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DECISION RIGHTS IN INTERFIRM RELATIONSHIPS: A REVIEW AND INTEGRATION OF THE LITERATURE

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ABSTRACT

The questions of existence of firms and the optimal governance mode choice in interfirm relationships have usually been framed in terms of an optimal structure of equity investments. A firm is said to exist when productive assets are owned centrally by one legal entity while in the market, assets are owned by separate legal entities. This emphasis on ownership of assets has led to a relative neglect of the second important aspect of governance mode choice: the decision-making structure. Building on the seminal work of Nobel Prize Laureate Joseph Stiglitz, this paper surveys various factors that may affect the optimal choice of a decision-making structure and builds a unified model that predicts both sides of the governance mode choice: optimal equity investments and optimal decision-making structures. The main focus of this paper is on the neglected question of optimal governance mode choice. The main finding is that many aspects of optimal choice of decision-making structures, and therefore of an optimal governance mode choice, have nothing to do with opportunism.

Keywords: alliances; decision making structures; governance modes.

INTRODUCTION

Allocation of decision rights is an important aspect of the governance of strategic alliances. Alliance partners may disagree on the best course of action and it is important who has the right to make the final decision in a specific situation. Without a clear allocation of decision rights, the partners may engage in protracted arguments and bargaining every time a decision has to be made. Such arguments and bargaining are not only costly but may also damage the relationship between the partners, which may further decrease the benefits that the partners obtain from collaboration (Doz, 1996, Faems et al., 2008).

There are two ways that decision rights may be allocated in an alliance. One is based on contractual agreements. During the contract drafting stage, the partners may delineate certain situations and assign decision rights in these situations to a specific partner. For example, in an alliance between a biotech company and a pharmaceutical firm, the contract may assign the rights to introduce new compounds to the biotech company; it may also assign the rights to make the final decisions on which compounds will be commercialized to the pharmaceutical firm.

The second way to allocate decision rights is by using the mechanism of equity ownership. According to the theory of incomplete contracts (Hart and Moore, 1990), equity investments assign residual rights to the owner of the majority stake. Equity ownership as a mechanism of allocating decision rights is likely to work only in the case of equity joint ventures (JVs) with unequal equity stakes. When the partners own equal stakes in the JV or when the alliance does not involve significant equity investments, the partners have to resort to either contractual allocation of decision rights or bargaining.

It is intuitive that the allocation of decision rights in an alliance may affect the outcomes for the alliance as a whole and for each partner. Therefore, an important question is what factors influence the optimal allocation of decision rights in alliances and other inter-firm collaborative arrangements and what consequences the partners will have to face when they deviate from such optimal allocation. However, the topic of optimal allocation of decision rights in alliances has not received much attention so far. Part of the reason is that researchers of governance in alliances have mostly concentrated on the ownership of equity in alliances as a governance mechanism. Equity ownership in alliances is relatively easy to measure which means that empirical studies using equity ownership in alliances and joint ventures are easier to conduct. While it is important to know who owns equity in an alliance, alliance governance cannot be reduced to the question of equity ownership. First, equity ownership determines residual rights

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(Hart and Moore, 1990) but not contractually specified rights. Therefore, equity ownership does not completely determine an important aspect of alliance governance – allocation of decision rights. Second, as Stiglitz (1989, 1991) noted, any governance mode chosen for an alliance must solve two problems: (1) alignment of incentives of the partners and (2) allocation of decision rights. The chosen equity arrangement is likely to affect both the incentives and the allocation of decision rights, but it does not completely determine either. Incentives and decision rights are also affected by the specifics of the contract between the partners and the relational dynamics that depend on trust and cultural differences. For example, it may be optimal for the owner of the majority stake to cede certain decision rights to the other partner if that partner has critical tacit knowledge (e.g. in the case of a biotech-pharmaceutical alliance, the biotech company may retain key decision rights that pertain to the R&D activities if it is the one that possesses critical technological knowledge).

This paper aims to build a theory of optimal allocation of decision rights in alliances. I build a prescriptive model that offers an optimal allocation of decision rights and then note the differences between the prescriptive model and the descriptive model that summarizes the findings of empirical studies. I suggest explanations that are meant to reconcile the differences between the prescriptive and the descriptive models of allocation of decision rights in alliances. The prescriptive model is based on the assumption of rational utility maximizers. The descriptive model is based on empirical results and describes the behavior of real-world companies. In order to build the prescriptive model, I use transaction cost economics (TCE), the knowledge-based view of the firm (KBV), real options theory, complexity theory, and the theory of incomplete contracting. I rely on the following factors in predicting optimal allocation of decision rights: opportunism, uncertainty, and knowledge differences between the partners. In order to build the descriptive model, I use resource dependence theory and prospect theory. I rely on the concepts of bargaining power, biases in decision making, and differentials in status as predictors of the allocations of decision rights observed in the real world.

This paper is structured as follows. In the next section, I build a theory of optimal allocation of decision rights in strategic alliances and joint ventures (JVs). Then, I survey the literature on allocation of decision rights in alliances and JVs and note cases when the observed allocation deviates from the optimal. I describe factors that may have contributed to these observed deviations and note the consequences of these deviations.

Optimal allocation of decision rights: The prescriptive theory

In this section, I build a theory of optimal allocation of decision rights in alliances. I first develop recommendations for allocation of decision rights based on different theories and then examine these recommendations together to arrive at a unified model.

