

Decision Making in Strategic Alliances: An Experimental Investigation

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Abstract

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ABSTRACT

This paper experimentally investigates the determinants of the deviation between potential and realized value creation in strategic alliances. To better understand how decision making in alliances may influence success, we use an experimental design that juxtaposes two important factors that affect alliance members' decisions: economic incentives and communication. The evidence derived from our experimental design sheds light on the relative impact of each, and importantly, how both factors interact to explain the probability of successful outcomes in an alliance. These empirical results are robust to the use of undergraduates, MBAs and seasoned executives who averaged over 20 years of work experience.

1 Introduction

Strategic alliances¹ are ongoing cooperative relationships and represent an important organizational form for governing business transactions (e.g., Dyer and Nobeoka, 2000; Gulati, 1998; Reuer, Zollo and Singh, 2002; Silverman and Baum, 2002; Singh and Mitchell, 2005; Zaheer and Bell, 2005). Strategic alliances have the potential to create economic value (Gulati and Singh, 1998; Harrigan, 1988; McEvily and Zaheer, 1999), and on average, empirical evidence corroborates this view (Chan, Kensinger, Keown and Martin, 1997). However, approximately half of all strategic alliances fail (Kale, Dyer and Singh, 2002). Indeed, the large gap between *potential* economic value creation and *realized* economic value creation in strategic alliances suggests that there are formidable impediments to success that need to be overcome in the implementation stage (Anand and Khanna, 2000; Madhok and Tallman 1998).

Decision makers in strategic alliances must deal with substantial uncertainty, coordination failures and tensions between cooperation and competition, which can lead to opportunism and low performance (Burgers, Hill and Kim, 1993; Dyer and Hatch, 2006; Shan, Walker and Kogut, 1994). Managerial solutions to such impediments have been often learned over time, albeit in a less than systematic fashion, through hard-earned experience by strategic alliance partners (Ahuja, 2000; Gulati, 1999; Kale, Singh and Perlmutter, 2000; Madhavan, Koka and Prescott, 1998). Despite the need for a deeper understanding of alliance implementation, there has been little systematic research on the processes by which some of these strategic alliances achieve cooperative outcomes and consequently achieve superior alliance performance, while other strategic alliances fail.² This need for a deeper understanding of processes has been long-recognized. As Simon wrote:

¹ While both the current paper's theory development and the experimental empirical context in which the participants involved are in terms of "strategic alliances," both the theoretical logic and the empirical results can be applied to a large number of cooperative settings (e.g., equity joint ventures, franchising of brands, internal corporate ventures, networks, R&D consortia, and teams, to name but a few).

² Some research on the processes of decision making has been provided concerning internal corporate venturing (e.g., Burgelman, 1985; Garud and Van de Ven, 1992; Shortell and Zajac, 1988), which highlights the importance of communication to overcome ambiguity in the minds of decision makers. The current paper's empirical findings derived from an experimental design corroborate the importance of communication.

we must give an account not only of substantive rationality – the extent to which appropriate courses of action are chosen – but also procedural rationality – the effectiveness, in light of human cognitive powers and limitations, of the procedures used to choose actions. As economics moves out toward situations of increasing cognitive complexity, it becomes increasingly concerned with the ability of actors to cope with the complexity, and hence with the procedural aspects of rationality.” (Simon 1978, p. 9).

This shortcoming in the research literature has at least two related sources — a lack of theoretical understanding of the relative importance of the mechanisms that lead to strategic alliance success and the need for better methodologies that disentangle the effects of these mechanisms on the decision-making processes.

While broad theoretical issues regarding the formation, governance, and performance consequences of strategic alliances have received research attention (e.g., Dussage, Garrette and Mitchell, 2000; Uzzi and Gillespie, 2002), the decision-making processes that underpin success or failure still need more systematic investigation. Some fundamental theoretical propositions for the decision-making processes within strategic alliances have been developed (Khanna, Gulati and Nohria, 1998), but we need to better understand what the driving mechanisms are, and how these mechanisms interplay with each other. Economic property rights theory (which relates to factors affecting the economic incentives) and classical organizational theory (which relates to factors affecting better communication and coordination) are both germane to a better understanding of decision-making processes within strategic alliances. We investigate the relative importance of each mechanism and the potential interaction between these mechanisms to better understand the factors that affect the probability of success of alliances.

On the empirical front of examining decision-making processes, current methods are either at too aggregate a level based on stock market returns and output measures or rely upon post-alliance perceptions of success that can suffer from recollection or reconstruction bias. Use of secondary data is also problematic for a study of the decision-making processes, since pre-alliance stage selection effects and potential endogeneity can confound with causal mechanisms during the decision making stages post-alliance formation. For example, since partner selection can impact alliance success (Li, Eden and Ireland, 2007), research studies examining causality of decision-

making processes during the strategic alliance need to control for such selection factors. This requirement is extremely difficult to satisfy in survey or secondary data based research. Further, alternative mechanisms, while distinct theoretically, are often confounded in the field. For example, it is difficult to isolate the impact of, or examine the interactions between, economic incentives and communication among partners using secondary data, since these mechanisms both co-exist simultaneously and cannot be teased apart in the real world.

To address these fundamental research challenges, we adopt an experimental approach that has a long-standing history in related disciplines such as Economics and Psychology (e.g., Davis 2003; Kagel and Roth 1995). The methodology enables a direct and clean measurement of both the dependent variable (success in the strategic alliance), and the causal mechanisms through the creation of independent “treatments” that represent each underlying mechanism. A salient feature of experimental methodology is that by simulating treatments that may not occur in the field (e.g., differences in economic incentives and the ability to communicate), it enables us to identify the independent and combined effects of these variables (Friedman & Sunder 1994). The laboratory setting also allows the creation of a simulated environment that controls for selection effects by random assignment of strategic alliance partners.

We believe, and others have suggested, that this type of empirical evidence is critical to advancing our understanding of the theory of economic organization. As Simon (1982) wrote: “One of the consolations of the vocation of science is that in the long run (though we may all be dead), such issues as the relevance of the behavioral theory of the firm to economics will be settled by empirical facts rather than by the eloquence of protagonists of one view or another” (p. 5).

