

**WORKING PAPER SERIES ON
RESEARCH IN RELATIONSHIP MANAGEMENT**

**The Evolution of a Dominated Alliance:
A Game Theoretic Approach**

Annelies de Ridder

| | |
|--|---|
| WORKING PAPER SERIES ON RESEARCH IN RELATIONSHIP MANAGEMENT | |
| Reference number | RRM-2005-09-STR |
| ISSN | 1572-4255 |
| Publication status / version | March 2005 |
| Email address contact author | a.deridder@fm.ru.nl |
| URL (electronic version) | http://www.ru.nl |
| Address | Nijmegen School of Management Radboud University Nijmegen Thomas van Aquinostraat 1 P.O. Box 9108 6500 HK Nijmegen, The Netherlands Phone: +31 (0)24 361 19 08 Fax: +31 (0)24 361 19 33 |

THE EVOLUTION OF A DOMINATED ALLIANCE: A GAME THEORETIC APPROACH

Annelies de Ridder¹

Radboud University Nijmegen
Nijmegen School of Management
Department of Strategy
PO Box 9108
6500 HK Nijmegen
tel. + 31 (0)24 3611908
fax. +31 (0)24 3611933
a.deridder@fm.ru.nl

Abstract:

Strategic multi-partner alliances run the risk of becoming instable because of opportunistic behavior by their members. Insights from a game theoretic social dilemma approach can explain how to avoid such instability. What happens to this social dilemma and the stability of the alliance if one of the partners gains so much power during the alliance that the alliance becomes dominated? I will study the process of a balanced to an unbalanced alliance, and the effects these change have on the tension between commitment and opportunistic behavior of member firms. An n-person dynamic prisoner's dilemma is used to study the evolution of equal alliances. For the study of dominated alliances I will rely on the literature on bargaining power and on an n-person dynamic version of the game of chicken.

Keywords:

Alliances, Dynamics, Bargaining power, Game theory, Prisoner's Dilemma, Game of Chicken.

¹ I would like to thank Inge Berendts for all her research input.

1. Introduction

In alliance research, strategic alliances and their dynamic evolution have so far mainly been studied as if partners are equal. In real life, the relation between partners in an alliance evolves and the equilibrium between members changes. Hence, partners may become less equal: one of them can get more powerful. The balance of bargaining power between the members of an alliance is important, as it is a crucial factor for the stability of the alliance (Yan and Gray 1994, Inkpen and Beamish 1997, Barringer and Harrison 2000). Another factor that can cause instability in alliances is an unbalance between commitment to the alliance and opportunistic behavior of partners (Zeng and Chen 2003). If all partners are merely focusing on their own learning opportunities and ways to frustrate the other(s), the alliance will be highly unstable. Firms that however invest and commit themselves unlimitedly and unconditionally to the alliance will be exploited and abused by the other partners (Das and Teng 2000, Zeng and Chen 2003). Since member firms in an alliance remain independent and might even be competitors in other areas, firms should never forget that their partners may be out to disarm them (Hamel, Doz, and Prahalad 1989, Barney 2002). This way, partners in an alliance find themselves trapped in a social dilemma: each member has the individual incentive to behave opportunistically, which will lead to an undesired collective outcome. Game theoretic analyses (Axelrod 1984, Taylor 1987) and insights from the alliance literature (Zeng and Chen 2003) have shown how to maintain the balance between cooperative and opportunistic behavior. This dilemma has however not been studied from the perspective that partners develop at a different pace during an alliance: what happens to the cooperative and opportunistic behavior of alliance members if one of the members gains more bargaining power during the alliance?

In this article I study under which conditions partners will commit themselves to cooperation in an alliance and what happens to the alliance if one of the partners gains more bargaining power during the alliance. The underlying motivation to study both the bargaining power balance and the dilemma between cooperation and competition is that both are important for maintaining stability in the alliance. The focus of the article is on multi-partner alliances, in which informal voluntary arrangements between two or more firms are formed. Besides insights from strategic management literature, I will use concepts and solutions from the field of game theory. More specifically, the social dilemma presented will be analyzed by a n-person dynamic version of the prisoner's dilemma. Alliances with an unequal distribution of power will be analyzed with a n-person dynamic version of the game of chicken.

This way, the article makes a theoretical contribution to the study of the evolution of alliances. The article will gain a greater comprehension of the path that alliance partners walk during an alliance. How does an alliance move from its initial conditions to evolved conditions; how does – in other words – the relationship evolve (Inkpen and Currall 2004)? In spite of some recent catch up, certain aspects of the evolution of alliances are still understudied (Smith, Carroll and Ashford 1995, Doz 1996, Inkpen and Currall 2004). It will become clear that some alliance partners walk the path of the alliance faster than others. They increase their bargaining power in some way: they might for example learn faster than others. Such difference in pace can be disadvantageous for the stability of an alliance. The powerful partner can eventually dominate the alliance and even force other members to commit themselves more to the alliance than the dominant partner. This gives us understanding of why an alliance might fail, which is also an underexposed area of study (Barringer and Harrison 2000).

The rest of this article is organized as follows. In section two I will review insights from strategic alliance literature on both the dynamics of alliances and on the concept of bargaining power. It will become clear how the balance of bargaining power in an alliance can modify during the alliance. The social dilemmas are introduced in section three. I will present both the prisoner's dilemma and the game of chicken in a 2-person version, an n-person version, and a dynamic n-person form. All of this will be combined in section four. There, I will first explain how players can find a way out of a social dilemma in an equal alliance. Furthermore, I will explain what happens in the alliance if one of the partners gains more power than the others. I end with a conclusion.

2. Insights from strategic management literature: The evolution of alliances and inequalities in alliances

In this section I will provide insights from strategic management literature on the evolution of alliances and the concept of bargaining power. First I will present a small overview of the literature on the life-cycle of an alliance (De Rond and Bouchiki 2004) by describing the alliance as a dynamic process which consists of different (artificial) phases which each characterize a different life stage of the alliance. I will deepen out the phase of the evolution of the alliance and will focus here mainly on the internal tensions that an alliance faces during its life. Subsequently, I will present insights on the bargaining power of alliance members and how changes in bargaining power takes place.