Optimal allocation of decision rights based on Transaction Cost Economics (TCE)

The main premise of TCE is that markets do not work perfectly and that market exchanges result in transaction costs (Coase, 1937). Transaction costs would be zero if all market participants had perfect information. Under perfect information, the parties could write a comprehensive contract that would delineate all possible developments and specify appropriate actions in all circumstances. Imperfect information results in incomplete contacts which in turn necessitate allocation of decision rights in situations that could not be prescribed in the contract (Hart and Moore, 1990, 1999). The less complete the contract, the more important the allocation of decision rights becomes.

According to TCE, the main sources of transaction costs are opportunism, asset specificity, uncertainty, and transaction frequency (Williamson, 1985; Carter and Hodgson, 2006). Williamsonian TCE places a special emphasis on opportunism as a factor that predicts high costs of transacting between two parties. Opportunistic parties will try to exploit each other's weaknesses by engaging in cheating, shirking, and holdup. Allocating decision rights to a specific partner may mitigate these costs. For example, one partner may contractually retain key decision rights if opportunism hazards from the other partner are high.

A prescriptive model specifies optimal allocation of decision rights according to the economics of alliance collaboration. The possible theoretical foundations of a prescriptive model are theories that deal with the questions of value creation and capture in alliances: TCE, KBV, complexity, uncertainty and risk, environmental

change, and incomplete contracting. A descriptive model deals with the allocation of decision rights in the real world and their deviations from the optimal allocation according to the prescriptive model. The possible theoretical foundations for a descriptive model are: the behavioral theory of the firm, prospect theory, and the bargaining perspective based on resource dependence theory, status, and power. I expect the descriptive model to differ from the prescriptive model because the prescriptive model is based on efficiency considerations (which allocation of decision rights is optimal?) while the descriptive model shows how the real-world allocation of decision rights differs from the optimal (with negative performance consequences for the alliance participants). I also argue that the greater the difference between the optimal and the actual allocation of decision rights, the worse the performance of the alliance and of the partners in the alliance.

The governance mode choice affects the performance of a strategic alliance via two mechanisms: (1) an incentive structure and (2) a decision-making structure (Stiglitz, 1989, 1991). An incentive structure affects the direction of effort of the alliance partners. Dissimilar incentives are likely to reduce cooperation and make each partner pursue their own private benefits (Khanna, Gulati, and Nohria, 1998) at the expense of the common benefits or the private benefits of the other partner(s). Aligning the incentives of the partners is likely to result in greater cooperation and increased effort at maximizing the common benefits, which may positively affect the success of the alliance.

A decision-making structure is a set of rules that determine who will make decisions in what situation and how those decisions will be made. The most basic examples of decision-making structures are hierarchies, polyarchies, and committees (Sah and Stiglitz, 1986, 1988). In a hierarchy, each member of the decision-making body must approve a decision before it is accepted. In a polyarchy, any one member of the decision-making body may approve a decision for it to be accepted. In a committee, a certain percentage of all members of a decision-making body must approve a decision before it is accepted.

The Problem

The choice of a governance mode in *combined ventures* (R&D partnerships, long-term supply agreements, strategic alliances, joint ventures, etc.) is an important theoretical and empirical question. Governance mode choice affects outcomes of combined ventures (Leiblein, 2003; Sampson, 2004). High failure rates of strategic alliances (Park & Ungson, 2001) could be partially attributed to problems with choosing a proper governance mode.

Many studies view the problem of optimal governance mode choice as the choice between equity-based and non-equity-based participation (e.g. Pisano, 1989; Das & Teng, 1996; Hennart, 1988; Gulati, 1995; Dyer, Kale, & Singh, 2004; Oxley, 1997). Other authors study the contracts that the parties design in order to protect their interests and ensure collaboration (e.g. Parkhe, 1993; Poppo & Zenger, 2002; Reuer & Arino, 2002, 2006, 2007; Gong et al., 2007). Equity investments and contracts are examples of *governance mechanisms* that are available to the parties in a combined venture. Thus, an ostensible part of the governance mode choice consists of choosing the salient characteristics of the combined venture: equity investments and specific contractual stipulations. What often goes unstated are the problems that these governance mechanisms are supposed to address.

According to Stiglitz (1989, 1991), any governance mode must solve two problems: (1) setting up an appropriate incentive structure; (2) designing an appropriate decision-making structure. An incentive structure is important because the parties' interests are not necessarily aligned when the parties form a combined venture. A properly designed incentive structure will ensure that the parties are trying to reach the same goals or at least are not working at cross purposes. A decision-making structure is important because contracts are incomplete (Hart, 1988; Hart & Moore, 1999) and not every contingency can be written into a contract. The parties have to agree how decisions will be made when uncertainties arise and who will make those decisions.

The theory of incentive alignment is relatively well-developed. Transaction cost economics (e.g. Williamson, 1985; Hennart, 1988, 1991) and property rights theory (e.g. Alchian & Demsetz, 1972; Hart & Moore, 1990, 1999) argue that incentive alignment is more easily achieved when ownership of equity is involved. In addition, contracts usually include monitoring and enforcement provisions that impose costs for breach of agreement and thereby promote cooperation (Ryall & Sampson, 2009; Faems et

al., 2008). Less is known about the antecedents and consequences of the choice of a decision-making structure (DMS). Meanwhile, a DMS is an important part of a governance structure because it affects the success of a combined venture by

What determines the optimal choice of a DMS in inter-organizational relationships? There could be two answers to this question. One answer invokes the concepts of opportunism and exchange hazards. According to this logic, more centralized, hierarchical decision-making structures can be used to mitigate partner opportunism. Centralized decision making may naturally follow from centralized ownership of assets (Das & Teng, 1996) which is used to curb opportunism (Williamson, 1991a; Foss, 1996a). In addition, centralized decision making may be contractually specified. Thus, we would expect to see longer and/or more detailed contracts in situations where exchange hazards are high. This line of reasoning has received solid empirical support (e.g. Masten & Crocker, 1985; Crocker & Reynolds, 1993; Deeds & Hill, 1999; Arrunada, Garricano, & Vazquez, 2001; Ryall & Sampson, 2009).