Thus, the current research paper focuses on contributing both to the theory of strategic alliances and to the methodology for studying strategic alliances. This paper joins insights from economics property rights theory and classic organization theory to build hypotheses related to processes that may lead to success in strategic alliances. These hypotheses are then empirically tested using experimental methodology, which enables us to separate the hypothesized effects in a manner not possible with field data. Through this process of theory development and empirical testing, this

paper sheds light on the relative importance of getting the monetary incentives right and managerial communication/coordination for enabling better alliance outcomes.

In the next section, we briefly review the research literature on the role of property rights and classic organization theory concerning alliances. In section 3, we develop the theoretical framework and hypotheses. We describe the experimental methodology in Section 4, and provide the empirical results in section 5. The concluding section 6 includes a discussion, limitations of our study and avenues for future research.

2 The Role of Property Rights and Classic Organization Theory in Strategic Alliances

Firms often engage in strategic alliances with other firms, some of whom may be potential competitors, to benefit from economic value creation. Based on prior research in the area (Dyer, 1997; Dyer and Singh, 1998; Gulati, Nohria and Zaheer, 2000; Lorenzoni and Lipparini, 1999; Spencer, 2003; White and Lui, 2005; Zajac and Olsen, 1993), potential synergies may be attributed to three fundamental drivers: (1) *revenue drivers*, (e.g., strategic alliances that provide entry into new markets/industry segments); (2) *cost drivers*, (e.g., strategic alliances that reduce costs by enabling increased asset specialization to reduce production costs); and (3) *risk drivers*, (e.g., strategic alliances that reduce risks in ways that cannot be replicated by shareholders)³.

However, realized value creation may deviate from potential value creation for several reasons. Notwithstanding the deviations that may occur due to external factors, forces that are endogenous to the actions of the alliance members may also be an important cause of a failure to achieve the potential economic value creation. To have successful outcomes from strategic alliances, the participating firms need to address issues related to *coordination* of effort and potential *opportunism* (Milgrom and Roberts, 1992), as strategic alliances typically represent a “coopetition” framework and an inherent tension between cooperative and competitive behavior (Khanna, Gulati and Nohria,

³ For sure, all three drivers of economic value creation may be at play in the same strategic alliance. For example, R&D alliances may create new knowledge that reduce production costs and help set standards that increase revenue and/or decrease risk due to obtaining strategic leverage in the market place.

1998). Simultaneous cooperative and competitive strategies are “compatible, complementary aspects of a unique reality” (Jarillo, 1988: 31). In this context, two theories address mechanisms that may lead to better coordination and a reduction of opportunistic behavior. We offer a brief overview of each of these theories below.

2.1 *Economic Property Rights Theory*

Property rights refer to sanctioned behavioral relations among decision makers in the use of potentially valuable resources (Barzel, 1989; Libecap, 1989). Coase (1960) introduced property rights into the economics of organization and questioned why firms, formal alliance structures, and other institutions exist at all if the price system is efficient. Coase (1937, 1960) notes that in a world of positive transaction costs, organizational forms matter for achieving efficiency. Thus, strategic alliances may enable economic value creation (Merchant and Schendel, 2000).

Property rights theory has much to offer in developing a more systematic approach for understanding strategic alliances (Chi, 1994; Foss and Foss, 2005; Liebeskind, 1996, Oxley, 1999)⁴. Since our primary objective is to move beyond *potential* value creation and analyze economic and strategic management issues concerning *realized* value creation, Olson’s (1965) seminal research on “the logic of collective action” is especially salient. Olson (1965) combines aspects of property rights theory (e.g., the tragedy of the commons) with game-theoretic insights⁵ in which prisoners’ dilemma situations can result in persistent severe under-performance of economic value creation potential (Arend and Seale, 2005). The key idea is that strategic alliances typically create economic

⁴ As Williamson (1996) notes there are both similarities and differences between transaction costs theory and property rights theory. An important similarity is that both transaction costs theory (Coase, 1937) and property rights theory (Coase, 1960) are theories of market frictions. An important difference is that the property rights literature treats the definition of property rights and contracting as being far less problematic than does transaction costs theory. Property rights theory hypothesizes that getting the economic incentives right lead to efficient outcomes. Since we are interested in isolating the importance of economic incentives as a mechanism of achieving alliance success, we base our predictions on property rights rather than transactions costs theory.

⁵ Lively discussions concerning the role of game theory in the field of Strategic Management can be found in the 1991 Winter Special Issue of SMJ (Camerer, 1991; Postrel, 1991; and Saloner, 1991).

value that have a “common pool” component⁶, and this lack of well-defined property rights invites potential opportunistic behavior and free riding (Mowery, Oxley and Silverman, 1996; Oxley, 1997; Reuer and Arino, 2002).

In particular, focusing on frictions in establishing property rights helps to explain and predict why there can be large and persistent economic gaps between potential and realized value creation (Kim and Mahoney, 2005; Mahoney 2005). Property rights theory is similar to agency theory in emphasizing that “getting the economic incentives right” is crucial. Aligning economic incentives is necessary for decisions regarding resource commitments. Absent some resource commitments from alliance members in a strategic alliance environment, the alliances will fail to achieve synergies and sustained economic value creation.

Some of the early property rights research literature took an optimistic view that efficiency would be readily achieved over time (Demsetz, 1967). However, more recently, both theorists and property rights historians have challenged this optimistic view (e.g., Eggertsson, 1990; North, 1990). For example, Libecap (1989) notes that asymmetric information and distributional conflicts often lead to persistent sub-optimization of economic outcomes. Furthermore, the more heterogeneous the contractual bargaining parties, the greater the impediments to achieving the full potential of economic value. Recent property rights research literature, which works from an incomplete contracting perspective (Hart, 1995) emphasizes that the coordination process by which one can obtain the correct economic incentives is exceedingly difficult.