In general, an alliance starts with preparations at firm level. Spekman, Isabella, MacAvoy, and Forbes III (1996) label this phase as the vision phase: firms envision a competitive advantage that could only be achieved with a partnership. Firms can have different strategic reasons to form a partnership, and these motivations have been documented extensively in the literature (see for example Barringer and Harrison 2000, Das and Teng 2003). After preparation at firm level, the partner selection takes place in which firms look for potential partners which meet their envisioned needs (Hitt et al. 2000, De Ridder, Van Deemen, and Bell 2004). The preparation stages are being pursued by the formation of the alliance. In this phase, potential partners sound each other out by what Spekman et al. (1996) call value and voice. Value refers to looking for common ground in the form of past working experiences, corporate culture, and mutual respect. Voice means the ability to articulate one's vision and communication with the potential partner. These value and voice phases eventually convert to formal negotiations: the partners have to agree on the coordination of the alliance and on the amount of investments each partner will make. Once formal agreements have been arranged, the alliance takes off. Van de Ven and Walker (1984) consider an interorganizational relationship as "... a gradual dynamic process that is continually shaped and recreated by the actions and symbolic interpretations of individuals" and the relation is "... likely to emerge incrementally with small transactions..." (Van de Ven and Walker 1984, 604). Ring and Van de Ven (1994) develop this framework further by studying the dynamics of interorganizational relationships as repetitive stages of negotiation, commitment, and execution. This cycle is repeated several times during the emergence, evolution, and dissolution of the relationship. Others that have studied the dynamics of alliances are Khanna, Gulati, and Nohria (1998), Das and Teng (2002), Zeng and Chen (2003), and Inkpen and Currall (2004).

During the alliance it is key for alliance managers to adapt to both external and internal pressures on the alliance (Spekman et al. 1996). External pressure has been understudied in the literature as compared to internal pressure, since internal pressure is (more) controllable by a firm and can hence be managed more easily. Considering an alliance as a set of contradictory competing internal forces gives a dialectic view on alliances (De Rond and Bouchiki 2004). While De Rond and Bouchiki present the most complete list of such competing internal forces, Das and Teng (2000) elaborate extensively on three of these internal tensions: rigidity versus flexibility, short-term versus long-term orientation, and cooperation versus competition. The balance between cooperation and competition is important in an alliance, since this balance can disturb the stability of an alliance (Zeng and Chen 2003). Zeng and Chen state that each partner in an alliance faces the choice to either behave completely in favor of the alliance and contribute as much as possible (cooperate) or to behave opportunistically (compete). Each partner in a multi-partner alliance individually prefers to behave opportunistically, which leads to an undesired outcome for the whole alliance. By presenting an alliance this way, Zeng and Chen adopt the social dilemma approach.

An alliance reaches its decisive stage if the partners (alone or together) decide to re-define the relationship in its current form. This will lead to instability, which can be defined as "... a major change that was *unplanned* and *premature* from the perspective of either one if the partners ..." (Inkpen and Beamish 1997, 182). Instability of an alliance will eventually lead to its termination. The termination of alliances has been studied extensively in the literature, as termination of alliances is related to the performance of alliances. Note however that the termination of an alliance does not always imply that the alliance has failed (Ring and Van de Ven 1994).

To conclude, an alliance can be studied as a process which the partners go through: from preparation to formal formation and from evolution to termination. Relations between these phases have also been under study. An important issue is what accounts for the stability of an alliance, as this is eventually related to the duration and success of an alliance. From the literature it appears that the *internal stability* between partners is important: partners should balance the internal forces within the alliance, as the balance between cooperation and competition. Although Das and Teng (2000) argue *why* the partners should balance these internal forces they do not describe *how* these forces can be balanced. Zeng and Chen (2003) do offer insights in how to maintain the balance between cooperation and competition. However, a drawback in their article is that they consider each partner as sharing an equal amount of power in the alliance, while in real life partners do not often have exactly the same amount of power in an alliance. That leaves us with the question how an alliance evolves if partners are not equally dependent. To study inequality between alliance partners, I will use the theory of bargaining power. The theory of bargaining power has so far mainly used the perspective of learning and has focused on joint ventures. In order to broaden this scope, I will develop an argument in this article by assuming that a change in the bargaining power between partners changes the game which they are playing, and hence their behavior during the alliance. Even though such changes may remain unnoticed for a while by the members of an alliance they do affect the outcomes of an alliance.

Each partner in an alliance has a certain amount of bargaining power. Yan and Gray (1994) provide two theoretical perspectives on bargaining power: the bargaining theory and the resource dependence theory, which together lead to three dimensions of bargaining power. Firstly, the stakes a partner has in a relationship influence the bargaining power of that partner. A stake refers to the amount of dependency a partner has on a relationship and its outcomes. The second dimension has to do with the alternatives available to a firm. If a firm has many alternatives to reach its specific goal, the firm has a high bargaining power. According to the resource dependence theory, power of a partner depends on the amount of critical resources a firm brings in the relation. The more a relation depends on the critical resources of a firm, the more powerful this firm will be. Note the difference between the first and the last dimension: the partner depends on the alliance versus the alliance depends on the partner.

Given these three dimensions, alliances can be or develop towards either a balanced or dominated alliance. In a balanced alliance, the partners each have the same amount of bargaining power. A dominated alliance contains one member or a small group of members who have more bargaining power than the rest, and who dominate the alliance. In between these two extremes, a continuum is found in which alliances are more or less balanced or dominated. The initial balance of power in an alliance influences the way the alliance is managed and the way the partners organize their management control, and this again will influence the performance of an alliance. The initial bargaining power distribution can be altered by both external and internal factors (Yan and Gray 1994). Such (unexpected) changes in the bargaining power influence the further evolution of the alliance. The original agreements do not hold anymore and the organization of an alliance might be outdated. Such a shift in the bargaining power of an alliance can therefore be a source of instability for the alliance (Inkpen and Beamish 1997). Especially when the balance of power is tilted towards one party, participating can be disadvantageous (Barringer and Harrison 2000).

External factors that lead to such a shift are found at different levels of analyses: macro-, industry-, and firm-level (Huff, Huff, and Thomas, 1994). At macro level, demographic or economic changes, or new government policies might cause changes. Demographic and economic changes alter demand for certain products or services and may therefore lead to different stakes for organizations. Their interest in a specific alliance might decrease or increase. Also macro-developments like new technological innovations may make the alliance less dependent on a specific resource of one its partners and this partner loses bargaining power (Yan and Gray 1994). At industry level the group of participating firms and their strategies and performances can change. This may give one of the partners new alternatives (the second dimension of bargaining power), and hence new bargaining power, or vice versa. Finally, modifications at firm level outside of the scope of the alliance may influence strategic change: new ownership or leadership, change in performance or the portfolio of business. These mutations affect the first and last dimension of bargaining power: the dependence of a firm on the alliance and the dependence of the alliance on the firm.

