	-1.257
	0.359 / 0.002	0.344 / 0.000	0.344 / 0.000
Number of observations	178	178	178
Log likelihood	-486.505	-400.932	-398.338
rho	0.187	0.349	0.336

Robust standard errors and corresponding p values are reported under coefficients.
Robust standard errors adjusted for non-independence among JVs in the same industry.

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Table 5. Robustness checks

	(4) DV: Gulati & Wang '03	(5) DV: Absolute Difference	(6) [-2,+1]	(7) [0,+1]	(8) C. Benefit Distribution
JV industry profitability	-0.055 (0.000)	-0.124 (0.538)	-0.088 (0.000)	-0.049 (0.003)	-0.051 (0.000)
JV industry growth	-0.174 (0.084)	-1.914 (0.019)	-0.201 (0.071)	-0.134 (0.074)	-0.184 (0.094)
Unbalanced distribution of common benefits	0.047 (0.173)	0.544 (0.075)	0.049 (0.259)	0.051 (0.110)	
Sequential interdependence	-0.268 (0.000)	-2.096 (0.016)	-0.239 (0.002)	-0.315 (0.000)	-0.270 (0.000)
Reciprocal interdependence	-0.097 (0.161)	-1.182 (0.108)	-0.137 (0.101)	-0.164 (0.055)	-0.108 (0.147)
Dominant operational control	-0.044 (0.391)	-0.500 (0.381)	-0.072 (0.267)	-0.097 (0.058)	-0.045 (0.400)
Sequential interdependence x dominant o. control	0.244 (0.002)	1.300 (0.169)	0.229 (0.014)	0.302 (0.000)	0.246 (0.005)
Reciprocal interdependence x dominant o. control	0.114 (0.181)	1.216 (0.149)	0.178 (0.073)	0.212 (0.025)	0.158 (0.072)
Complementarity	0.291 (0.002)	2.509 (0.010)	0.278 (0.024)	0.229 (0.055)	0.275 (0.003)
Related scope	0.043 (0.043)	0.413 (0.001)	0.029 (0.164)	0.029 (0.189)	0.041 (0.011)
Relative resources	0.010 (0.000)	0.079 (0.030)	0.006 (0.067)	0.004 (0.232)	0.007 (0.028)
Relative size	-0.000 (0.186)	0.000 (0.716)	-0.000 (0.550)	-0.000 (0.434)	-0.000 (0.602)
Joint centrality	0.412 (0.000)	4.118 (0.000)	0.289 (0.026)	0.347 (0.007)	0.367 (0.003)
Relative status	-0.216 (0.607)	-3.312 (0.385)	0.046 (0.934)	0.239 (0.636)	-0.081 (0.865)
Relative JV experience	0.017 (0.092)	-0.047 (0.497)	0.031 (0.012)	0.017 (0.106)	0.020 (0.041)
Prior ties	0.091 (0.494)	0.127 (0.874)	0.080 (0.598)	0.080 (0.465)	0.100 (0.183)
Common ties	-0.051 (0.399)	0.418 (0.537)	-0.088 (0.420)	0.041 (0.637)	-0.030 (0.636)
Horizontal JV	0.033 (0.424)	0.508 (0.290)	0.007 (0.906)	-0.003 (0.953)	0.027 (0.527)
Industry competition	0.002 (0.988)	0.612 (0.566)	-0.055 (0.706)	-0.059 (0.571)	-0.083 (0.443)
JV density	0.057 (0.797)	-0.017 (0.989)	-0.026 (0.853)	-0.016 (0.917)	-0.001 (0.993)
Share difference ≤ 2%					0.119 (0.045)

Share difference > 2%					0.036
					(0.423)
Constant	-0.318	-2.632	-0.166	-0.101	-0.224
	(0.098)	(0.038)	(0.278)	(0.561)	(0.058)

p-values in parentheses

Table 6. Probit estimation on the likelihood of JV termination

	Coeff.	Std. Error	P>|z|
Differential benefits	1.306	0.709	0.065
Unbalanced shares	1.867	0.436	0.000
Differential benefits x unbalanced shares	-3.575	1.015	0.000
Sequential interdependence	0.732	0.395	0.064
Reciprocal interdependence	-0.137	0.280	0.626
Dominant operational control	-0.200	0.404	0.621
Complementarity	-1.736	1.024	0.090
Business distance	-0.133	0.457	0.771
Geographic distance	-0.016	0.178	0.929
Horizontal JV	-0.626	0.379	0.099
Relative resources	0.302	0.216	0.161
Relative size	-0.146	0.096	0.127
Prior ties	0.471	0.568	0.407
Common ties	0.870	0.606	0.151
Relative JV experience	0.144	0.086	0.093
Relative status	-6.973	3.974	0.079
Joint centrality	-4.215	1.674	0.012
Industry competition	-3.456	1.509	0.022
Constant	0.222	1.077	0.837
Number of observations	167		
Log likelihood	-44.129		
chi2	131.369		