These contributions in property rights theory are consistent with theoretical arguments in the strategic management research literature that focus on strategic alliance success and failure (Khanna, Gulati and Nohria, 1998; Nielsen, 1988), which recognize that there can be a gap between

⁶ The “common-pool problem” has many applications in economic theory. Indeed, an extensive research literature on depletable natural resources such as oil fields and fisheries describe how inefficiency arises due to a lack of well-defined property rights causing individual or firms to “over-harvest” the resources (Libecap, 1989). Beyond these examples on conservable resources, Michael (1999) shows how firms tend to under-invest in advertising under a franchising framework where the economic returns to a common brand or trademark are shared by both franchisors and franchisees. Argyres and Liebeskind (1998) report on the business problem caused by the “intellectual commons” for achieving the full potential of a commercializable technology.

potential and realized economic value creation. Given a world of positive transaction costs, agency hazards, opportunism and bounded rationality (Reuer and Ragozzino, 2006; Williamson, 1996), it can be quite difficult for strategic managers to get the details right, so that *realized* value creation is equivalent to the *potential* value creation of the strategic alliance (Kim and Mahoney, 2002; Oxley and Sampson, 2004). The presence of miscalculations, free-riding behavior, heterogeneous actors, and distributional conflicts can lead to sub-optimal economic results and a persistent wedge between the potential and realized value creation.

We turn next to a related complementary literature from classical organization theory that provides mechanisms through which alliance performance can be improved.

2.2 Classical Organization Theory

Classical organization theory, from a rational systems perspective (Scott, 1987), also has much to offer, since alliance organizations can be viewed as rational systems containing the elements of: (i) purpose and goal specificity; (ii) attempts to build stable expectations and the belief in a common purpose; and (iii) the development of rationality, which resides in formal reward systems, and informal and interpersonal communication (Barnard, 1938; Simon 1947; Scott, 1987).

The fundamental insight from classical organization theory is that effective coordination requires not only monetary incentives but also non-monetary rewards, and that both formal and informal managerial communication can increase the likelihood of cooperation and coordination (Barnard, 1938). What sets apart organization theory from much of economics is this emphasis on the non-material, informal, interpersonal, and moral basis of behavior (Scott, 1987). Contemporary organization theory concerning social capital --- which can be defined as resources embedded in a social structure that are accessed and/or mobilized in purposive actions --- is in many ways connected to this classical organization theory (Koka and Prescott, 2002).

While our experimental design cannot strictly be interpreted as one testing social capital theory, there are nonetheless many insights from this research literature that improve understanding in our current business context (Blyler and Coff, 2003; Lin, Cook and Burt, 2001; Moran, 2005; Tsai,

2000; Yli-Renko, Autio and Sapienza, 2001). In particular, the current paper focuses on communicative interactions among members that help facilitate cooperation and coordination (Rodan and Galunic, 2004; Rowley, Behrens and Krackhardt, 2000). Investing time and effort in improving communication improves economic returns (Adner and Helfat, 2003; Chung, Singh and Lee, 2002). Such investments facilitate a *flow of information*, which can clarify expectations and causal connections between individual actions and group outcomes (Kogut, 1988, 2000; Thorelli, 1986). Communication can thus provide convergent expectations that enhance the coordination and cohesion of the group. Secondly, these communication efforts may exert *influence* on decision-makers since appeals to cooperation may carry a certain weight in the essence of the decision-making process, which may be reinforced by identification with the cooperative system (Barnard, 1938; Simon 1947)

Given the relevance of both economic property rights theory and classical organization theory, we maintain that *both efforts matter* for increasing the likelihood of strategic alliance success. In short, property rights incentives and managerial communication are complementary mechanisms that together increase the realized economic value of strategic alliances. Our hypotheses in the next section develop the manner in which each mechanism contributes to value creation, when present in isolation or in conjunction with the other.

3 Strategic Alliance Propositions Based on Property Rights and Organization Theory

Following Khanna, Gulati and Nohria (1998), who base their theoretical model on economic reasoning pertaining to property rights, we analyze the payoff structures of strategic alliances in terms of their private and common benefits. Khanna, Gulati and Nohria (1998) define “private” benefits as those accruing to individual firms from activities not governed by the alliance, and “common” benefits as those accruing to all participants in the alliance. Private benefits occur when partners “take” from others, in the form of unilateral learning of skills and knowledge and application in areas unrelated to the alliance’s activities, while common benefits occur due to a collective “giving” or sharing of information and application of the learning in areas related to the

alliance (Khanna, Gulati and Nohria, 1998, p. 195). Since strategic alliances typically result in both kinds of benefits, the decision makers in a strategic alliance face an inherent tension between competition and cooperation, as exemplified by learning races where an alliance partner can benefit at the expense of the others' in the alliance. Thus, the probability of alliance success depends on the extent to which the decision makers perceive common benefits to be greater than private benefits. In a property rights' perspective, a strategic alliance has elements of the "tragedy of the commons" (Hardin, 1968); if the benefits perceived for contributing to the alliance (and maintaining the value of the common pool) are perceived as less the private benefits from "raiding" the pool, then the alliance is less likely to result in cooperative behavior among the decision makers. Thus, consistent with property rights theory (Coase, 1960), aligning of incentives is critical to ensuring alliance success. When modeled as a "take some or give some" game, the extent of cooperative behavior (giving to the alliance to contribute towards synergistic value creation) vs. competitive behavior (taking from the alliance for private benefits) will be higher the greater the perceived benefits for the alliance partner from the common sources of activities. Accordingly, we posit:

H1: Alliances wherein decision-makers perceive a higher ratio of common to private benefits are more likely to achieve success than alliances wherein decision-makers perceive a lower ratio of common to private benefits.

In line with the optimistic property rights view (Demsetz, 1967), the above hypothesis focuses on the importance of incentive alignment, but abstracts away from considerations arising from coordination failure, miscalculation, free-riding behavior, and distributional conflicts (Libecap, 1989; Olson, 1965). The strong form property rights theory, which relies on strategic partners optimizing based on economic incentive alignment alone, makes many behavioral assumptions that may not hold in reality. Indeed, since receiving the common benefits from alliance activity is contingent not just on the focal partner's decision, but also on the collective actions of all partners, each partner's expectation regarding other partners' behavior is a critical determinant of their own contribution. Even in the absence of actual opportunistic behavior by any of the alliance partners, the fear that others may not contribute towards joint alliance interests may prevent individual

decision makers from undertaking actions that will result in alliance success. Distrust thus breeds distrust, and reversion to competitive rather than cooperative actions. Such coordination costs are further exacerbated by decision-making biases caused by uncertainty (Zajac and Bazerman, 1991), the anchoring and/or framing problem (Kahneman, Slovic & Tversky, 1982) or by differences in the considerations of “fairness” across strategic alliance partners (Messick, 1991). In sum, lack of coordination due to insufficient common knowledge, differential perceptions of other decision-makers’ actions and the bounded rationality⁷ of the participants to clearly see what actions are in their best interests (Simon, 1982) lead to the following hypothesis:

H2: Even in alliances wherein decision-makers perceive a higher ratio of common to private benefits ratio, the realized value creation from a strategic alliance falls short of the potential value creation.