Next to these external events, internal developments within the alliance itself can cause modifications to the balance of power. The keyword here is learning, as it is one of the most important determinants of bargaining power (Hamel 1991). By distinguishing between private and common benefits within an alliance, Khanna, Gulati, and Nohria (1998) explain the dynamics of learning alliances. This way, they recognize simultaneous cooperative and competitive behavior of alliance members and they describe the existence of asymmetry in the alliance. Inkpen and Beamish (1997) describe the process of differential learning in an international joint venture. At the start of a dyadic international joint venture both partners are dependent on each other: the local partner needs a new technology, organizational skills, and / or a good product from the foreign partner; and the foreign investor is dependent on the local market of the local firm. Over time, the acquisition of skills and knowledge of the partner decreases a firm's dependency in the relation and results in a shift in the bargaining power of the partners. Hamel's (1991) empirical data on international strategic alliances confirm that a difference in learning between partners may exist and that this results in a shift in the relative competitive positions of the partners. Asymmetric learning causes a shift in the bargaining power, and can moreover lead to a pattern of unilateral dependence. Without any intervention by the members, differential learning and its consequences will continue (Makhija and Ganesh 1997). The firm that is learning faster will even learn faster, and the firm will become less dependent, and gain more bargaining power. In the end, this will lead to dissolution of the relation. If one of the partners intervenes in this process, the relation can be renegotiated and new control mechanisms can be agreed on. According to Kumar and Nti (1998) differential learning may occur because partners have different absorptive capacities. Absorptive capacity is a firm's "... ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal 1990, 128).

Besides learning, an alliance meets more internal dynamics on its way, as can be seen in for example Ariño and De la Torre (1998), and Inkpen and Currall (2004). These internal dynamics go beyond the individual level of the alliance members and relate to the relational quality that develops between partners. Much literature has been devoted to the development of trust (see e.g. Inkpen and Currall 2004). Although one could argue that the blind trust a firm has on his partners gives these trusted partners more power, this argument is not as strong as the learning argument. Concerning trust changes takes place on the relational level, not so much on the dependency between partners. I will however not ignore that relational quality plays a role in the internal bargaining power dynamics between partners.

In sum, the balance of power, which exists at the start of an alliance, evolves during the course of the relation. Both external factors and internal factors (the learning of partners) affect the bargaining power. This way, one member or a small group of members can start dominating a balanced alliance, which will turn into a dominated alliance. The question that remains unanswered is what effect this radical change in an alliance has on its further evolution and stability. More specific, how will this affect players' behavior during the alliance? What happens to the balance of cooperation and competition as described before? We will model this situation by assuming that players move from one type of social dilemma game into another. Therefore, I will now introduce the theory on social dilemmas.

3. Social dilemmas: prisoner's dilemma and game of chicken

This section presents the game theoretic social dilemma approach, which I use to study changes in the power balance of an alliance and its effects on cooperation and competition. In this section, I will argue why I use a game theoretic approach to the introduced problem and I will introduce the prisoner's dilemma and the game of chicken. Of these two social dilemma games, the two-person and n-person versions are introduced, as well as the dynamic game form. The social dilemma approach is embedded in the theory of games. Game theory finds its origin in the seminal work of Von Neumann and Morgenstern (1953) and is a mathematical approach to study social interactions. The approach can be characterized by its abstract way of studying complex phenomena: details are neglected and hence one can focus on the essence of a phenomenon. Furthermore, a deductive method is generally used: carefully building a theory without generalizing empirical facts – in line with Popper's reasoning

(1968) – and testing empirical facts only after constructing a theory. For extensive studies of game theory, see e.g. Fudenberg and Tirole (1991) and Colman (1995).

The abstract way of reasoning of game theory is often considered a weakness of the approach (Colman 2003). The assumptions underlying game theory are strict and might not hold in real life. The assumptions might become suspect when examined in the light of differences between actors' cultural, national, and organizational backgrounds (Parkhe 1993b). Although game theorists have "repaired" some of these assumptions (see for example the work of Harsanyi (1967 and 1968) on incomplete information, and Taylor (1987) on altruistic behavior), they remain a consequence of the choice for game theory. Notwithstanding these strict assumptions insights from game theory can make a contribution to the field of business administration and more specific alliances (Camerer 1991, Saloner 1991, Furrer and Thomas 2000). The alliance research that has used game theory gives evidence of its merits (Hill 1990, Parkhe 1993 and 1993b, Axelrod, Mitchell, Thomas, Bennett, and Bruderer 1995, Zeng and Chen 2003). Also empirical testing of game theoretic models on alliances (see Parkhe 1993b and Axelrod et al. 1995) does not fully wipe out game theory. As Parkhe (1993b) concludes in his study "... game theory can prove to be extremely useful toward generating needed progress in the increasingly important phenomenon of global strategic alliances" (321), yet it "... cannot alone capture the rich complexity of real-world [global strategic alliances]." (320). Therefore, I will use game theory as a guiding framework which provides insights and structure to the analyses, but I will also use alliance literature.

In general, a social dilemma game models a situation in which individual and collective interests conflict (Colman 2003). In social dilemma games, players have complete knowledge of the structure of the game, i.e. they know each player's strategies and their payoffs. In a dynamic version of the game, the players know what has happened in previous rounds. Furthermore, it is important to note that players cannot make binding agreements. Within a game, players cannot form coalitions and together achieve a better payoff. This assumption rests on the idea that players are rational beings that only hunt their own preferences. In the world of business one could say that the firms playing the game of alliance formation remain above all independent firms aiming at a maximum profit for their own business (Hamel, Doz and Prahalad 1989, Barney 2002, Zeng and Chen 2003). A social dilemma can take different forms, depending on the specific payoff structure of the game. Here, I will use two forms: a prisoner's dilemma and a game of chicken. A prisoner's dilemma can be characterized by the fact that each player has an individual incentive to cheat on the other, which will always lead to a collective undesired outcome. A game of chicken holds if each player prefers to cheat under the condition that enough others do not cheat. If all players cheat, the results of the game would be catastrophic. Important is to force the others not to cheat, so that you can cheat.

