

CHOICE AND PERFORMANCE OF GOVERNANCE MECHANISMS: MATCHING ALLIANCE GOVERNANCE TO ASSET TYPE

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Formal and relational governance mechanisms are used in strategic alliances to coordinate resources and mitigate the risk of opportunistic behavior. While recent work has shown that these approaches are not mutually exclusive, we understand little about when one approach is superior to the other. Using data on the governance choices and subsequent performance of alliances in the German telecommunications industry, we find that the optimal configuration of formal and relational governance mechanisms depends on the assets involved in an alliance, with formal mechanisms best suited to property-based assets and relational governance best suited to knowledge-based assets. Furthermore, a mismatch between governance mechanisms and asset type can harm the performance of the alliance. Our findings contribute to transaction cost economics, the literature on relational governance, and recent work studying their interaction.
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INTRODUCTION

Alliances allow firms to ‘pool imperfectly tradable resources in order to gain greater efficiency in the use of existing resources as well as opportunities to create new resources’ (Mitchell, Dussauge, and Garrette, 2002: 207). Successful alliances must accomplish two goals: coordinate the optimal combination of productive resources across parties and mitigate the risks of opportunistic behavior (Mitchell *et al.*, 2002; Nickerson and Zenger, 2004).

Work drawing primarily on transaction cost economics has argued that increases in exchange hazards will lead to the greater use of formal governance mechanisms (Mayer and Argyres, 2004;

Williamson, 1991). At the same time, a parallel literature has argued for the role of more relational governance mechanisms that enhance building of trust and social identification through, for example, establishing teams, frequent direct managerial contact, shared decision making and joint problem solving (Gulati, 1998; Uzzi, 1997). Recent work has shown that these approaches are not mutually exclusive (Hoetker, 2005; Poppo and Zenger, 2002). However, we understand little about when one approach is superior to the other.

In this study, we argue that the optimal configuration of formal and relational governance mechanisms in an alliance is contingent on the amount of property-based assets and knowledge-based assets involved. Property-based assets that are easily codified and transmitted will be more suited to formal controls. On the other hand, knowledge-based assets will be best suited to the use of relational governance mechanisms due to the inability to specify exact processes and outcomes in advance. Furthermore, we argue that a mismatch between

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the governance mechanism and the content of an alliance can harm the performance of a relationship.¹

Using data on alliances in the German telecommunications industry, we test the relationship between alliance content, the choice of governance mechanisms, and the performance of the alliance. Our hypotheses are broadly supported. Firms use more relational governance mechanisms in the presence of knowledge-based assets and more formal mechanisms in the presence of property-based assets. Relational governance mechanisms improve overall alliance performance to the degree that knowledge-based assets are involved, but actually impair performance when property-based assets are involved, pointing to a managerial quandary when alliances involve extensive assets of both types.

By introducing this critical contingency, our findings contribute to transaction cost economics, the literature on relational governance, and recent work studying their interaction. We advance transaction cost economics by showing that considering the nature of the assets in an alliance, rather than just the level of potential opportunism, allows more precise predictions about the appropriate governance for a transaction. We confirm the advantages of relational governance mechanisms in managing knowledge-based resources, but discover that their costs may be higher than previously appreciated. In combination, our findings are consistent with work finding that relational and formal governance mechanisms partially complement each other. However, they are not interchangeable. Extending prior work, we establish the distinct limitations of each, which make the optimal combination of governance mechanisms highly dependent on the content of the alliance.

We focus on asset type, which is only one of many dimensions characterizing an alliance, because aggregating, sharing, and exchanging valuable resources (assets) between firms are a key rationale for engaging in an alliance (Das and Teng, 2000). We also believe that a more extended analysis of resources (assets) has the potential to reduce the gap between transaction cost theory and the resource-based view concerning the boundary

decision, moving beyond the oft-criticized one-sided focus on appropriability as the major driver in the boundary choice decision (c.f. Gulati and Singh, 1998).

ACHIEVING COOPERATION AND COORDINATION IN ALLIANCES

Successful alliances must accomplish two goals: mitigate the risks of opportunistic behavior and coordinate the optimal combination of productive resources across parties (Gulati, Lawrence, and Puranam, 2005; Nickerson and Zenger, 2004). We consider potential opportunism first.