The above hypothesis underscores that economic payoff structures are necessary but not sufficient to achieve the desired cooperative outcome (Inkpen, 2000; Khanna, Gulati and Nohria, 2000). Bounded rationality and lack of common knowledge suggest a significant role for managerial communication and coordination.

Barnard (1938) emphasized that both formal and informal communication were important elements for achieving cooperation. To Barnard, the essential executive functions are: “first, to provide the system of communication; second, to promote the securing of essential efforts; and third, to formulate and define purpose” (1938: 217). There is a significant role for personal communications among decision makers for achieving cooperation (Miller, 1992; Zaheer and Venkatraman, 1995). Through communication, managers can minimize the bounded rationality problem through joint problem solving (McEvily and Marcus, 2005) and they can potentially reduce

⁷ The principle of bounded rationality has been defined by Simon as follows: “The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problem whose solution is required for objectively rational behavior in the real world --- or even for a reasonable approximation to such objective rationality” and “it is only because human beings are limited in knowledge, foresight, skill, and time that organizations are useful instruments for the achievement of human purpose” (1957: 198-1999).

opportunistic behavior. Indeed, prior alliance-related research has found a positive relationship between inter-partner communication and superior alliance performance (Doz, 1996; Marks and Mirvis, 1998). When decision makers are aware of each other's incentives and orientation towards the strategic alliance, there is an alleviation of fears related to potential partner misconduct. Further, communication facilitates coordination, both through the joint creation of routines, and due to timely conflict resolution. Communication also reduces the possibility of surprises by helping to form more accurate expectations. Importantly, communication permits the development of social capital and trust among partners (Gulati, 1998). Thus:

H3: Alliances in which there is both an economic incentive and communication will achieve greater success rates than alliances that rely exclusively on economic incentives.

The coordination problems highlighted in the above discussion can differ based on whether decision makers are similar or different to each other in terms of perceived benefits of the strategic alliance. An increase in the heterogeneity of decision-makers increases the difficulty of reaching the efficient economic outcome (Libecap, 1989). Khanna, Gulati and Nohria (1998) discuss differences in relative scope of alliance partners and predict that asymmetric common benefits can cause problems in achieving cooperation in strategic alliances. There are several reasons why one may expect increases in heterogeneity to cause a decrease in success rates of strategic alliances. First, the need for coordination is greater when partners have to determine the optimal allocation of effort, given differences in relative common benefits from the alliance activities. Since heterogeneity in strategic alliance scope among partners cause each decision maker to have different opportunity costs for contributing to the strategic alliance, arrival at optimal routines that ensure incentive compatibility for all partners increases the coordination burden.⁸ Second, heterogeneity among

⁸ For example, decision makers may decide to use a simple coordination rule of equal contribution of effort when they receive similar benefits from the alliance activity. However, when the common benefit of the activity is greater for one alliance partner than the other, equal contribution of effort is *not* equitable, and the strategic alliance partners have to determine the relative costs and benefits for each person before arriving at routines that align all partners' incentives.

alliance partners increases the perception of opportunistic behavior by partners, even when none may be present. The effects of bounded rationality and various decision-making biases are likely to be exacerbated as well, since heterogeneity increases the potential for misunderstanding of the rules, and creating divergent expectations among alliance partners (Goerzen, 2007; Goerzen and Beamish, 2005). Accordingly, we have:

H4: Alliances in which there is heterogeneity in strategic alliance partner scope will have a lower likelihood of success than alliances where partners are relatively homogenous in scope.

4 Methodology

We test the above hypotheses using experimental methodology, an important method of inquiry as demonstrated by seminal research (e.g., Kahneman, Knetsch and Thaler, 1990; Plott, 1982; Smith, 2000). While well established in the economics of organization as a fruitful approach for the study of issues pertaining to private and common property rights (Hazlett, 1997; Poppe and Utens, 1986), and now considered commonplace in the Economics discipline (Samuelson, 2005), experiments have only recently begun to be utilized in the Strategic Management field (Knez and Camerer, 1994; Song, Calantone and Di Benedetto, 2002). The use of experimental methodology allows us to directly test the theories proposed by implementing different treatments corresponding to each while controlling for factors that may confound with these mechanisms in the real world.

To represent the tension between cooperation and competition confronting the decision makers in a strategic alliance, we model the strategic alliance as a variation of a stag hunt game, also called an “assurance game,” “coordination game,” and “trust dilemma.” The stag hunt represents an accurate context in which to study cooperation and its problems (Skyrms 2003). In a stag hunt game — unlike the prisoners’ dilemma game — when other parties cooperate, cooperation is the best-response. Specifically, we model the decision-making processes within a strategic alliance as a “take some or give some” game, where decision makers either contribute to the strategic alliance for common economic benefit, or use the alliance for private economic advantage. Each participant in

the experiment represents a firm making a decision about the extent to which to engage in cooperative activities within their strategic alliance. Each alliance partner has different monetary benefits for participating (or not participating), which will affect their decisions concerning how much knowledge to contribute (give) or extract (take) from the alliance. In a series of experiments, we examine the behavior of participants under different assumptions of private and common economic benefits accruing as a result of the strategic alliance. We also investigate the impact of communication on strategic alliance performance, by implementing communication protocols to examine their impacts.

4.1 *Experimental Design*

Our experimental design is developed for both external and internal validity. For external validity, we designed a setting that captures the parameters and processes that occur in real-world learning alliances between pharmaceutical and biotechnology companies (Baum, Calabrese and Silverman, 2000; Phene, Fladmoe-Lindquest and Marsh, 2006; Roethaermel and Deeds, 2004; Santoro and McGill, 2005). The experiments were designed so that strategic alliance issues grow organically out of the hypotheses they are designed to distinguish (Kagel and Roth, 1995). Moreover, our experiments involve *induced valuation* of participants (Smith, 1976, 2000) — they are paid for their participation in the experiment in a way that is responsive to the choices they made — to ensure that participants are motivated by the same factors they would encounter in the real world.