The second function of a DMS is coordination and adaptation. In many alliances and other similar combined ventures, two or more parties undertake a joint project to develop and/or market a new product or service. It is difficult to specify *ex ante* all the tasks that need to be completed and all the actions that need to be taken to complete those tasks. In addition, it may be unclear how to evaluate certain events and actions of the partners because their short-term or long-term consequences may be difficult to assess. The parties need to have a structure that will assign decision-making rights to a specific party under certain circumstances or, alternatively, will determine procedures for joint decision making. Allocation of decision rights and joint decision making may matter even without opportunism (Saxton, 1997). However, currently there is no theory about when decision making should be coordinated or centralized and when it is optimal to decentralize decision making without invoking the concept of opportunism.

Organization theory (OT) has traditionally been concerned with the question of decision making. The "rational" school in early OT (e.g. Taylor, 1911; Fayol, 1949) emphasized the design of an organization as a machine that serves a well-defined purpose or goal. The work of all parts of this machine was supposed to support the movement of the whole toward reaching the goal. As a result, any organization was to be led by managers who determined what needed to be done and who would do it. Thus, the rational school in OT suggested centralized decision making as a necessary condition of a well-functioning organization.

A later approach took a more "natural" view of organizations. This approach, represented by the works of Mayo (1945), Barnard (1938), and Selznick (1949, 1952), concentrated on the more "human" side of organizations. "Natural systems" theorists considered some decentralization essential because it promoted worker motivation and participation. Lawrence and Lorsch (1967) suggested that the rational design and centralized decision making were more appropriate in stable environments while the natural design and decentralized decision making were more appropriate in changing environments.

Thus, organizational theorists were among the first to suggest that centralization or decentralization of decision making may depend on the characteristics of the environment in which the organization functions. Later research in management and strategy has added to the list of factors and environmental characteristics that may influence the choice of a decision-making structure. Factors that may affect the choice of a DMS include knowledge substitution (Conner & Prahalad, 1996), the need for quick decision making (Eisenhardt & Bourgeois, 1988; Marengo, 1992), integration of knowledge (Grant, 1996), uncertainty and risk (Sah & Stiglitz, 1986, 1988; Kim & Burton, 2002), and complexity (Thompson, 1967; Simon, 1962). None of these factors necessarily invoke opportunism as an explaining factor. All of them ultimately rely on the presence of bounded rationality (Simon, 1945) of the participants in the transaction.

The present paper is an attempt to give an answer to the question, "What factors affect the choice of a decision-making structure in combined ventures?" I will review the existing literature and synthesize the main conceptual arguments and empirical findings, outline unexplored areas, and suggest avenues for future research.

DMS choice: Opportunism vs. other factors

I would like to begin the discussion of DMS choice with a brief review of opportunism-related factors. This discussion will serve as a baseline to compare the findings of the opportunism-based theories with non-opportunism-based arguments.

A standard recommendation for dealing with opportunism in combined ventures is centralized or common ownership of assets. It has been argued that asset ownership would not matter in a "moral utopia" (Foss, 1996a) in which no-one is ever opportunistic. In the real world where opportunism is present, common asset ownership serves to mitigate opportunism by making the investor a residual claimant. Even if the investor is not the sole owner of the venture, he/she will be less likely to engage in opportunistic value appropriation because such actions may decrease the value of his/her investment. In addition to residual claimancy, ownership of assets establishes residual control rights (Grossman & Hart, 1986; Hart & Moore, 1990). The owner of an asset has the rights to use this asset in any legally permitted way that has not been explicitly specified in the contract. The stipulations of the contract complement the residual rights of control to determine the decision-making structure. In many combined ventures, the contract that the parties have signed will limit the residual rights of control of the asset owner and give some rights to use the asset to the other parties. The contract may also specify more general decision rights regarding the operations of the alliance or joint venture. For example, the contract may impose limits on what some of the parties are allowed to do (Leblebici & Shalley, 1996).

Existing research lends support to the notion of decision making rights as a factor that can mitigate opportunism. In a sample of contracts between auto manufacturers and Spanish auto dealers, Arrunada, Garicano, & Vazquez (2001) found that the auto manufacturer had more decision rights when there was greater potential for opportunism and moral hazard of the dealer. In a similar argument, Das and Teng (1996) suggested that joint decision making inherent in many equity alliances could serve to restrain partner opportunism in addition to the rewards and control systems. In general, the decision-making rights that come with ownership work to mitigate opportunism. In terms of optimal contract design, a party will tend to retain more decision-making rights if it is more vulnerable to the other parties' opportunism (Arrunada, Garicano, & Vazquez, 2001).

Decision-making structures without opportunism

The concept of decision making is inextricably tied to the concept of choice. If no choice exists, no decisions need to be made. Intuitively, it seems clear that decision making will matter more in situations where there are more options available to the parties, where the options are more varied, or where consequences of the various choices are more significant. The existence of options may have nothing to do with opportunism. There are several literature streams that explore non-opportunism-related antecedents of decision-making structure choice.

Decision making and knowledge substitution

Conner and Prahalad (1996) suggested that differences in the knowledge of the various parties may be one reason why decision making needs to be centralized. The focus of their paper was on the knowledge substitution effect that occurs when one party ("the manager") has valuable knowledge that is difficult to transfer to another party ("the employee"). Conner and Prahalad (1996) argued that in this case, it will be optimal for "the employee" to sign an open-ended employment contract that delegates the decision-making rights to "the manager." In employment contracts, the valuable knowledge of "the manager" is substituted for the relatively less valuable knowledge of "the employee." Now, "the manager" does not have to explain why something needs to be done – he/she may simply order "the employee" to do something according to "the manager's" decision.