Opportunistic behavior can arise from several sources. In order to generate value, many alliances require one or both parties to make investments in support of the alliance that would be of less value in other applications. To the degree that one firm has made such relationship-specific investments, it is vulnerable to the other firm attempting to extract additional rents through holdup or other opportunistic behavior (Williamson, 1985). Specific assets can include property-based assets that are heavily customized to support the activities of the alliance, for example, a specialized stamping machine in the automobile industry (Klein, 1988) and specialized knowledge that would be of limited application outside of the relationship in which it was developed (Williamson, Wachter, and Harris, 1975).

Opportunistic behavior can occur even in the absence of specific assets. A firm can misrepresent its capabilities or resources during the negotiating process prior to the alliance (Akerlof, 1970). During the alliance, a firm can shirk its contracted responsibilities by failing to live up to its promised contribution of knowledge, effort, or other resources (Klein, 1980) or by applying the resources gained via the alliance to markets or products outside of the agreed-upon scope (Bresser, 1988; Caves, Crookell, and Killing, 1983).

Coordination of the alliance members' activities is also critical to achieving the collective goal(s) of the alliance (Loasby, Foss, and Knudsen, 1996). Coordination addresses the pooling of resources, the division of labor across partners, and the subsequent integration of the dispersed activities, all of which are critical to the generation of value in an alliance (Mitchell *et al.*, 2002; Sobrero

¹ For the sake of brevity, we speak of the 'content' of an alliance to refer narrowly to the assets (both property- and knowledge-based) involved in an alliance, rather than referring more expansively to all the elements of an alliance.

and Schrader, 1998). Accomplishing this coordination requires developing the appropriate linkages between different and interdependent task units (Adler, 1995; Alchian and Allen, 1977). This task is complicated by differences in each firm's structure and experiences (Lawrence and Lorsch, 1967), and the fact that individuals in each firm may not understand the interdependencies of their actions and those of others (Thompson, 1967). Information needs to flow between appropriate individuals at each partner firm and it may not initially be clear who those individuals are (Hoetker, 2005).

Two common approaches to mitigate opportunism and achieve coordination in the context of alliances are: the use of formal governance mechanisms and/or the use of relational governance mechanisms (Dekker, 2004; Martinez and Jarillo, 1989).² The approaches are not exclusive; both may occur to varying degrees within the same alliance (Macneil, 2000; Mellewigt, Madhok, and Weibel, 2007).

Formal governance mechanisms are generally understood to include 'depersonalized exchanges, a reliance on financial parameters, and the drafting and implementation of formal contracts' (Ferguson, Paulin, and Bergeron, 2005: 217). Relational governance mechanisms, on the other hand, are generally understood to include people- or social-based mechanisms that enhance open communication and the sharing of information, trust, dependence, and cooperation (Eisenhardt, 1985). Unfortunately, the precise terminology regarding governance mechanisms varies considerably across papers, reflecting the range of scholars studying the topic. Thus, we have drawn on common elements in the existing literature to identify two critical,

interrelated distinctions between the two, and chosen terminology that reflects the central characteristics of each mechanism.³

The degree to which the operation of the mechanism can be separated from the specific people and their relationships

The operation of formal governance mechanisms is largely independent of specific people involved (cf. Telser and Higinbotham, 1977; Williamson, 1979): internal prices—a formal mechanism—are internal prices, no matter who is involved. Relational governance mechanisms, by contrast, are tightly bound to the specific individuals and their relationships: for example, steering committees—which are relational mechanisms—depend critically on the precise membership and the relationships formed among the members (cf. “‘people” or social control’ [Eisenhardt, 1985: 139]).

The degree to which the mechanism can stipulate a specific outcome or behavior

Formal mechanisms can specify outcomes, for example, 500 units will be delivered on the fifth of each month, or specific behaviors, for example, 'submit change requests in writing.' On the other hand, the outcome of a relational governance mechanism such as a steering committee relies on the interaction of individuals from the parties involved and, thus, cannot be prespecified (c.f. Das and Teng, 1998; Makhija and Ganesh, 1997; Williamson, 1979). Similarly, the specific behavior of individuals as they interact cannot be stipulated in advance, for example, a firm cannot specify in advance what will occur during a face-to-face meeting of top managers (c.f. Sobrero and Schrader, 1998).