For internal validity, we designed a setting where theories about strategic alliance behavior could be tested directly. Five treatments were developed for the strategic alliance simulations, each representing an interaction between economic incentives (ratio of common to private benefit) and communication. (Details of the implementation are provided in the next section.) The first treatment of *low common benefit* represents a scenario where the ratio of common to private benefits is low, i.e., none of the decision makers have a significant economic incentive to contribute to the common alliance activities. Second, we consider a scenario of *high common benefit* of alliance activity, where all of the decision makers have a high common to private benefit ratio, i.e., the economic incentives are

aligned so that the pay-offs when all contribute to the alliance activity is significantly higher for every decision maker than when the alliance is not successful. The third treatment of *mixed common benefit* allows for heterogeneity in the ratio of common to private benefit among the alliance partners. For some decision makers, the ratio of common to private benefit is very high, while for others, the ratio is very low. The fourth and fifth treatments permit strategic alliance partners to communicate with each other. In the fourth treatment of *high common benefit with communication*, decision makers have a high ratio of common to private benefits and can communicate with each other, while in the fifth treatment of *mixed common benefit with communication* decision makers have heterogeneous ratios of common to private benefits, and the ability to communicate with each other. Thus, a comparison between the different treatments permit an assessment of the individual and interaction effects of economic incentives and communication on alliance outcomes and their evolution as alliance partners engage in the decision-making processes.

4.2 Experimental Procedure

Our experiment involved 405 participants that engaged as decision makers in alliances. All participants were business students at a Research I US institution, with the majority of the students enrolled in the MBA (regular and executive) program.⁹ Participation was strictly voluntary, and in accordance with the principle of induced valuation, participants were paid in cash, after conversion of their experimental profits into dollars.

Participants were randomly assigned to one of the five treatments and to their role within the treatment. When they arrived at the laboratory, they were seated next to a computer terminal. In compliance with Institutional Review Board guidelines, they read and signed a consent form. Participants were provided with a hard copy of their role-specific instructions, and prior to the start of the simulation, a composite version of the instructions is read aloud (see Appendix 2 for the

⁹ Robustness checks confirmed that there were no significant differences among alliance members that were undergraduates, regular MBA or executive MBA students. Subsequent to the alliance experiments conducted for research, there were additional experimental simulations conducted for pedagogical purposes (not included in the data to be compliant with Institutional Review Board guidelines). The outcomes in these experiments were consistent with the results reported in the empirical section.

composite version). To ensure that participants had understood the instructions, the necessary decisions they were being asked to make, and the resulting payoffs, each participant filled a pre-experiment questionnaire, and the answers to the questions were discussed until there was a consensus on the understanding of the simulation. The entire experiment was computer-aided, and implemented using a web-based Java application; participants input their decisions, and were given feedback electronically at the end of each period of decision making. After the experiment ended, participants completed an exit questionnaire describing their experiences.

Participants were informed that they would role-play managers that were responsible for allocating resources within their own firm, or to an existing, five-firm alliance to which they belonged. We designed the monetary incentives to reflect realistic payoffs of managers in the field, and participants were (privately) paid those incentives in cash at the end of the experiment. The experiment involved no deception and thus contamination effects are not a major concern. Nonetheless, participants were asked not to discuss the experiment with others.

At the beginning of the simulation, the alliance common pool was endowed with 100 information units. Further, as members representing decision makers of a five-firm alliance, each participant received 20 information units (created by their R&D staff) in every period of a multi-period alliance simulation. The primary decision concerned how much information they chose to give to or take from the alliance common pool. At the end of every period, each alliance member received \$1,000 experimental dollars for information held within their own firm (private benefit). Further, if the alliance common pool had at least 150 information units, the alliance achieved a successful outcome and each alliance member received a bonus representing benefits accruing from the alliance activity (common benefit). The bonus amounts were calibrated for the different treatments described above (low, high and mixed common benefit). While each alliance member knew their own bonus, they did not know the bonuses of the other alliance members. However, they were informed whether the other alliance members received similar (homogeneous) or different (heterogeneous) bonuses to their own.

At the end of each period, after the decisions had been made regarding information transfer to or from the alliance common pool and the members had received their experimental earnings, two events occurred. First, the knowledge available in the alliance pool depreciated by 33%.¹⁰ Second, a random draw indicated whether the game would continue (80% likely) or end at that period (20% likely). The random draw enabled us to implement an infinitely repeated game in the lab (with a discount rate of .2) avoiding endgame effects (Friedman & Sunder 1994).

4.3 Implementation of Experimental Treatments

As indicated above, the differences in the ratio of common to private benefit treatments were implemented by differences in bonus structure across the alliance simulations. In the *high common benefit* treatment, the bonuses (in experimental dollars) were \$35,000 for two of the firms and \$40,000 for three of the firms. This bonus ensured that economic incentives made it worthwhile for each of the decision makers to contribute to the strategic alliance; in any one period, it collectively cost the firms in the strategic alliance \$50,000 to contribute to the alliance common pool, and they collectively received \$190,000 in the form of common benefits (bonuses).¹¹ Of course, there is still an incentive problem, since each firm would prefer that the *other* firms do the contributing while they free ride (or even worse, take resources). Note that no one firm has an incentive (or the resources) to unilaterally contribute 50 information units to receive the bonuses (costing \$50,000 and gaining at most \$40,000). Nonetheless, the payoffs are consistent with economic incentives being aligned towards success of the alliance. As in the stag-hunt game, if others are contributing, it is in the best interests of a target firm to contribute as well.

In the *low common benefit* treatment, the bonuses were \$4,000 for two of the firms and \$5,000 for three of the firms. This bonus made it economically inefficient for any of the firms to contribute

¹⁰ The depreciation was implemented to ensure that if the strategic alliance threshold of 150 was met, the start of the next period would replicate the conditions for the first period (100 units of information).

¹¹ These parameters are chosen so as to make it unattractive for any player to take the alliances' resources in any given period as well. By taking they earn \$150,000, but they lose their bonuses in this and all future rounds, which occur with an 80% chance. Thus, the expected discounted value of the losses is at a minimum $(\$35,000 + .8*\$35,000 + .82*\$35,000, \dots) = \$175,000 > \$150,000$.

to the common alliance activity; in any one period, it collectively cost the firms \$50,000 to contribute to the alliance common pool, and their collective common benefit was only \$23,000. Thus, the payoffs in this treatment are consistent with economic incentives *not* being aligned for strategic alliance success.