The logic that Conner and Prahalad (1996) use is intriguing and potentially insightful, yet it breaks down under close scrutiny. In particular, the implicit assumption that Conner and Prahalad make is that "the employee" is not rational. If "the employee" believes that "the manager" has superior knowledge, it will be rational for "the employee" to submit to "the manager's" directions without any employment-type contract. If "the employee" does not believe that "the manager" has superior knowledge, it is not clear why the rational "employee" would sign such an open-ended employment-type contract in the first place. Thus, irrational behavior of "the employee" needs to be assumed: "the employee" believes that "the manager" has superior knowledge but refuses to follow "the manager's" instructions without having signed

a formal employment contract. Barring irrational behavior, the only reason for "the employee" to sign such a contract would be managerial control over some of the assets that are necessary to do the job[1] in the presence of opportunism hazards (cf. Holmström & Roberts, 1998). Thus, knowledge substitution alone is not sufficient to explain the existence of formal employment-type contracts.

Despite the failure of Conner and Prahalad's (1996) theory to explain the existence of employment contracts, their reasoning is applicable to the choice of a decision-making structure. In particular, their theory predicts that it is optimal to allocate decision making rights to the party that has critical, inalienable knowledge (Hart & Moore, 1990)[2]. If this critical knowledge is difficult to transfer to other parties (e.g. because it is tacit), decentralized or consensus-based decision making does not make sense. Decentralized decision making in such situations would result in worse decisions due to inferior knowledge of other parties (Geanakopoulos & Milgrom, 1991; Jensen & Meckling, 1995). Consensus-based decision making may also result in protracted negotiations in which each party will try to convince others of the superiority of its solution. The only complication of centralized decision making is how to determine whether any one of the parties have critical knowledge.

Decision making under environmental and task uncertainty

Another reason why decision making structures may matter without opportunism is uncertainty that stems from a lack of perfect information about the world. Pioneering research in this direction was done by Sah & Stiglitz (1986, 1988). They studied stylized firms making decisions about what projects to adopt. The key feature of those projects was a lack of perfect information about their true value. Sah & Stiglitz (1986) studied hierarchies and polyarchies as their decision-making structures. A hierarchy is a structure in which the project is approved if each of the N decision makers in the firm approves it. A polyarchy is a structure in which the project is approved if any one of the N decision makers in the firm approves it. A polyarchy makes decisions in a decentralized fashion while a hierarchy presumes that a proposal is passed to the top of the corporate ladder until every decision maker approves this proposal or one decision maker rejects it. In their 1988 paper, Sah and Stiglitz also introduce a consensus-based structure ("committee") that approves a proposal if n members out of all N members of the committee accept the proposal ($1 <= n <= N$). Polyarchies in general accept the greatest number of proposals. Hierarchies accept the smallest number of proposals. The acceptance rates of committees decreases with an increase in n. The reverse side of the acceptance rate is the quality of accepted proposals. The average quality of proposals accepted by a hierarchy will be the highest; the average quality of proposals accepted by a polyarchy will be the lowest. A committee will accept higher quality proposals on average with an increase in n while the number of accepted proposals will decrease.

When might it be beneficial for a strategic alliance or a joint venture to use a hierarchy-like decision-making structure? Hierarchies described by Sah and Sliglitz minimize the acceptance rate of bad proposals. This will be the most valuable when the cost of making a mistake is very high, for example in the aerospace industry. On the other hand, a decentralized decision-making structure (a polyarchy) will be adopted when it is costly for the partners to let a "good" project escape their field of vision while the cost of accepting a "bad" project is not very high. Polyarchies maximize the number of projects approved. Such structures might be adopted in alliances that engage in basic or exploratory research where the goal is to explore the maximum possible number of different projects.

Another factor that may affect the adoption of a more hierarchical or a more polyarchical structure is the expected quality of the projects. If the average potential project is expected to be of low quality, the hierarchy is the best structure because it will weed out a greater number of "bad" projects. If the average potential project is expected to be of high quality, a polyarchy may be the most efficient structure because it will retain a greater number of "good" projects. In addition, the level of uncertainty regarding the potential quality of the projects is likely to be positively related to the use of hierarchical decision making. Well-defined projects that are expected to yield predictable payoffs can be

[1] The manager may be the owner of the assets or an agent of the owner. The important fact is that the manager controls the assets that the employee needs to do the job.

[2] It may be difficult to ascertain which party has critical knowledge. However, I will ignore this complication in order to concentrate on DMS choice in principle.

chosen in a decentralized way while poorly-defined projects with highly uncertain payoffs are likely to be chosen hierarchically.

This line of reasoning has received some empirical support. For example, Macher (2006) found that poorly-structured problems were more likely to be solved hierarchically in a sample of semiconductor manufacturers. Similarly, Lerner & Malmendier (2010) studied partnerships between research-based biotech firms and financing pharmaceutical firms. They found that the financing firm was more likely to have unconditional termination rights if there was no specifiable lead product at the outset. While this latter result may be explained using the concept of opportunism (the financing firm held key decision rights to guard against potential shirking of the biotech firm), it is also consistent with the idea that key decisions will be centralized when severe uncertainty is present. Colombo & Delmastro (2004) found that delegation of decision making to plant managers in large companies was positively related to the size of the company and the number of levels in the corporate hierarchy. This finding is consistent with the idea that polyarchical decision making is best when there are more decisions (due to information overload of top managers) and with the previously discussed idea that decision making should be delegated when the top managers do not have all the necessary knowledge.