The prisoners' dilemma (Luce and Raiffa 1957, Taylor 1987, Axelrod 1984, Parkhe 1993b) is perhaps one of the most famous parts of game theory, and hence also one of the most elaborated parts. It has not only been studied in a basic way (2-person and static), but the game has been extended to an n-person version and the dilemma has been made dynamically. Both sophistications have matured the dilemma extensively and have given new insights in analyzing cooperation. The game has been applied to a diversity of problems: e.g. collective action problems in general (Taylor 1987), the situation in the trenches of the First World War (Axelrod 1984), cooperation in biological systems as for example the copulating behavior of the sea-perch (Axelrod 1984), price cheating in cartel agreements in oligopolies (Mansfield 1997), and the 'innovation-to-organization dilemma' (Kok and Van Deemen 2005). In this section I will first discuss the simple version of the dilemma (i.e. the simultaneous moving of the players in just one game). We will subsequently deal with the n-person variant and the dynamic version.

In table one a two-player prisoner's dilemma is given. The payoffs in the table refer to the utilities the individual players receive for that outcome of the game: it is their subjective evaluation of an outcome. The table shows how the reasoning behind the game works: each player wants to achieve the highest payoff (4). If both however play the strategy attached to this payoff, they will both play competition. The result will then be (2,2). In that case, the players would have preferred to end in mutual cooperation (3,3), the desired collective outcome. If one on them is however playing cooperation, it will be advantageous for the other to play competition: 4 is more than 3 and players do not make

binding agreements. This incentive is so strong that the game equilibrium is the collective undesired outcome (2,2).

| | | Player 2 | | | |
|----------|----------------|------------------|-------|----------------|-------|
| | | <i>Cooperate</i> | | <i>Compete</i> | |
| Player 1 | Strategies | | | | |
| | | <i>Cooperate</i> | x,x | 3,3 | z,y |
| | <i>Compete</i> | y,z | 4,1 | w,w | 2,2 |

in which $y > x > w > z$

Table 1: A prisoner's dilemma

The game of chicken (Taylor 1987, Colman 1995) resembles the prisoner's dilemma: both are social dilemmas and both have the same general structure. Although the game of chicken has not been studied as extensively as the prisoner's dilemma, the insights that have arisen from the sophistications of the prisoner's dilemma can also be used for the game of chicken. The game of chicken gets its name from a game in which two cars drive in full speed towards each other. If both keep driving straight ahead both drivers will crash: the worst that can happen. If one of them "chickens out" and deviates, the other one wins and receives the highest payoff. The other gets the sucker payoff for being the chicken. In table two a formal two-player game of chicken is given. It is seen that result (1,1) is the worst outcome for both players. Note the difference with the prisoner's dilemma: there the worst that can happen is that a player plays cooperation while its opponent plays competition. In a chicken game, the payoff (3,3) will not be the result of the game: even though both players have an incentive to play cooperate (this gives them 4). If the other player plays compete, his opponent will prefer to play cooperate, otherwise he will end up with the worst payoff (1). Hence, this game has two equilibriums (2,4) and (4,2). Which of the two equilibriums will be the result of the game cannot be forecasted within the boundaries of game theory. Extra information on the strengths of the players found outside of the game can help to solve the game. In a game of chicken it is important for the players to express a credible threat. If the opponent is convinced that you will never chicken out (i.e. you will never play compete), the other one is forced to cooperate in order not to end with (1,1). Making a credible threat by being dominant in the game is hence crucial. This way, the dominant player can bind himself irrevocably to non-cooperation and compel the other player to choose cooperation.

| | | Player 2 | | | |
|----------|----------------|------------------|-------|----------------|-------|
| | | <i>Cooperate</i> | | <i>Compete</i> | |
| Player 1 | Strategies | | | | |
| | | <i>Cooperate</i> | x,x | 3,3 | z,y |
| | <i>Compete</i> | y,z | 4,2 | w,w | 1,1 |

in which $y > x > z > w$

Table 2: A game of chicken

3.1 N-person versions of prisoner's dilemma and game of chicken

Often, more than two players are trapped in a social dilemma as the game of chicken and the prisoner's dilemma, in which case the two-person approach does not suffice. Therefore, both games can be represented in an n -person way². The strategies available to the players do not change, nor is the payoff structure in principle different. However, the payoff a player gets depends in the n -person version both on his own strategy and on the number of *other* players choosing to cooperate.

To define the n -persons prisoner's dilemma two (sufficient and necessary) conditions are needed (Taylor 1987). First, it holds that if at least one other player plays cooperation, a player receives more when he is playing competition than when he is playing cooperation. This is the incentive each player has to play compete. Secondly, if everybody in the game plays cooperation the payoff for each individual is higher than when everybody plays competition. In other words, for each player competition dominates cooperation (assumption one), but every player prefers the outcome (coop., coop., coop., ...) to the outcome (comp., comp., comp., ...). This denotes the dilemma: every player has a dominant strategy, but if every player uses this dominant strategy the outcome is collectively inferior.

Two (sufficient and necessary) principles are also needed to define the n -persons version of the game of chicken (Taylor 1987). The first principle says that each player prefers the outcome in which he plays competition and all the others play cooperation. Note the difference with the first assumption of the prisoner's dilemma. Secondly, as in the prisoner's dilemma, it also holds that each player prefers universal cooperation to universal competition. Here, as in the 2-person version one can find the incentive to commit oneself to competition. Each player prefers compete if enough others cooperate and players prefer cooperate if too many compete. How many would be needed for such a turn, is dependent on the filling in of the game. In other words, each prefers the others to do the work (play cooperate), but if nobody did the work (all played competition) the results would be disastrous.

3.2 A dynamic approach

Both Taylor (1987) and Axelrod (1984) have further developed these social dilemmas by repeating them through time. The assumption is that the same players play the same game an *infinitely* number of times. The players have to determine their super-strategy for all these games before the first game starts. To model the future a *discount factor* is introduced, as used often in economic research. This discount factor is a real number between 0 and 1 that denotes the worth of future payoffs at this moment. If the discount factor is very small, future payoffs will currently be worth very little. If on the other hand the discount factor is big, the players will already appreciate future payoffs right now.

In dynamic versions of both the prisoners' dilemma and the chicken game players can each round choose to play cooperation or competition. To determine a super-strategy for every subsequent sub-game, players can use unconditional and conditional super-strategies. In the first case, a player plays always cooperation or always competition, irrespective of what the others do or have done in previous rounds. Players can nevertheless also punish and reward their opponents by playing a more advanced conditional strategy, which reacts to other players' moves³.