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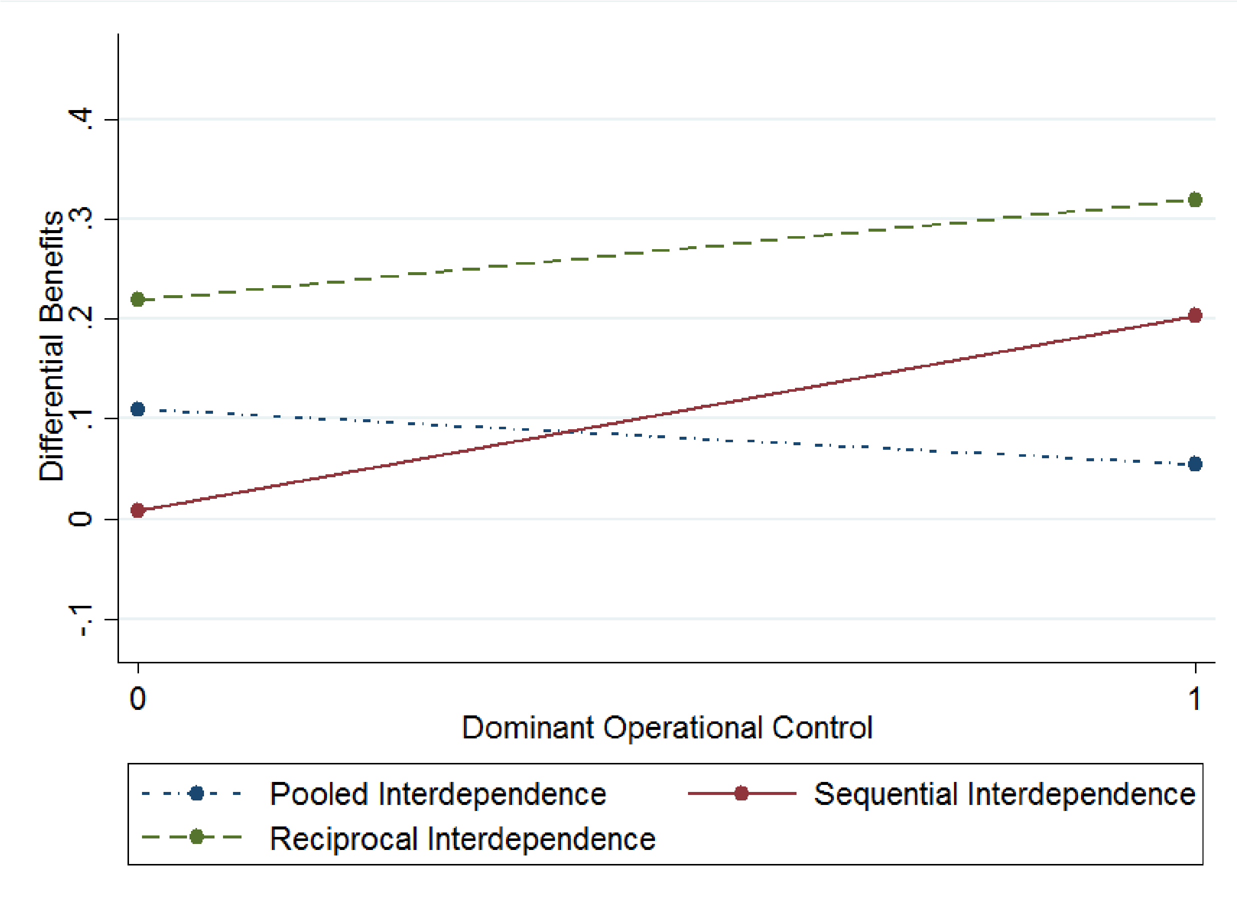

Figure 1. The relationship between differential benefits and task interdependence