The importance of the research by Sah and Stiglitz (1986, 1988) for this discussion lies in the fact that the decision-making structures studied by Sah and Stiglitz did not use the concept of opportunism. The performance differences that emerged among the decision-making structures in their models were due to differences in the quality of projects and the uncertainty regarding the incoming information. Thus, Sah and Stiglitz were among the first researchers who formally showed how the choice of a decision-making structure may result in performance differentials without invoking the concept of opportunism.

Further work on the importance of decision making structures was done by Kim and Burton (2002). Using modeling techniques similar to those employed by Sah and Stiglitz (1986, 1988) , Kim and Burton (2002) showed that the effect of centralization of decision making on the duration, cost, and quality of projects depended on task uncertainty. In particular, centralized structures resulted in longer project times and higher costs under medium or high task uncertainty. However, under all levels of task uncertainty (low, medium, and high), centralized structures resulted in better quality of decisions (the difference was very large under medium and high task uncertainty). These results further confirmed the importance of decision-making structures in situations of environmental and task uncertainty even when opportunism is not an issue.

Decision-making in rapidly moving markets

Sometimes, the value of a decision may greatly depend on the speed at which the market is moving. Making a well-considered, high-quality decision may be less important than making an acceptable decision quickly. Fast-paced markets will most likely demand fast decision making. The more decision makers are involved in the decision, the more time the decision will likely take. A hierarchy similar to one described by Sah and Stiglitz (1986) may be counterproductive in fast-paced markets. A project has to be evaluated by all levels of the hierarchy before it is approved. A polyarchy requires only one decision maker to approve a project. Thus, polyarchies may be more suitable in fast-paced environments than hierarchies.

Hierarchies and polyarchies described in Sah and Stiglitz (1986, 1988) are not the only possible decision-making structures. Decision making could be centralized at the top of the organization or alliance or delegated to the individual parties. According to the results of Wally and Baum (1994), centralization of decision making was positively related to the speed of decision making in a sample of York County, Pennsylvania manufacturers. One reason for that could be politics that may play a prominent role in decentralized firms (Eisenhardt & Bourgeois, 1988). Also, Radner (1992) argued that decentralization of decision making leads to a loss of control which may be detrimental in fast-paced markets.

Based on simulation models, Marengo (1992) found that in stable markets, centralized structures outperformed decentralized structures initially; then the difference disappeared. In a regularly changing environment, the decentralized structure outperformed the centralized structure. Finally, in a randomly changing environment, the centralized structure outperformed the decentralized structure initially. Then, the difference diminished but did not disappear. Marengo's models involved agents learning

about the states of the world. Based on incoming information about the success of past actions, agents modified their existing rules and generated new ones. The difference between the centralized and decentralized structures was in the presence of direct ties between "the shop level" and the environment in the decentralized structure, while in the centralized structure, it was the central management only that had access to information from the environment. Marengo's results suggest that not only the speed of change but also the presence or absence of pattern in change may affect the choice of optimal decision-making structures, and that centralized decision making has certain advantages even though it may reduce the amount of information processed by the organization.

Decision-making structures and integration of knowledge

Grant (1996) argued that an important function of the firm is integration of knowledge of its individual members. In all but the smallest firms, information and knowledge are decentralized (Radner, 1992). Any rational decision is based on certain information[3]. A problem with firms, alliances, and joint ventures is that the person making the decision does not usually have full information. What is more, the necessary information may be dispersed throughout the organization. In order to make a decision, the decision maker may need to (1) ascertain who has the relevant information, and (2) obtain the necessary information from the party or parties that have it. These two problems are different and require different solutions.

Discovering a source of relevant information may be difficult. The most obvious way of looking for information is by asking the people whose duties directly relate to the information being sought. For example, if the CEO needs to make a decision about investing in a project and the information needed is the amount of liquid capital that the firm has, the CFO will be the most obvious source of this information. However, many decisions need information whose location in the firm is unclear. In this case, the decision maker may seek the input of many people. For example, the decision maker may specify the information need and announce it to all employees in the firm. If the decision maker has much of the relevant information and only needs a relatively small part to "complete the picture", it is likely that some of the newly acquired information will be relevant to making a good decision. Complications may arise if none of the people in the firm or alliance have the necessary information, if the information arriving from different people is fragmented and needs to be integrated prior to use, or if the decision maker cannot distinguish between relevant and irrelevant information due to his/her lack of relevant knowledge and absorptive capacity (Cohen & Levinthal, 1990).

Having received communication from different people in the organization does not mean that the decision maker will be able to make an informed decision. First, the information that was received must be interpreted (Daft & Lengel, 1986; March, 1987). It could be argued that information becomes knowledge only after it has been assimilated and integrated into the existing cognitive schemata of the person (Dretske; 1981; Nonaka, 1994). A decision maker may be unable to assimilate new information if (1) it is communicated in an unclear way; (2) it conflicts with the existing beliefs of the decision maker; (3) the person receiving the information does not have the absorptive capacity to assimilate it (Cohen and Levinthal, 1990).

In many firms, decision making is concentrated at the top of the firm, usually within the top management team (TMT). However, many other firms decentralize decision making. Generally, with an increase in the amount of information that the TMT members lack, decision making should be delegated to lower levels of the corporate hierarchy. The hypothesis that decision making will be more decentralized in firms with greater information dispersion has received empirical support (Breshanan, Brynjolfsson, & Hitt, 2002; Acemoglu et al., 2007).