For the prisoner's dilemma, it has both mathematically (Taylor 1987) and experimentally (Axelrod 1984) been proved that the *tit-for-tat* super-strategy generates the highest pay-off for players *under the condition* that the discount factor is high enough. The tit-for-tat rule simply puts that one should start

² Hence, this extension from 2- to n -person social dilemmas refutes Zeng and Chen's (2003) critique that "... the iterated two-person prisoner's dilemma is much narrower in scope than the social dilemma and generally cannot represent multi-partner alliances ..." (Zeng and Chen 2003, 590). By using an n -person social dilemma game theory is capable of representing a multipartner alliance.

³ Recall that players have information on what moves have been played in previous rounds, which they can use to determine a new strategy in each sub-game.

with playing cooperation and that one should only play cooperation in the subsequent rounds if all the others have played cooperation in the round before. Tit-for-tat contains the idea of an eye for an eye, a tooth for a tooth: if you are nice to me I will be too, but as soon as you cheat on me, I will do so too. The strategy is in essence nice: it starts with cooperation, and will only deviate from this if the others do too. These results are important, because they offer a way out of the dilemma. In the one-shot version of the game, the players would always end up with universal competition. It is however proven that by an infinite number of repetitions of the prisoner's dilemma, the participants can realize universal cooperation as long as they value the future enough.

Game theorists have not made such a in-depth analysis of the dynamic n-person chicken game yet. Since this is not the aim of the paper I will neither deepen this. In short however, in the chicken game their discount factor should also be high enough to value the future. Also, it is important to convince the others that you will play competition in order to force the others to play cooperation. Exactly in a dynamic version of the chicken game this credibility and power exposure becomes important. Not only the threats matter now, but also the real behavior matters, which can be seen in the moves that have been played in the subsequent rounds. Being powerful can enforce the others to play cooperation.

3.3 Changing from game

It could happen that a game starts with certain players and a certain payoff structure, but changes during the game into another game (Parkhe 1993b). A prisoner's dilemma could change into a chicken game if the universal competition situation gets evaluated as the worst situation. The major difference between a prisoner's dilemma and a chicken game is the payoff in the universal competition situation. In a prisoner's dilemma, this situation is evaluated less dramatic than in a chicken game. There, it is the worst that can happen. And consequently, some players are always forced to play cooperation in order not to end in the most dramatic situation. The change can also take place the other way round: from a chicken game to a prisoner's dilemma.

Besides changes for all the players of the game, Taylor (1987) also discusses hybrid games in which parties play different games. In a two-player version one of the players can be in a chicken game and one in a prisoner's dilemma.

Changes from one game to another have not yet been studied extensively in game theory. This raises questions like: how could players end up in another game: what causes such a change? And what are the consequences on the result of the game? In the next section I will use insights from strategic alliance literature to fill in some of these questions and provide a more comprehensive theoretical framework for the relation between bargaining power, dynamics, and cooperation versus competition.

4. The evolution of alliances

To recapitulate, I am interested in the dynamics of interorganizational relationships. For the stability of alliances it is important that partners maintain a good balance between cooperation and competition during the relation. Previous research based on a social dilemma approach has demonstrated how to maintain such a balance (Zeng and Chen 2003). Here, I will examine what influence a fundamental change in the balance of power has on the maintenance of the cooperation – competition balance. The balance between competition and cooperation will be – in line with Zeng and Chen – modeled with a game theoretic social dilemma. I will explain the meaning of such an application at the start of this section. Next, the question is how the game can change during an alliance, and what will be the result of such a change. I end this section with a small example of the development of an unequal alliance.

An alliance can be modeled as a social dilemma, like the prisoner's dilemma and the chicken game: once an alliance has set off, its members have the choice to play cooperation or to play competition. Cooperation can be interpreted as a commitment of a member to the alliance: a cooperative member will invest as promised, and he will behave in such a way as to optimize the alliance. The commitment here is mostly intended as commitment in concrete action, it does not have a relational dimension like

the development of trust or faithfulness. A competitive member will focus on its own personal gain: how to get as much out of the alliance with investing as little as possible. The learning race view of Hamel (1991) coincides with this sort of behavior. A stress on formal control in the alliance is also typical for competitive behavior (Inkpen and Currall, 2004). In an alliance the risk of opportunistic behavior is always present and hence the risk of getting an unstable alliance (Hamel, Doz, and Prahalad 1989, Parkhe 1993, Dussauge, Garrette, and Mitchell 2000, Zhang and Li 2001). The often informal character of alliances, the lack of the creation of a new entity in an alliance, the lack of a central authority, and the flexibility of an alliance are factors that increase the likelihood of opportunistic behavior (Barringer and Harrison 2000). In spite of the development of trust and the existence of formal control mechanisms, which may indeed lower the risk of opportunistic behavior, this risk can never be completely gone (Kogut 1989, Inkpen and Currall 2004). In sum, all the partners of an alliance have an incentive to behave in such an opportunistic way. However, if all the members of an alliance behave opportunistically this will undermine the alliance and the alliance will be doomed to fail. An alliance in which sustainable cooperation and commitment dominate will be more successful, although it is no guarantee for a successful alliance. To find a way out of this dilemma, I will present two games which model this situation: the prisoner's dilemma (equal partners in a balanced power alliance) and the game of chicken (unequal partners in a dominated alliance).

4.1 A way out of the dilemma in a balanced power alliance: prisoner's dilemma

In a prisoner's dilemma each player has the incentive to behave opportunistically, which will lead to a collective undesired outcome (alliance instability). The dynamic version of the n-person prisoner's dilemma has however shown a way out of the dilemma. If partners value the future enough (if their discount factor is high enough) it pays for them to play the tit-for-tat strategy (Axelrod 1984, Taylor 1987). Two concepts from game theory need more explanation and application to alliances: the discount factor or the shadow of the future and the tit-for-tat strategy.

Firms in an alliance have a high discount factor if they currently evaluate the alliance as valuable and if it currently matters to them. Indicators for such a high discount factor are a high frequency of interactions, an intensive alliance, and a shorter time span between alliance outcomes assessments (Parkhe 1993b). Inkpen and Currall (2004) describe that cooperative behavior between firms increases with the length of the relationship. At the start of an alliance trust between partners may be absent, consequently partners will be more suspicious of each other. As interactions however start taking place and the alliance develops, trust may increase and opportunistic behavior may decrease. This indicates that partners that have a prospect of a lengthy relationship will value the future higher than partners in an ad-hoc short-term alliance. Hence, combining this with the insights from game theory leads to the conclusion that partners that value the future of the alliance, will be more likely to play cooperation and behave in a committed way to the alliance (see also Zeng and Chen 2003). This gives the first proposition:

Proposition 1: Members of a balanced alliance which value the future of the alliance will be more likely to commit themselves to the alliance, and hence a more stable alliance will be formed.