Finally, the *mixed common benefit* treatment represented heterogeneity among the bonuses received by the alliance members; while three of the firms received high bonuses (\$35,000, \$35,000, and \$40,000), two firms received low bonuses (\$5,000 each). Importantly, the bonus values are still consistent with incentive alignment for the strategic alliance to succeed (\$120,000 of benefits versus \$50,000 of costs); however the heterogeneity in bonuses creates a problem. For instance, were the alliance only among the three firms with high bonuses they could contribute enough to make the threshold and collect their bonuses (the alliance pool shrinks by 50 units each period, and these three members together control 60 units). However, there is an incentive for the low common benefit firms to take the resources in the alliance pool (earning \$150,000 and losing only their bonuses of \$10,000), and thus preventing the alliance from succeeding. A successful outcome requires that the members of the strategic alliance configure the optimal amount of contributions so that the low common benefit firms are also better off from alliance success.¹²

The two treatments that permitted communication were implemented via a free-form chat box. For both the *high common benefit with communication* treatment and the *mixed common benefit with communication* treatment, the strategic alliance members had the ability to chat with all of the other members in their alliance, or send private messages to any one alliance member. The “chat” feature was implemented using a “chat box” resembling instant messaging, and a record of all prior messages was available for each member as the alliance progressed across periods.

¹² For example, if the low common benefit firms neither give to or take from the alliance pool, each firm can still expect to be better off at the end of the game, since their expected bonus from all the periods of the alliance simulation is \$55,000, which is greater than \$50,000 that they would gain if each raided the alliance pool in the first period, thereby resulting in alliance failure.

4.4 Empirical Model

Multiple games for each treatment created our empirical observations and the decisions of each member and outcomes of each period were recorded. Our primary dependent variable, *Alliance Success*, is coded as 1 if the alliance common pool information units exceeded the threshold of 150 in a particular period, and 0 otherwise. Our second dependent variable, *Transfer of Information*, is measured as the net amount of information transferred to the alliance common pool (total giving – total taking by all alliance members in each period). Our last dependent variable, *Information in Alliance* is the total amount of information in the alliance pool at the end of each period, which is the sum of the residual information from the prior period (after depreciation) and the net transfer of information in the current period. As expected, these measures are highly correlated but they capture multiple aspects of the same question: to what extent did alliance members create value?

The main independent variables in the model include the indicator variables for each of the five treatments described above (e.g. *high common benefit* = 1 if the observation was drawn from that treatment, and 0 otherwise), and the *period* in which the decisions were made. In addition, since the experiments represent hierarchical data (alliance members are grouped together), we include group fixed effects to control for unobserved heterogeneity caused due to idiosyncratic group specific factors. We use a logistic regression analysis for our first dependent variable, and multivariate regression analysis for the other dependent variables.

5 Results

Table 1a and 1b present summary statistics and one-way ANOVA tests. The panels show preliminary support for all our hypotheses, which are formally tested and reported in Table 2. Consistent with Hypothesis 1, economic incentives do matter. In the *low common benefit* treatment where there is no financial incentive to participate in an alliance, alliances never succeeded. On average, less than one unit of information is transferred to the alliance, and very little of the initial information stock remains. In stark contrast, in treatments where there is a financial incentive for

the alliance to succeed, the alliance success rates are positive. Twenty-seven percent of the alliances in the *high common benefit*, and ten percent of the alliances in *mixed common benefit* treatment succeed. The average amounts of information transferred and in total information the common pool is significantly higher as well.

That said, consistent with hypothesis 2, economic incentives alone are not sufficient. The success rate of 27% in the *high common benefit* treatment is a far cry from the theoretical optimum of 100%. Table 1a and 1b demonstrate the importance of communication for successful alliance performance. As seen in Panel B of Table 1b, when economic incentives are in place, adding communication in the *high common benefit treatment* more than doubles the success rate (from 27% to 59%) and the amount of information transferred to the alliance (from 13 units to 35 units), and increases the amount of information contained in the alliance (from 47 units to 78 units). The same effect occurs when communication is included in the *mixed common benefit* treatment. This result is consistent with hypothesis 3, that economic incentives are not, by themselves, sufficient, and that the addition of communication significantly increases the rate of successful alliances.

Panel D of Table 1b presents descriptive statistics for the impact of heterogeneity. As predicted in hypothesis 4, we find that heterogeneity decreases alliance performance, even in the presence of communication. Heterogeneity reduces the percentage of successful alliances to 22%, the information transferred to the alliance in each quarter to 20% and the information in the alliance to 55%, all significantly less than in the homogeneous condition. The reduction in performance due to heterogeneity is approximately the same as the increase in performance that we saw due to the introduction of communication.

We next proceed to a more formal analysis of these differences. In particular, we present a series of regressions testing our hypotheses using the same three dependent measures. The regressions control for unobserved heterogeneity and for the period in which the decisions are made. Results from the regression are consistent with our descriptive results. Based on the results in Panel A, Hypothesis 1 is supported. Economics incentive alignment is a necessary condition for alliances to succeed, and the coefficient of high common benefit is significant and positive for all

three dependent variables. However, even though positive, the success rate in the high common benefit is still only 27%, and significantly lower than the success rate of high common benefit with communication. Thus, we find empirical support for both Hypothesis 2 and 3 in Panel B of Table 2. Communication increases the probability of success (in a logistic regression), the net information transferred to the alliance, and the amount of information retained by the alliance over low joint benefit. The impact of communication in the mixed common benefit treatment is similar to that observed for the high common benefit treatment, as evidenced in Panel C of Table 2. Finally, in Panel D we show support for Hypothesis 4 that heterogeneity in alliance members' common benefit has a negative effect on performance. The homogeneous high common benefit treatment has significantly higher performance than the heterogeneous mixed common benefit condition for all three of the dependent variables in our analysis.