Alliances and other combined ventures are not fundamentally different from single firms in this respect. It makes sense to decentralize decision making if key knowledge is possessed by different parties. This will be especially true if the knowledge in question is either difficult to communicate (tacit knowledge) or proprietary (knowledge that needs to be protected from leaks). On the other hand, if the combined venture is commonly owned (e.g. a joint venture) and if the managers of the combined venture possess the necessary information, it makes sense to centralize decision making at the top.

[3] If there is no information upon which to make a decision, then any decision is as good as another.

There has been less research on the effects of information decentralization in combined ventures on the choice of DMS compared to similar research within firms. This constitutes a potentially fruitful avenue of future empirical inquiry.

To summarize the arguments based on integration of knowledge: centralization of decision making will be positively related to centralization of key information and knowledge within the firm. The less knowledge the top managers have, the more decision-making rights will be delegated to the lower levels of the corporate hierarchy. The same argument applies to alliances. We will expect to see more centralization in decision making in alliances if the key knowledge is available to the people who are supposed to manage the alliance activities in a centralized fashion.

Decision-making structures and complexity

Many alliances are characterized by significant complexity that may make decision making difficult. There are different kinds of complexity; each of them will have a special effect on the choice of the decision-making structure.

The first kind of complexity that is described in the literature concerns uncertainty and the number of items that need to be considered before a decision can be made (e.g. Thompson, 1967; Astley et al., 1982). Due to the cognitive limitations of decision makers, very complex problems will tend to be solved in a decentralized fashion (Astley et al., 1982). This type of decision making is similar to distributed computing that is used in modern computer systems. When the amount of information that needs to be processed exceeds the capacities of a single computer, engineers can program several computers working in parallel so that each one of them will solve part of the problem. An obvious complication of using this approach in organizations is the need for subsequent integration of individually obtained solutions. It may happen that the individual decision makers have come up with incompatible or conflicting solutions. The problem of dealing with this type of complexity is conceptually similar to the problem of integration of knowledge dispersed throughout the organization that was discussed earlier.

The second type of complexity that exists in organizations and alliances arises because of the presence of multiple simultaneous interactions among the various decisions and activities. This type of complexity was first treated in substantial detail by Herbert Simon (1962). He suggested that the presence of multiple interactions among parts of the system complicated the task of management. Each change in the organization may have multiple consequences in other parts of the organization that are not always obvious. Thus, managing a complex system such as a firm or a combined venture will usually entail managing interactions of the resources as well as managing the resources themselves.

One approach to dealing with complexity is modularizing the organization. The concept of modularizing refers to containing most interactions within relatively compact modules and minimizing interactions among modules. Baldwin (2008) suggests that modularity of the organization will generally mirror modularity of the production technology. Decentralization of decision making is possible if the technology itself is modular. Then the firm or combined venture can break up the task into a series of subtasks and assign each of these subtasks to divisional managers or managers of each individual party in the combined venture. However, if the overall task cannot be broken apart into modules, the management of the entire firm or combined venture will have to take a much more active role in the coordination of efforts of the divisions or parties. The hypothesis that the structure of the organization will generally mirror the structure of the technology was suggested by Henderson and Clark (1990). Colfer and Baldwin (2010) surveyed the literature and found that the mirroring hypothesis has received good empirical support. In particular, within-firm tests found support for the mirroring hypothesis in 68 percent of all empirical tests, with another five percent of all tests providing partial support. Support was lower in across-firm studies (mostly alliances and joint ventures). 47 percent of all across-firm tests supported the mirroring hypothesis, with another 23 percent providing partial support. Notably, a total of 26 percent of all across-firm tests provided results that were contrary to the mirroring hypothesis (this number was 23 percent for within-firm tests). Overall, it could be noted that there is some evidence suggesting that organizational structure does mirror the structure of the problem that needs to be solved; however, this evidence is far from conclusive.

A similar approach to the problem of complexity was taken by Nickerson and Zenger (2004). They suggested that decomposability of the task will affect the optimal governance mode choice. If the task is decomposable, which means that it can be broken up into a series of independent subtasks, the optimal governance mode for solving this task will be market contracting with independent decision making by each party involved. If the task is nearly decomposable, which means that there are some non-trivial interactions among the sub-tasks, but their number is not too large, the optimal governance mode will be the authority-based hierarchy. Centralized decision making that is a characteristic of authority-based hierarchies will facilitate coordination of activities among the interdependent parts. Finally, if the problem is non-decomposable, which means that the sub-tasks interact very significantly, the optimal governance mode will be the consensus-based hierarchy. The main difference between consensus-based and authority-based hierarchies is the mode of decision making. In the authority-based hierarchy, decisions are made centrally by the top management of the firm or combined venture. In the consensus-based hierarchy, decisions are made via agreement of all the parties involved. The conceptual arguments of Nickerson and Zenger (2004) are based upon the need for communication and coordination as a function of interdependence. If interdependence is very low or non-existent, the parties do not need to communicate or coordinate their actions and decisions can be made in a fully decentralized fashion. If interdependence is present but not very high, the central management may play the role of an information-processing center that gathers information from all parties and makes decisions based upon it. The centralized decision making characterizing an authority-based hierarchy will serve to mitigate the problem of externalities that interdependent agents may impose on one another. Finally, when interdependence is very high, fully centralized decision making is likely to break down because the top management will be overloaded with information. The most obvious solution to this problem is partial decentralization of information processing (Radner, 1992) while decision making is done via consensus.

Summary of DMS choice as a function of various factors

In order to summarize the findings and arguments of the various streams of research, I would like to present the following table.