The tit-for-tat strategy refers to reciprocal behavior in an alliance. This means that if the other partners behave in an optimizing way for the alliance, the focal partner will do so to. As soon as the others start with opportunistic behavior, the focal partner will follow them. Reciprocity refers to the potential to reward and penalize behavior of the other member-firms. According to Kogut (1989) it is fundamental to the achievement of long-term cooperation: a high norm of reciprocity in a joint venture will increase the stability of the joint venture. Adopting the tit-for-tat strategy or the norm of reciprocity in an alliance means more partners will increase their commitment to the alliance (Zeng and Chen 2003).

Proposition 2: Members of a balanced alliance that adopt the norm of reciprocity will be more likely to commit themselves to the alliance, and hence a more stable alliance will be formed.

Other authors have also given ways – sometimes outside the boundaries of game theory - to get out of the dilemma; I will shortly mention them here. Taylor (1987) and Parkhe (1993b) mention the advantages of small groups: a small group is more likely to play cooperation. Social incentives are

more effective in small groups; and identification in and recognition with a big group is more difficult. Parkhe (1993b) and Zeng and Chen (2003) point furthermore to the positive effect of a change in the payoff structure of an alliance, for example by imposing certain formal control systems. It will also be more likely to achieve a cooperative alliance if relational quality between the partners has arisen. This implies better communications, more trust, the development of fair norms, a high identification with the alliance, and perceiving a high individual impact (Zeng and Chen 2003, Inkpen and Currall 2004).

These conclusions are drawn on the basis of the assumption that all partners are equal in the alliance. However, firms with more bargaining power in an alliance will be able to influence the control mechanisms more than less powerful partners. Using this power might violate the development of mutual commitment in an alliance (Madhok and Tallman 1998). Inkpen and Currall (2004) confirm that control by one partner increases the likelihood of opportunistic behavior in the alliance. To study the relation between an unequal balance of power and the opportunistic behavior in an alliance, I will use the game of chicken.

4.2 The dilemma with unequal partners: game of chicken

In a prisoner's dilemma, the situation of one player playing cooperation while the others play competition is the worst that can happen to this cooperative player. In a game of chicken on the other hand, the collective competition situation is the worst that can happen. A participant in the game of chicken would prefer to save the game by playing cooperation. This creates inequality in the game: some players will be forced to save the game, while others can behave opportunistically. This makes a game of chicken more suitable to model an unequal alliance: the dominant alliance member can impose a strategy on the others. The question, which remains unanswered in the theory underlying the game of chicken, is who will be the participants that play cooperation. This is where insights from the alliance theory come in, and more specific the idea of bargaining power. Adding information about the power of the players participating in a game of chicken could help to solve the game towards one solution.

In the section on unequal alliances it became clear that partners in alliances can have a different amount of power. The bargaining power of a partner in an alliance is caused by his dependence on the alliance, the dependence of the alliance on this partner, and the amount of alternatives available to this partner. This bargaining power can change through both external and internal circumstances. There are different mechanisms how a firm gains more bargaining power during the alliance. First, this firm might obtain more alternatives outside of the alliance (external developments). Secondly, the alliance can for some external reason become more dependent on this dominant partner. The third mechanism is that a partner can become less dependent on the alliance. Besides external reasons, the learning that takes place in an alliance can also cause this. If one of the partners learns faster than the others, this firm will need the alliance less in the future. To a lesser degree the development of relational quality between partners plays a role. Here, I will assume that one of the firms in the strategic alliance gains more bargaining power than the others: he will develop towards a dominant partner.

Proposition 3: A member of a balanced alliance can gain more bargaining power during the alliance by three mechanisms: (1) learning and a decrease of his dependency on the alliance; (2) an increase in the alternatives available to him; (3) an increase in the dependency of the alliance on this partner.

This way, a balanced alliance becomes a dominated alliance.

Dominance by one of the partners means that this firm can impose more power on the alliance and can force the others member-firms to play cooperation in subsequent rounds of the game. The dominant partner can distance himself from the alliance and start "abusing" the alliance by opportunistic behavior. He is able to play the game this tough for two reasons. First, the dominant player needs the alliance less: he has more alternatives, and / or is less dependent on the alliance. And second, the dominated players are trapped in the game and they are forced to play the game as the strong member now dominates it. The dominated members have no alternative moves available: they are still more dependent on the alliance, have less alternatives, and the alliance is less dependent on them. If they would also behave opportunistically, the alliance will fail and this is even a worse option for these dominated firms. Also, trying to outlearn the dominant partner is not an option, since the game they

have arrived at forces them to commit to the whole alliance to “save the day”. Furthermore, the dominated players will not make binding agreements with each other to counter balance the dominant partner. Each firm is individually rational and will maximize his own gains. If the dominated partners could form a counter-balance coalition against the power of the dominant member, why could not each individual firm for himself decide to ally with the powerful member: this will take him much less effort. Or, if all the other small members form a counter coalition, I can stay out of it and free-ride on their success. Since each dominated member has these incentives, no counter-coalition will form.

Proposition 4: In a dominated alliance, the dominant partner will start behaving himself more and more opportunistically, which forces the others to commit themselves more and more to the alliance.

Inkpen and Currall (2004) and Madhok and Tallman (1998) arrive at a different conclusion by reasoning that exercising power in an alliance abuses trust between partners. The dominated partners will notice this maltreatment and they will react by undermining the alliance by also behaving opportunistically. Reasoning from this perspective of trust and relational quality hence gives a different conclusion than the one I have arrived at in proposition four. The relational quality approach however neglects the power the dominant actor can exercise over the other alliance members. This power gives the dominant firm the ability to dictate the other members. The trust approach ignores that the dominated members will first be forced to commit themselves to the alliance to avoid an alliance failure. I do recognize that they will feel personally offended by the dominant partner’s behavior and would prefer to pay him back. As my analysis however shows, they are forced to commit themselves to the alliance to prevent a worse situation to occur.