Formal governance mechanisms

Formal governance mechanisms can play a vital role in enabling transactions that require investments in specific assets. They create a mutually agreed upon range of acceptable behaviors

² We distinguish *governance mechanisms* from *governance*. *Governance* is a higher-level concept describing an organizational construction or, in broader terms, institutional framework (for example, a strategic alliance). *Governance mechanisms* are the underlying and concrete management and control activities, which describe in detail how the required behavior of the partner will become motivated, influenced, and established, or more generally, in which ways the desirable or predetermined gains are to be fulfilled ('administrative tool[s]' in the words of Martinez and Jarillo (1989: 490). Thus, governance mechanism points to an actual operative practice, which is brought to bear between the two parties. Obviously, the two concepts are related: governance is supported by governance mechanisms that allow companies to solve the problems of safeguarding, cooperation, and coordination.

³ Ferguson *et al.* (2005: 220) note that terms including hard, explicit, formal and written mechanisms have been associated with formal governance and relationalism, social, informal self-enforcing governance, and procedural governance coordination with relational governance.

(Masten, 1996). Business plans, service level agreements, performance indices, and similar mechanisms can specify each party's roles, performance expectations, and dispute resolution mechanisms (Poppo and Zenger, 2002). Profit and loss accounts, economic efficiency calculations, and reporting requirements can help monitor the degree to which each party is satisfying its assigned role.

By placing limits on the actions of each party and enhancing monitoring, formal governance mechanisms help *mitigate potential opportunism*, constraining the subsequent ability of one party to extract additional rents from the other by failing to perform as agreed (Williamson, 1985). Additionally, recent work has drawn attention to the role of formal governance mechanisms in *coordinating* the efforts of alliance partners (Gulati, 1995; Ryall and Sampson, 2006; Sobrero and Schrader, 1998). Mayer and Argyres found that firms included clauses regarding delivery dates and information about system interactions to enable 'better information flow between the parties to avoid coordination failures' (Mayer and Argyres, 2004: 404). Such prior arrangements enable coordination by enhancing the predictability of each party's actions and structuring communication flows (Galbraith, 1977; Gulati and Sytch, 2005).

The costs of formal governance mechanisms occur both before and during an alliance (Dyer and Chu, 2003). At the initiation of an alliance, the parties incur the costs of negotiating and designing the mechanisms that will be used. Implementing those mechanisms during the alliance will require the parties to gather and compile information, prepare and deliver documents and, as recipients of these documents, review and evaluate the information provided (Williamson, 1985).

Relational governance mechanisms

Relational governance mechanisms refer broadly to mechanisms that enhance the building of trust and social identification (Dyer and Singh, 1998; Martinez and Jarillo, 1989). Examples include establishing teams, task forces, and committees (Grandori, 1997; Schrader, 1991); direct managerial contact through trips, meetings, and even the transfer of managers (Martinez and Jarillo, 1989); mechanisms for shared decision making (Saxton, 1997); and formal systems for conflict resolution

relying on two-way communication and joint problem solving (Kale, Singh, and Perlmutter, 2000).⁴

Each of these mechanisms helps *mitigate potential opportunism* by building trust and social identification through the interaction of personnel across firms.⁵ Through repeated interaction, managers in each firm learn about each other and develop personal ties (Macaulay, 1963; Shapiro, Sheppard, and Cherasking, 1992). The exchange of extra effort voluntarily given and reciprocated builds trust (Uzzi, 1997), while first-hand knowledge of a partner's behavior provides some information regarding its future actions (Granovetter, 1985). Thus, these mechanisms enable the parties to resolve conflicts based on open communication and a preference for non-opportunistic, win-win solutions (Kale *et al.*, 2000; Powell, 1990). As these mechanisms build confidence on the part of the alliance members that unexpected contingencies will be resolved with neither party taking opportunistic advantage, the alliance can proceed even if these contingencies cannot be addressed *ex ante* (Powell, 1990).