6 Discussion and Conclusions

In an attempt to better understand the decision-making processes undertaken in strategic alliances, our research study brings together complementary streams of literature in economics (property rights theory) and organizational theory and tests their relative effects by using an experimental design that permits the isolation of the underlying causal mechanisms. Consistent with property rights theory, we find that aligning economic incentives is crucial to success (Barzel, 1989; Demsetz, 1967). However, our results also reveal that coordination costs, bounded rationality, and fear of opportunistic behavior or lack of trust in the absence of shared knowledge create endogenous uncertainty regarding partner actions, thus causing the realized value creation to be much less than the potential value creation. While designing the right payoff structure is a necessary condition to alliance success (Khanna, Gulati and Nohria, 1998), it does not seem to be sufficient.

In this context, the ability to communicate significantly increases the probability of success. The results are both economically and statistically significant; indeed communication approximately doubles the rate of alliance success. As depicted in Figure 1, the success rates in the absence of communication are low and relatively constant across periods. If the decision makers did not “get it

right” the first time, the probability of success was very low for the strategic alliance across time. In contrast, communication increases success rates not only in the first period, but also causes success rates to increase as decision makers interact with each other in subsequent periods.

An informal inspection of the communication content of the decision makers revealed that communication allowed alliance members to recover from mistakes and co-ordinate for a more optimal solution. The following excerpts from an alliance communication represent the various effects of communication, including but not limited to creating a shared understanding of the rules, explanation of behavior, and development of trust.

Company 5: “Alliance partners let’s aim to maximize profits.”

Company 2: “I think it is beneficial if we all work together.”

Company 4: “If everyone enters 10 every time, there will always be 100 at the beginning of the quarter. Therefore, we can easily reach 150 every time [to make our bonus]. What does everyone think?”

Company 1: “There are many [computer] windows to manage; hard to keep an eye on the clock ... You guys ... woops, I made a mistake! I am putting 15 now to win back your trust. [Otherwise] revenge will destroy us.”

Company 3: “Yeab, please do not do that again ... You’ll make me paranoid.”

Thus, in line with classical organizational theory, communication enables managers to set goals, to coordinate, and to provide initial communications and subsequent feedback. Further, communication reduces defection from cooperative outcomes, mitigates problems of bounded rationality (Simon, 1947), lessens fears of opportunism (Hennart, 1988), and allows the group to recover from mistakes. Communication also enables leaders of the group to make appeals not to be selfish and to cooperate (Barnard, 1938; Miller, 1992), which seem to work for some of the participants for some of the time.

We note that the transactions costs literature has developed a rich understanding, based on the seminal work by Williamson (1975), of the role that opportunistic behavior, uncertainty, asset specificity, and their interactions play when determining the governance form choice among feasible

alternatives.¹³ However, Williamson (1975) also identified other factors that are critical determinants of success, which have perhaps not received as much attention in subsequent research in the transactions costs literature stream. For instance, Williamson (1975) highlighted the similarities in transactions costs theory and property rights theory regarding the importance of aligning economic incentives. This seminal work also underscored the presence of bounded rationality in decision making, and that heterogeneity among decision makers further exacerbates difficulties in achieving cooperative outcomes (Williamson, 1975, pp. 239-240). Importantly, Williamson (1975) asserted that the development of *convergent expectations* is a vital managerial role, and that managerial communication promotes convergent expectations by attenuating uncertainties generated when interdependent parties make independent decisions (Malmgren, 1961). Our empirical findings find strong support for the role that these factors (economic incentives, bounded rationality, heterogeneity, and communication) play in determining successful alliance outcomes, *even in the absence of asset specificity or opportunistic behavior*. We thus believe the empirical findings of the current paper will generate new interest and empirical inquiry concerning factors that relate to strategic alliances success.

Our study has some limitations, which also open up avenues for future research. Our laboratory setting and use of experimental methodology allowed us to disentangle the relative and interaction effects of the causal mechanisms underlying decision-making in alliances, but at some cost of realism in our need to abstract away from the multiple issues that may also be relevant in actual alliances undertaken by corporations in the real world. For instance, our experiments controlled for selection effects by randomly assigning participants to the different treatments, and also did not take into account exogenous uncertainty (either technological and demand driven). Future research examining the role of prior relationships, due diligence in the pre-alliance phase in

¹³ For example, there is a substantial body of empirical evidence that supports the significant role of interactions between uncertainty and asset specificity, which include: Anderson (1985), Coles and Hesterly (1998), Leiblein and Miller (2003), Leiblein, Reuer and Dalsace (2002), Villalonga and McGahan (2005) and Walker and Weber (1987), among others.

partner choice, and the use of contractual safeguards can help shed light on the effect of these factors on the decision making processes. In the same vein, our experimental setting did not permit alliance members to credibly threaten consequences for deviant behavior and research in this area would be beneficial as well. Exogenous uncertainty may interact with the endogenous uncertainty regarding partner actions to create additional challenges in the realization of the potential value creation, and research that examines such interaction effects would be fruitful.

The use of students as subjects is open to the criticism that students may not emulate the actual decisions of managers in an alliance setting. We believe that this concern is somewhat mitigated for the following reasons. First, the majority of the participants in our experiments had at least three years of work experience. Further, there was no significant difference in the results obtained for groups in which the alliance members were Executive MBA's; the average age of this cohort was approximately 40 years, and they had a minimum of seven years work experience. Some of the executives had also participated in alliance activity as part of their job description. Finally, research in experimental economics has addressed this issue explicitly. Indeed, Dyer, Kagel and Levine (1989) and Croson and Donohue (2006) find that "real world" decision makers performed the same or sometimes worse in the laboratory setting than students.

In sum, we contribute to the extant research literature by examining the underlying decision-making processes that lead to alliance success or failure, and in particular, focus on the relative and interaction effects of economic incentive alignment and communication. Methodologically, we contribute to the strategic management literature by using under-utilized but powerful experimental methods to isolate the effects of alternative causal mechanisms, and we hope that more researchers use this well-established technique in related disciplines to address more strategic management issues. Theoretically, consistent with Khanna, Gulati and Nohria's (1998) propositions, we find evidence that payoff structures are critical for determining alliance outcomes, and that increased heterogeneity in alliance scope can result in lower rates of success. Thus, an important contribution to organizational theory literature is that alliance partners need to give close attention to the

underlying economics of a strategic alliance, and to ensure that win-win situations are created for all members in the alliance.