The changes described in propositions three and four take place via an incremental process which evolves during a substantive period of time. In an equal alliance one of the partners can become more powerful and gradually a more and more unequal alliance emerges. Modeling an alliance as a social dilemma means modeling an alliance as a super-game with small sub-games in which the members of an alliance interact. Compare this to the vision of Van de Ven and Walker (1984) and Ring and Van de Ven (1994) in which an alliance is a gradual dynamic process that emerges incrementally with small transactions. A change from an un-dominated to a dominated alliance does not take place radically, and the consequences of this change will also emerge gradually. A change in the type of game takes place: the first rounds will be a prisoner’s dilemma and this will gradually change into sub-games of game of chicken. Slowly, the increasing dominant partner will undermine the alliance more and more by playing competition instead of tit-for-tat. This will eventually force the others to repair this and behave in a committed way to the alliance by playing cooperation. Since the game has changed into a chicken game, they are forced to play cooperation, because staying to tit-for-tat will now lead to a dramatic outcome. If this process has taken place for a while, this unequal development of the alliance will get out of hand and will cause instability in the alliance. As noted before, such changes in an alliance may remain unnoticed by the partners for a while. Eventually, it will become clear how the alliance has evolved and in that case firms might intervene. Partners may repair the inequality by renegotiating the alliance (like described in Ariño and De la Torre 1998) or terminating the relation. In sum, without a fruitful formal intervention and renegotiating of the alliance, the alliance will in the end be terminated.

Proposition 5: An equal alliance that transforms into a dominated alliance will without any formal intervention become unstable and will fail in the end.

To end this section I will shortly discuss the example of the alliance between Rover and Honda (Pilkington 1996, Carr 1999) to illustrate the presented insights. Already in 1979 the British Rover and the Japanese Honda cooperated for the first time to produce a car together. This initial cooperation was extended and the two partners formed an alliance that lasted until 1994. Each partner had its own motivations to form the alliance: Rover was suffering from financial problems and wanted to renew its range of cars; for Honda the alliance was a way to enter and settle on the European market. During their alliance Rover and Honda produced several models of cars together. These subsequent models can be seen as subsequent steps or social dilemma games within the alliance. During the alliance and the development of models Rover became more and more dependent on the technological knowledge and designers expertise of Honda. While Rover lacked to learn from Honda, Honda learned to operate

on the European market. The alliance relied furthermore heavily on the technological knowledge of Honda. Consequently, Honda's bargaining power increased along the way. The game changed from the more equally oriented prisoner's dilemma to the game of chicken in which one player (Honda) gets the upper hand. The subsequent phases of the alliance got more and more advantageous for Honda. The contracts were for example arranged in such a way that parts for constructing the cars produced in the alliance had to be bought at Honda. In sum, Honda started playing competition and the game changed into a chicken game. Rover was however "trapped" in the alliance: it was highly dependent on the alliance, it had - considering its financial situation - not many alternatives, and it had not learned a lot from Honda. This lack of bargaining power forced Rover to play cooperation and the alliance got more and more disadvantageous for Rover.

5. Conclusion

Two evolutionary paths of alliances have been under study here: the evolution of an equal and an unequal alliance. In an alliance in which partners have an equal amount of power, partners face a social dilemma. They are exposed to the problem of opportunistic behavior: each member of the alliance has an incentive to behave opportunistically in the alliance, while this will lead to a collective undesired outcome. Being cooperative in the alliance means that the others in the alliance will abuse this cooperative member and behave opportunistically (Zeng and Chen 2003). Modeling such a situation with an n-person dynamic prisoner's dilemma and using insights from game theory can help partners to establish a cooperative and stable alliance. Alliances in which partners have a high value of the future and in which partners behave reciprocally will maintain cooperation and establish stability in the alliance.

If one of the partners of the alliance however gains more bargaining power than the others an unstable alliance will evolve. An increase in a firm's bargaining power means that the dependence of this firm on the alliance has decreased (which can happen via learning) and / or the dependence of the alliance on the firm has increased. The increase of alternatives for a firm can also increase his bargaining power. Both internal and external events can cause such changes. Alliances, in which one partner gets more and more powerful, slowly become dominated alliances and can in that case be better modeled with an n-person dynamic game of chicken. The powerful player can permit to behave opportunistically and can force the dominated players to behave in a cooperative way. If the dominated firms also behave opportunistically, they will subvert the whole alliance. They have no bargaining power to force or convince the dominant partner to change its behavior. Eventually this process will undermine the alliance: the proportions between the partners will cause instability. If no intervention and renegotiation takes place, the alliance will terminate. This analysis shows how an alliance can evolve from a stable cooperative arrangement to an unstable alliance. If one of the partners gains so much power that it can fully dominate the alliance and the behavior of the other partners, his opportunistic behavior will eventually undermine the process. This shows how the development of a dominated alliance ultimately leads to an unstable alliance.

Although this study has offered new insights in the evolution of alliances and alliance instability, the approach also has its limitations. Game theory has provided a good structure to analyze the evolution of balanced and dominated alliances. To build the analysis I have used assumption as complete information, uniform actors, and rational behavior of players. These quite strict assumptions might be violated in real life as a diversity of studies has already shown (see for example Colman 2003). Although this study has accepted and used these strict assumptions, game theory can handle more realistic structures: in that case the analysis can become extremely complex. Furthermore, by focusing on the dilemma between cooperation and competition in an alliance and the use of game theory the study has neglected other elements of alliance evolution, like personal ties between people in firms and alliance capability. I have for the most part also neglected relational elements as trust. As already became clear earlier, reasoning with taking such relational elements into account might give different conclusions.

References:

- Ariño, A. and J. de la Torre (1998). Learning from failure: towards an evolutionary model of collaborative ventures. *Organization Science*, 9(3): 306-325.
- Axelrod, R. (1984). *The Evolution of cooperation*. Basic Books, New York.
- Axelrod, R., W. Mitchell, R. Thomas, D. Bennett and E. Bruderer (1995). Coalition-formation in standard-setting alliances. *Management Science*, 41(4): 1493-1508.
- Barney, J. (2002). *Gaining and sustaining competitive advantage*. 2nd Edition. Prentice Hall, Upper Saddle River, NJ.
- Barringer, B. and J. Harrison (2000). Walking a tightrope: creating value through interorganizational relationships. *Journal of Management*, 26 (3), 367-403.
- Camerer, C. (1991). Does strategy research need game theory?. *Strategic Management Journal*, 12: 137-152.
- Carr, C. (1999). Globalisation, strategic alliances, acquisitions and technology transfer. Lessons from ICL-Fujitsu and Rover-Honda and BMW. *R & D Management*, 29(4):405-422.
- Cohen, W. and D. Levinthal (1990), Absorptive capacity: a new perspective on learning and innovation, *Administrative Science Quarterly*, 35(1): 128-152.
- Colman, A. (1995). *Game theory and its applications in the social and biological sciences*. 2nd Edition. Butterworth Heinmann, Oxford.
- Colman, A. (2003). Cooperation, psychological game theory, and limitations of rationality in social interactions. *Behavioral and brain sciences*, 26: 139-198.
- Das, T. and B. Teng (2000). Instabilities of strategic alliances: an internal tensions perspective. *Organization Science*, 11(1): 77-101.
- Das, T. and B. Teng (2002). The dynamics of alliance conditions in the alliance development process. *Journal of Management Studies*, 39(5): 725-746.
- Das, T. and B. Teng (2003). Partner analysis and alliance performance. *Scandinavian Journal of Management*, 19, 279-308.
- De Ridder, A., A. van Deemen and J. Bell (2004). A multi-dimensional model of resources and alliances formation. *Presented at Workshop "The Dynamics of Cooperation" Center for Strategy and Alliances*, Nijmegen, October 2004.
- De Rond, M. and H. Bouchiki (2004). On the dialectics of strategic alliances. *Organization Science*, 15 (1), 56-69.dissdi
- Doz, Y. (1996). The evolution of cooperation of strategic alliances, initial conditions or learning processes. *Strategic Management Journal*, 17 (summer), 55-83.
- Dussauge, P., B. Garrette and W. Mitchell (2000). Learning from competing partners: outcomes and duration of scale and link alliances in Europe, North America and Asia. *Strategic Management Journal*, 21, 99-126.
- Fudenberg, D. & J. Tirole (1992). *Game theory*. MS: MIT Press, Cambridge.
- Furrer, O. and H. Thomas (2000). The rivalry matrix: understanding rivalry and competitive dynamics. *European Management Journal*, 18(6): 619-637.
- Hamel, G., Y. Doz and C.K. Prahalad (1989). Collaborate with your competitors - and win. *Harvard Business Review*, January-February, 133-139.
- Hamel, G. (1991). Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal*, 12: 88-103.
- Harsanyi, J. (1967 / 1968). Games with incomplete information played by "Bayesian" players, part I-III. *Management Science*, 14(3, 5, 7): 159-182, 320-334, 486-502.
- Hill, C. (1990). Cooperation, opportunism, and the invisible hand: implications for the transaction cost theory. *The Academy of Management Review*, 15 (3): 500-513.
- Hitt, M., T. Dacin, E. Levitas, J. Arregle, and A. Borza (2000). Partner selection in emerging and developed market contexts: Resource-based and organizational learning perspectives. *Academy of Management Journal*, 43(3): 449-467.
- Huff, A., J. Huff, and H. Thomas (1994). *The dynamics of strategic change*. In: Daems, H. and H. Thomas. Strategic groups, strategic moves and performance. Pergamon, Page 31-62.

- Inkpen, A. and P. Beamish (1997). Knowledge, bargaining power, and the instability of international joint ventures. *The Academy of Management Review*, 22 (1), 177-202.
- Inkpen, A. and S. Currall (2004). The Coevolution of trust, control, and learning in joint ventures. *Organization Science*, 15(5): 586-599.
- Kogut, B. (1989). The stability of joint ventures: reciprocity and competitive rivalry. *The Journal of Industrial Economics*, 38(2): 183-198.
- Khanna, T., R. Gulati and N. Nohria (1998). The dynamics of learning alliances: competition, cooperation, and relative scope. *Strategic Management Journal*, 19: 193-210.
- Kok, R. and A. Van Deemen (2005). An n-person repeated prisoners' dilemma approach to the ad-hoc/sustained product innovation trade-off. *Working paper series on research in relationship management*, RRM-2005-08-STR. Radboud University Nijmegen, Nijmegen School of Management
- Kumar, R. and K. Nti (1998). Differential learning and interaction in alliance dynamics: a process and outcome discrepancy model, *Organization Science*, 9(3): 356-367.
- Luce, R. and H. Raiffa (1957). *Games and decisions, introduction and critical survey*. Dover Publications, New York.
- Madhok, A. and S. Tallman (1998). Resources, transactions and rents: managing value through interfirm collaborative relationships. *Organization Science*, 9(3): 326-339.
- Makhija, M. and U. Ganesh (1997). The relationship between control and partner learning in learning-related joint ventures. *Organization Science*, 8(5): 508-527.
- Mansfield, E. (1997). *Micro-economics: theory / applications*. 9th edition. W.W. Norton & Company. New York.
- Parkhe, A. (1993). Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. *The Academy of Management Journal*, 36(4): 794-829.
- Parkhe, A. (1993b). Partner nationality and the structure-performance relationship in strategic alliances. *Organization Science*, 4(2): 301-324.
- Pilkington, A. (1996). Learning from joint venture: the Rover-Honda relationship. *Business history*, 38(1): 90-114.
- Popper, K. (1968 ed.). *Conjectures and refutations*. Horper Row.
- Ring, P. and A. van de Ven (1994). Developmental process of cooperative interorganizational relationships. *The Academy of Management Review*, 19(1): 90-118.
- Saloner, G. (1991). Modeling, game theory, and strategic management. *Strategic Management Journal*, 12: 119-136.
- Smith, K., S. Carroll and S. Ashford (1995). Intra- and interorganizational cooperation: toward a research agenda. *The Academy of Management Journal*, 38 (1), 7-23.
- Spekman, R., L. Isabella, T. MacAvoy, and T. Forbes III (1996). Creating strategic alliances which endure. *Long Range Planning*, 29(3), 346-357.
- Taylor, M. (1987). *The possibility of cooperation*. Cambridge University Press, Cambridge.
- Yan, A. and B. Gray (1994). Bargaining power, management control, and performance, in United States-China joint ventures: a comparative case study. *The Academy of Management Journal*, 37(6): 1478-1517.
- Van de Ven, A. and G. Walker (1984). The dynamics of interorganizational coordination. *Administrative Quarterly*, 29(4): 598-621.
- Von Neumann, J. and O. Morgenstern (1953). *Theory of games and economic behaviour*, 3rd edition. Princeton University Press, Princeton.
- Zeng, M. and X. Chen (2003). Achieving cooperation in multiparty alliances: a social dilemma approach to partnership management. *The Academy of Management Review*, 28(4): 587-605.
- Zhang, Y. and H. Li (2001). The control design and performance in international joint ventures: a dynamic evolution perspective. *International Business Review*, 10: 341-362.