Beyond their role in mitigating potential opportunism, relational governance mechanisms support *coordination* across partners. Repeated interaction

⁴ To avoid confusion from the unfortunate existence of multiple meanings for 'formally,' we note that relational governance mechanisms can be formally organized—as opposed to being *ad hoc*. This is completely distinct from 'formal governance mechanisms' as we have carefully defined them.

⁵ We distinguish relational governance *mechanisms*—the actual means through which decisions are made, disputes resolved, and coordination achieved—from relational *capital* (Kale *et al.*, 2000: 221) and trust. If an adjustment needs to be made in an alliance, the parties cannot bring it about by sitting in their offices feeling trusting. Rather they must draw upon the problem-solving mechanisms that allow actors to coordinate functions and work out problems 'on the fly' that characterize relationships rich in trust (Uzzi, 1997: 49) and carry out some sort of activity (e.g., have their executives meet) to make the necessary decisions. These activities are the relational governance mechanisms we study. Dekker (2004) very nicely elaborates how trust and relational governance mechanisms are interconnected, yet distinct: 'Although relational trust is an emergent characteristic and cannot simply be implemented, over time it can be built. *Mechanisms to build trust are deliberate risk taking and increasing interaction*, for instance by joint goal setting, problem solving, decision making and partner development activities' (Dekker, 2004: 33, emphasis added). In addition, Gulati and Sytch (2008) show empirically that trust cannot be generated at will. In summary, we study formal and relational governance mechanisms, which are activities or processes managers can deploy, as opposed to trust, which is a set of beliefs that cannot be deployed by managers.

of individuals from each firm can lead to the development of interfirm communication and coordination routines (Dyer and Singh, 1998; Mitchell and Singh, 1996), a common language for discussing technical and market issues (Buckley and Casson, 1976), and a shared representation of their task environment (Gulati and Sytch, 2005).

Relational governance imposes considerable costs in terms of time and resource allocation (Das and Teng, 1998; Larson, 1992). Because they depend on the repeated interaction of personnel across the firms, particularly in face-to-face meetings, relational mechanisms often require managers and engineers to travel between firm locations (Teece, 1977). Modern telecommunications such as video-conferencing can help reduce travel costs, but cannot decrease the inefficiency of having multiple employees, often highly compensated, engaged in meetings rather than their normal productive activities.

Further, relational governance mechanisms can directly diminish performance. Relationships based on frequent interaction take on some aspects of internal supply that diminish incentives, such as second chances being given more frequently, an expectation of due process before termination, and greater willingness to negotiate unexpected cost increases. This is a nearly inevitable accompaniment to the assumption underlying relational governance mechanisms: that disputes will be resolved 'fairly.' As a result, relational governance mechanisms may elicit less of what Williamson (1985: 150) refers to as 'inordinate energies.'

MATCHING GOVERNANCE TO ALLIANCE CONTENT

Both formal and relational governance mechanisms have been found to be successful in governing alliances (Poppo and Zenger, 2002). However, it is unclear when one type of mechanism would be more effective than the other. We argue that the appropriate mix of governance mechanisms depends on the type of assets involved in the alliance being governed. Drawing upon Miller and Shamsie (1996) and Das and Teng (2000), we contrast two types of assets. *Knowledge-based assets* are a firm's intangible know-how and skills. Examples include marketing knowledge and customer service expertise. *Property-based assets* are legal properties owned by firms including physical

resources (e.g., buildings, infrastructure), financial capital, and the like.

We develop our predictions based on two key arguments. First, property-based assets and knowledge-based assets present different governance problems, which formal governance mechanisms and relational governance mechanisms address with different degrees of effectiveness. Second, the asset types pose different coordination problems, which formal and relational governance mechanisms differ in their ability to resolve. Table 1 summarizes the differences between asset types.