Simon (1982) wrote that “[o]rganization theory, economics (especially the theory of the firm) and cognitive psychology are all basically concerned with the same phenomena. All three are theories of human decision making and human problem solving processes” (p. xv). This research integrates insights from classical organizational theory with property rights theory from economics and behavioral insights from psychology. We make an important contribution to property rights theory; that successful outcomes are attainable when *both* economic incentives *and* social capital (through communication and establishment of relationships) are present. These two factors are thus complements, rather than substitutes, in determining the success of strategic alliances.

Table 1a: Success Rates across Treatments

	Without Communication	With Communication
Low Common Benefit	0%	n.a.
High Common Benefit	27%	59%
Mixed Common Benefit	10%	22%

Table 1b: Descriptive Statistics and ANOVA Tests across Treatments

A. High vs. low common benefit, no communication			
	High, no communication	Low, no communication	Chi-Squared / F-ratios
Observations	165	187	
Alliance success	27.27%	0.00%	75.75**
Transfer of Information	13.59 (3.09)	0.47 (2.90)	9.61**
Information in Alliance	47.00 (3.00)	24.47 (2.52)	37.37**
B. High common benefit, with vs. without communication			
	High, no communication	High, with communication	Chi-Squared / F-ratios
Observations	165	176	
Alliance success	27.27%	58.52%	34.57**
Transfer of Information	13.59 (3.09)	35.40 (2.98)	25.92**
Information in Alliance	47.00 (3.00)	78.64 (2.90)	57.49**
C. Mixed common benefit, with vs. without communication			
	Mixed, no communication	Mixed, with communication	Chi-Squared / F-ratios
Observations	176	187	
Alliance success	10.11%	21.93%	9.63**
Transfer of Information	3.01 (3.37)	20.53 (3.27)	13.89**
Information in Alliance	31.78 (2.98)	55.93 (2.91)	33.64**
D. High vs. mixed common benefit, with communication			
	High, with communication	Mixed, with communication	Chi-Squared / F-ratios
Observations	176	187	
Alliance success	58.52%	21.93%	52.06**
Transfer of Information	35.40 (2.98)	20.53 (3.27)	11.27**
Information in Alliance	78.64 (2.90)	55.93 (2.91)	29.85**

Standard errors in parentheses

* Significant at the 5% level

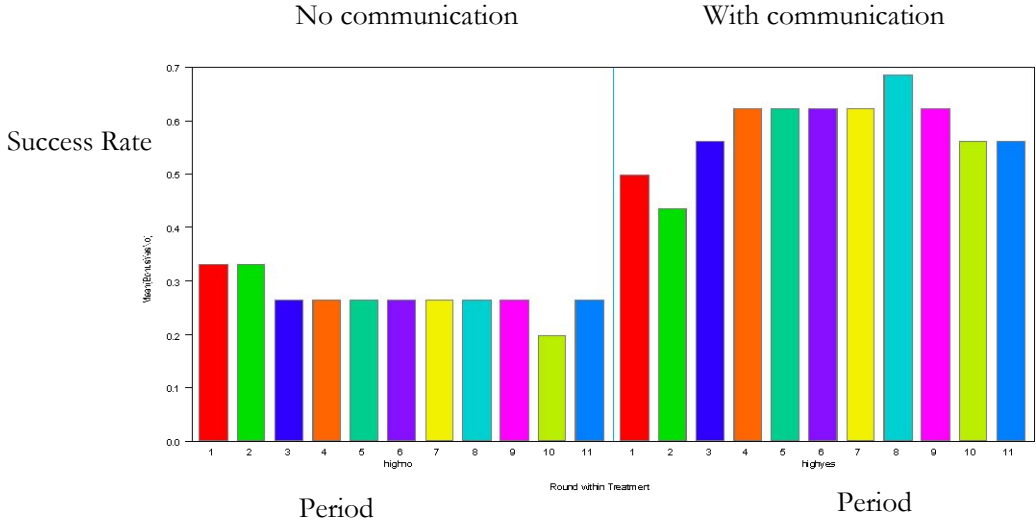
** Significant at the 1% level

Table 2: Fixed Effects Regression

A. High vs. low common benefit, no communication			
Independent variable	Alliance Success	Transfer of Information	Information in Alliance
Intercept	----	3.60 (4.18)	55.32** (2.21)
High Common Benefit	1.23** (0.19)	6.56** (1.95)	11.27** (1.03)
Period	0.35** (0.04)	0.57 (0.62)	-3.26** (0.33)
Observations	352	352	352
Log likelihood	-134.56		
R2	0.08	0.25	0.74
χ^2 / F	$\chi^2 = 22.35^{**}$	F = 3.25**	F = 28.55**
B. . High common benefit, with vs. without communication			
Independent variable	Alliance Success	Transfer of Information	Information in Alliance
Intercept	----	22.82** (3.99)	74.55** (2.19)
High with communication	0.66** (0.12)	10.90** (1.86)	15.82** (1.02)
Period	0.04* (0.02)	0.28 (0.59)	-1.96** (0.32)
Observations	341	341	341
Log likelihood	-233.39		
R2	0.07	0.36	0.81
χ^2 / F	$\chi^2 = 32.48^{**}$	F = 5.65**	F = 43.54**
C. Mixed common benefit, with vs. without communication			
Independent variable	Alliance Success	Transfer of Information	Information in Alliance
Intercept	----	10.18* (4.75)	59.87** (3.05)
Mixed with communication	0.35** (0.13)	8.76** (2.22)	12.11** (1.42)
Period	0.22** (0.02)	0.27 (0.70)	-2.68** (0.45)
Observations	363	363	363
Log likelihood	-161.47		
R2	0.11	0.22	0.61
χ^2 / F	$\chi^2 = 60.67^{**}$	F = 2.80**	F = 15.76**
D. High vs. mixed common benefit, with communication			
Independent variable	Alliance Success	Transfer of Information	Information in Alliance
Intercept	----	25.47** (4.37)	73.08** (2.84)
High with communication	0.79** (0.11)	7.42** (2.04)	11.35** (1.33)
Period	0.05** (0.02)	0.42 (0.64)	-0.97* (0.42)
Observations	363	363	363
Log likelihood	-243.81		
R2	0.09	0.25	0.66
χ^2 / F	$\chi^2 = 43.33^{**}$	F = 3.34**	F = 19.10**

Standard errors in parentheses; Group dummies included (not reported); * Significant at the 5% level; ** Significant at the 1% level

Figure 1: Effect of Communication on Success Rate in High Common Benefit Treatments



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