Table 1: Decision-making structure choice from the point of view of existing theories

Theory	Factors that affect DMS choice	Main predictions and findings	Representative papers
Transaction cost economics	Opportunism Bounded rationality	Decision making will be centralized when opportunism hazards are significant	Hennart (1988) Hennart (1993) Arrunada, Garicano, & Vazquez (2001)
Knowledge-based view	Knowledge substitution effect	Decisions will be made by one party if this party has valuable knowledge that is difficult to transfer to other parties.	Conner (1996) Conner and Prahalad (1996)
Decision making under uncertainty	Quality of proposals Risk tolerance Uncertainty Quality of problem definition	Decision making will be decentralized if making a mistake is not very costly and if the average quality of proposals is high. Decisions will be centralized if the problem is ill-defined and when there is a lot of uncertainty	Sah and Stiglitz (1986, 1988) Kim & Burton (2002) Macher (2006) Lerner & Malmendier (2010)
Decision making in changing environments	Speed and pattern of market change	Decisions will be centralized if high speed of decision making is important. Decisions will be centralized if the market is stable or changes unpredictably.	Eisenhardt & Bourgeois (1988) Wally & Baum (1994) Marengo (1992)
Integration of knowledge	The locus of knowledge in the organization	Decision making will be decentralized if the managers of the firm (alliance) do not possess information and knowledge necessary to make decisions.	Grant (1996) Breshanan, Brynjolfsson, & Hitt (2002) Acemoglu et al. (2007) Dewitt & Jones (2001)

Theory	Factors that affect DMS choice	Main predictions and findings	Representative papers
Complexity theory	Cognitive limitations; the number of items to consider	Cognitive limitations of decision makers will necessitate decentralized problem solving; the problem of coordination and integration emerges.	Thompson (1967) Astley et al. (1982)
	Interactions among sub-problems	Increasing interactions among sub-problems will drive centralization of decision making.	Simon (1962) Nickerson & Zenger (2004) Colfer & Baldwin (2010)

Based on Table 1, the antecedents of centralized decision making can be classified into three groups according to their locus:

(1) General environmental factors:
   a. Adverse environment that increases the probability of making mistakes and raises the cost of making a mistake
   b. A need for quick decision making (e.g. a fast-changing environment)
   c. High environmental uncertainty

(2) Transaction-specific factors:
   a. An ill-defined problem that the parties are trying to solve
   b. Many interactions among the sub-problems that need to be solved
   c. Relatively few decisions need to be made
   d. Opportunism hazards caused by the characteristics of the transaction (e.g. transaction-specific investments need to be made)

(3) Subjective, personal characteristics of the participants in the transaction
   a. Valuable, difficult-to-transfer knowledge that is owned by one party
   b. Opportunism hazards caused by characteristics of the parties (e.g. propensity of one of the parties to engage in opportunistic behavior)
   c. Low risk tolerance of the parties

According to this classification, centralized decision making can help solve or alleviate many different problems. All of these factors are based on the assumption of bounded rationality of the transacting parties that does not allow them to write and enforce a complete contingent claims contract in a cost- and time-efficient manner. As a result, a centralized authority that has the power to make decisions not specified in the contract might be beneficial.

As noted previously, the importance of a decision-making structure stems from contract incompleteness. If contracts were complete, a decision-making structure would not matter because the contract would specify every possible situation with every duty unambiguously assigned to specific parties. An incomplete contract makes DMS choice important. As a result, the more incomplete the contract, the more important the DMS choice becomes.

What conditions lead to contract incompleteness? In general, incomplete contracts are an outcome of bounded rationality of humans. The more severe the problems imposed by bounded rationality, the more incomplete the contract will be. Bounded rationality itself is a result of complexity and uncertainty that exceed the capacities of the human brain. Table 1 presented the factors that affect DMS choice. Most of those factors are related to uncertainty and complexity. According to Table 1, centralization of decision making will be beneficial if there is a lot of uncertainty and complexity in the environment, the transaction, and the knowledge of the participants. These same factors affect the extent of bounded rationality and contract incompleteness. In addition, as Nickerson & Zenger (2004) argued, complexity and uncertainty affect the chances of opportunistic behavior by affecting the appropriability regime.

As a result, we would expect to see more opportunistic behavior under severe uncertainty and complexity. Individual-level characteristics of the parties will affect opportunism (due to the varying propensities of different parties to engage in opportunistic behavior) and the extent of bounded rationality (due to the varying capabilities of different parties to process information and write effective contracts).

Based on the previous discussion, the following conceptual model can be drawn:

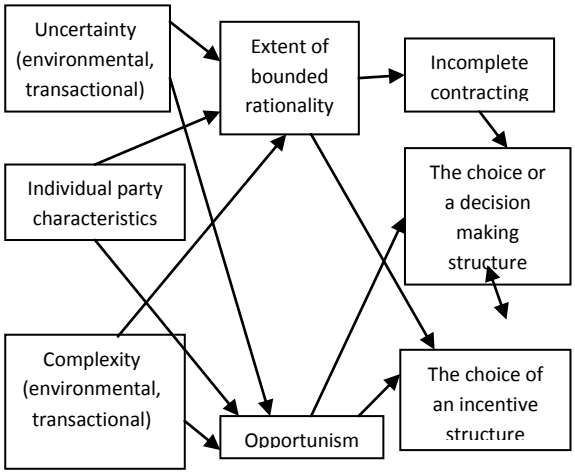

Figure 1: Theoretical model

DISCUSSION: SUMMARY AND FUTURE DIRECTIONS

The previous section provided various reasons why decision making matters in firms and alliances. Some theories, such as transaction cost economics and property rights theory, suggest that centralized decision making combined with an appropriate incentive structure may help contain opportunism. Other theories, such as the knowledge-based view of the firm, complexity theory, and environmental analysis, suggest that decision making may be important for reasons unrelated to opportunism. While none of these theories explain centralized ownership of assets, which is at the heart of the modern theory of the firm (Foss, 1996b), they help predict an important aspect of governance mode choice (Stiglitz, 1989, 1991) that the modern theory of the firm does not explain adequately. Having covered the conceptual arguments and empirical findings of the various non-opportunism-based theories of DMS choice, I would like to outline the existing blind spots and suggest areas for future research in these theories.