Governing knowledge-based assets

We offer the transfer of marketing knowledge as an example from our empirical setting, the telecommunications industry.⁶ The first governance issue posed by the exchange of knowledge-based assets is a variation of the well-known appropriability problem. Arrow (1962) argues that once a party discloses knowledge to a potential buyer, that buyer is in a position to apply that knowledge at least partially without paying for it—describing the marketing knowledge available requires revealing how one segments the market, the types of data they gather, and what analytical techniques they have found most effective. Of course, a potential buyer will not agree to pay for the knowledge until it has the opportunity to evaluate it. In the governance context, it is unlikely that the parties will be able to negotiate a mutually acceptable contract in this situation (Teece, 1986).

It may be difficult to develop concrete performance criteria for knowledge that one party is to supply (is a specific increase in market share expected?), particularly in light of the reluctance on the part of the asset owner to disclose detailed information about the knowledge (Teece, 1988). Lacking concrete criteria as a reference point, the parties will be handicapped in developing formal governance mechanisms such as internal prices, economic efficiency calculations, or performance indices. The lack of a reference point will also make it more difficult for any external arbitrator,

⁶ To give context for our example, we note that our alliances were mostly (70%) between telecommunication firms, but that many had partners from the IT, media, finance, and retail sectors. They included both horizontal (55%) and vertical (45%) alliances, with the majority including both property- and knowledge-based assets, for example, both infrastructure and marketing/customer service.

Table 1. Characteristics of each asset type

	Knowledge-based	Property-based
Coordination challenges		
Ability to prespecify coordination	Lower	Higher
Organizational embeddedness and tacitness	Higher	Lower
Governance (opportunism mitigation) challenges		
Vulnerability to appropriability problem	Higher	Lower
External verifiability of contribution	Lower	Higher
Ability to develop performance criteria in advance	Lower	Higher
Ability to reclaim asset from partner	Lower	Higher

for example, the courts, to ascertain if each party is performing as agreed.

Further, the transfer of knowledge requires effort on the part of both the provider and receiver (Cohen and Levinthal, 1990). However, the quality of effort put forth by each party is difficult or impossible for a third party to verify (Arora, Fosfuri, and Gambardella, 2001: 118)—who is to blame if the recipients feel they have not gained useful insights from the new marketing knowledge? Thus, opportunities for shirking arise that outside arbitrators will not be able to ameliorate (Alchian and Demsetz, 1972).

In the event of an alliance-ending dispute, the range of potential remedies varies for property-based and knowledge-based assets. Firms can be forced to return property, but it is difficult to force a firm's employees to unlearn the knowledge once transferred (Arora *et al.*, 2001).

Lastly, knowledge-based assets are difficult to coordinate across firms because they tend to be embedded in the routines and culture of the originating firm, composed largely of tacit (hard to articulate) knowledge and couched in the firm's specialized technical language (Spender, 1996). This makes the optimal means of combining the alliance partners' knowledge-based assets difficult to specify in advance (Anand and Khanna, 2000; Dyer and Singh, 1998). How many meetings are necessary to transfer the marketing knowledge? At what date will the knowledge be mastered and ready to deploy in the alliance? These difficulties make formal governance mechanisms relatively ineffective for coordinating the use of knowledge-based assets.

For all of these reasons, formal governance mechanisms are likely to be a suboptimal response to transactions involving extensive knowledge-based assets. Thus, we do not expect firms to vary their use of formal mechanisms according to the

presence or absence of knowledge-based assets. We state our hypotheses in a strong form, recognizing that formal governance mechanisms are not completely without utility in the presence of knowledge-based assets (Lyons, 1994).^{7, 8}

Hypothesis 1: There will be a negligible relationship between the amount of knowledge-based assets involved in the alliance and the use of formal governance mechanisms.

Relational governance mechanisms provide a more flexible means of addressing this problem. By alleviating the 'fear that one's exchange partner will act opportunistically' (Bradach and Eccles, 1989: 104), relational governance mechanisms minimize contracting costs by allowing the parties to move forward with a less fully specified contract under the assumption that contingencies will be addressed in good faith and shirking will not occur (Cusumano, 1985). Thus, the difficulty of setting performance criteria in advance does not significantly handicap relational governance mechanisms. Further, when unanticipated changes occur, the parties can make mutual adjustments without formal renegotiation, increasing the flexibility of the alliance.

⁷ Additionally, prolonged interaction—even via reports and other formal governance mechanisms—could lead to increased social identification, albeit to a much lesser degree than the more intense interpersonal relationships involved in relational governance mechanisms.

⁸ While it is generally inappropriate to test a null hypotheses, Cohen (1988, 1990) notes that the absence of a relationship is a valid phenomenon of interest when theory calls into question previously accepted relationships. Since formal and relational governance mechanisms have both been proposed to govern alliances without reference to the type of assets involved, our Hypotheses 1 and 4 represent such questioning and are thus appropriate to be tested. As described in our methods section, we use statistical power analysis to test these null hypotheses properly. See also Lane, Cannella, and Lubatkin (1998).

The coordination routines, common language, and open information exchange fostered by relational governance mechanisms also help overcome the embedded and tacit nature of knowledge-based assets. For example, members of a project group bringing together staff of both firms to jointly apply marketing knowledge to a problem will develop a common vocabulary and a sense of how the group best coordinates its efforts.

Because relational governance mechanisms offer advantages over formal mechanisms in governing and coordinating the use of knowledge-based assets, we expect the use of relational governance mechanisms to increase when substantial knowledge-based assets are involved in an alliance.

Hypothesis 2: There is a positive relationship between the amount of knowledge-based assets involved in the alliance and the extent of relational governance mechanisms used.

Governance of property-based assets

We argue that formal governance mechanisms are generally superior to relational governance mechanisms for governing property-based assets. Formal governance mechanisms do not face the same obstacles when governing and coordinating property-based assets as they do when governing knowledge-based assets, and avoid the costs of relational governance mechanisms, which are no longer offset by the (now less necessary) advantages of relational governance mechanisms. We take as an example providing access to the backbone infrastructure of a telecommunication network (switches, trunk lines, etc.).

Arrow's (1962) appropriability problem is less relevant for property-based assets than for knowledge-based assets, since property-based assets can be demonstrated to the buyer without relinquishing control of the asset—one firm can give the other a tour of the infrastructure-related facilities. Greater pre-agreement disclosure makes it easier for the parties to negotiate a mutually acceptable contract and to specify performance criteria that will form the basis of formal mechanisms—the backbone will be available a certain number of hours a day, pricing will be a given amount per gigabyte of data transferred, and so on. In the event of disagreement, external arbitrators can refer to these criteria in judging the performance of each party. There are also a wide range of

remedies for property-based assets, since—unlike knowledge—firms can be forced to return property (Arora *et al.*, 2001: 118) or, in our case, one party can easily exclude the other from future use of the backbone infrastructure.

Formal governance mechanisms are also capable of coordinating property-based assets. Coordination of a specific property, for example, the necessary physical connections will be made at a specific time and date, is easier to specify in advance than the coordination of knowledge-based assets, with their attendant tacitness and embeddedness (Kogut and Zander, 1992). Business plans and service level agreements can precisely enumerate the tasks to be accomplished and define specific procedures to be followed for property-based assets in a way that they cannot for knowledge-based assets.

The transfer of physical assets makes it possible to transfer the fruits of productive knowledge between firms without requiring the receiving firm to master that knowledge (Demsetz, 1988)—the other party needs to know very little about the operation of backbone infrastructure to access it. Therefore, when coordinating the use of property-based assets, there is less need for—and less value in—the coordination benefits of relational governance mechanisms.

The ongoing costs of relational governance may be merited when governing knowledge-based assets because of the advantages they provide over formal mechanisms. However, these advantages are less relevant for property-based assets, increasing the net costs of these activities. Therefore, we expect firms to bring formal governance mechanisms to bear when considerable property-based assets are involved. Since relational mechanisms are a less effective means of governing property-based assets, we do not expect the use of relational governance mechanisms to be affected by the presence or absence of property-based assets. A stronger prediction would be that firms would avoid using relational governance mechanisms in the presence of considerable property-based assets. However, we do not believe theory supports such a strong prediction.

Hypothesis 3: There is a positive relationship between the amount of property-based assets involved in the alliance and the extent of formal governance mechanisms used.