Empirical testing of theory is a vital part of scientific inquiry. However, some of the theories outlined above have not received adequate testing. There are various reasons for that. One reason is that governance has traditionally been associated with asset ownership modes. Much existing research has been devoted to determining when an alliance is likely to be equity-based as opposed to being strictly contract-based. While equity investments are important, they are not the only governance mechanism available to alliance parties. Other governance mechanisms are contracts and relational governance. All of these mechanisms can be used to align incentives and set up a decision-making structure (Stiglitz, 1989, 1991). This dual role of governance mechanisms may complicate empirical testing. In the world where opportunism exists, the use of centralization of ownership and more detailed contracts as means to align incentives may correlate with centralized decision making. Future researchers will need to separate decision making and incentive alignment as reasons for choosing a specific governance mechanism.

The second reason for limited empirical testing of non-opportunism-based theories is difficulty in measurement of certain key constructs. For example, according to the knowledge-based view, centralization of decision making is likely if one party possesses critical knowledge that is difficult to transfer to other parties. It may be difficult to measure possession of such knowledge given the fact that such knowledge is likely to be tacit. Likewise, complexity of the problem that the alliance is facing is not easy to measure. The concept of complexity is based on the existence of multiple interactions. Observing all interactions in a complex system is an almost impossible task. Many of those interactions are unclear even to managers and employees of the firm. Thus, researchers would have to resort to proxies, many of which are far removed from the phenomenon of complexity. Much existing research that uses the concept of complexity is based on formal modeling and simulations because these methods allow researchers to capture the relationships without the need to measure the constructs and control for multiple confounding factors (e.g. Levinthal, 1997; Rivkin and Siggelkow, 2003; Ganco and Agarwal, 2009; Aggarwal, Siggelkow, & Singh, 2011).

The goal of an optimal governance mode choice is improved efficiency and increased performance of the exchange transaction (Williamson, 1991b, 1999). One weakness of existing research on decision making structures is the relative lack of attention to performance consequences of DMS choice. While we may know when centralization of decision making makes sense, we do not know what happens when DMS choice differs from theory prescriptions. How much does overcentralization of decision making damage the performance of a combined venture? What about insufficient centralization? Which deviation from the optimal degree of centralization is more damaging? Future researchers should address these questions in the same way as previous researchers have

addressed costs of misalignment of ownership structures and exchange characteristics (e.g. Nickerson & Silverman, 2003; Sampson, 2004).

An important difference between combined ventures and single firms is the fact that alliance performance is not as easy to measure. While performance metrics are fairy well-established for single firms (e.g. ROA, ROE, operating margin, etc.), no such commonly accepted metrics exist for alliances and other similar combined ventures (see Arino, 2003; Lunnan & Haugland, 2008 for examples of measures of alliance performance). In particular, performance may be measured at the individual firm level or at the combined venture level. While performance at the level of the whole combined venture is important, managers of the individual parties will also want to know how the alliance contributes to the performance of their firms. Thus, researchers will be well advised to study performance differences between the partners as a result of adopting certain decision-making structures. In addition, researchers will need to find structural characteristics of combined ventures and the partnering firms that affect the relative performance of the parties (Hennart, 2006).

One way to approach the problem of performance is by constructing formal computer simulations of combined ventures. This approach was successfully used to study performance of individual firms as a function of complexity and other structural characteristics (e.g. Levinthal, 1997; Gavetti & Levinthal, 2000; Siggelkow & Rivkin, 2006). However, studies of alliances using computer simulations are yet to be developed (a notable exception is Aggawal, Siggelkow, & Singh, 2011). Nickerson & Zenger (2004) offered a knowledge-based theory of the firm and of optimal governance mode choice largely based on the findings of single-firm studies (e.g. Rivkin & Siggelkow, 2003). Their theory has not been tested in either the simulation framework or empirically. Simulation research is valuable because it may offer unique insights into behavior of complex systems such as alliances. Based on predictions derived from simulations, researchers may create more precise empirical models.

To sum up, the following topics need to be addressed in future research on decision-making structures:

1. Empirical testing of various antecedents of DMS choice. It is important to test for both opportunism-related and non-opportunism-related factors simultaneously so as to obtain more precise estimates of the effects of each.
2. Development of good measures of such constructs as complexity and criticality of knowledge.
3. Testing of consequences of DMS choice and of the misfit between the optimal DMS and the actual choice of the alliance participants.
4. Testing for performance consequences of DMS choice both at the level of the whole alliance and the individual firm level.
5. Developing simulation models to derive empirically testable predictions.

CONCLUSION

The choice of a decision-making structure in inter-organizational relationships does not always depend on the presence of opportunism. Existing modeling and empirical research supports the idea that centralization or decentralization of decision making may be affected by other factors such as uncertainty, complexity of the problem, risk tolerance, or the locus of critical knowledge in the organization. Transaction cost theory has traditionally concentrated on provision of incentives in the presence of opportunism as the primary goal of governance mode choice. The surveyed theories suggest that the choice of a decision-making structure, which is the other part of a governance mode choice, is also affected by factors unrelated to opportunism. Further research is needed to investigate when certain decision-making structures are optimal and how deviations from the optimal choice affect organizational performance.

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