Hypothesis 4: There will be a negligible relationship between the amount of property-based assets involved in the alliance and the extent of relational governance mechanisms used.

We conclude by considering the performance implications of the choice of governance mechanisms. We argue that performance differences between alliances may be attributable to the matching of asset type with appropriate governance mechanisms (Yin and Zajac, 2004). More specifically we argue that alliances that pursue a strategic fit between the assets involved in the alliance and the governance mechanisms used will enjoy greater alliance performance. Extending our prior logic suggests that a mismatch, for example, frequent meetings of top executives (relational governance) just to manage an ongoing connection to one firm's backbone infrastructure (property-based assets), might harm performance. Again, we believe that theory does not adequately support such a strong hypothesis and leave the matter for empirical investigation. Thus, we hypothesize the following:

Hypothesis 5: Formal governance mechanisms will contribute to the overall success of the alliance to the degree that property-based assets are involved in the alliance.

Hypothesis 6: Relational governance mechanisms will contribute to the overall success of the alliance to the degree that knowledge-based assets are involved in the alliance.

METHODS

Sample

The research sample was alliances in the German telecommunications industry. Because the industry had been recently liberalized, primarily in 1998, many firms had entered the market, but few had the entire set of necessary resources. As a result, firms needed to ally, often (45%) with multiple partners over multiple functional areas with diverse resources (48% involved three or more areas). Approximately one-third of alliances included partners from non-telecommunication sectors and most involved both property- and

knowledge-based assets. All of these factors create significant need for (and challenges to) effective governance and coordination.

According to Section 4 of the German telecommunications law, every company that wants to offer telecommunication services is required to notify the German regulatory authority for telecommunication and postal services. The resulting registry, updated twice a year and publicly available, was the starting point for our data.⁹ Targeted respondents in this study were all telecommunication companies that owned a Class 3 license (i.e., a network license allowing the company to build network infrastructure), or a Class 4 license (i.e., a service license allowing the company to offer voice telephony to the public) according to Section 6 of the German telecommunications law. Most of the alliances covered multiple functions, with a majority including aspects of both infrastructure and marketing/customer service.

In total, 257 companies were identified that owned a Class 3, a Class 4, or both licenses. Surveys were sent to the chief executive officer (CEO) of the respective company, who was asked to send the survey to the most informed person who was involved in the formation and management of the firm's most important alliance. Respondents were asked to describe the management of their most important alliance. We defined an alliance as 'a voluntary arrangement between firms in order to gain a competitive advantage, involving exchanging, sharing, or codevelopment of resources, products, technologies or services.' Mergers and acquisitions were explicitly excluded. In line with previous work, we allowed respondents to identify their most important alliance (Jaafar and Rafiq, 2005; Kale *et al.*, 2000; Kotabe Martin, and Domoto, 2003; White and Lui, 2005).

Four German business scholars and nine practitioners from the German telecommunications industry reviewed preliminary versions of the questionnaire to ensure face validity. To check whether the participants really understood the questions, and thus avoid item ambiguity, the interviewer asked the participants to explain their responses during in-person interviews. As a result several questions were rephrased. Variables previously used in U.S. empirical studies

⁹ See http://www.bundesnetzagentur.de/enid/2fae95195976f293995548f0d9c96571,0/Notification_requirement/List_of_notified_undertakings_1ky.html

were translated into German and reviewed by two German-speaking researchers.

We received 83 completed questionnaires, representing a 32 percent response rate. Twelve were discarded because they had missing values for key variables.¹⁰ The high response rate may be attributed to the follow-up procedure of sending a reminder letter and making supplemental phone calls (Dillman, 2000) and the fact that the study was supported by two letters of recommendation from the leading telecommunication industry federations (the Association of Telecommunications and Value-Added Service Providers [VATM] and the German broadband federation Bundesverband Breitbandkommunikation e. V. [BREKO]). Sixty-five percent of responders identified themselves as the CEO, the director of business development, or the director of the legal department.¹¹ The remaining 35 percent of responders did not identify their positions, but we assume that the CEO identified the most appropriate person to respond.

To assess potential nonresponse bias, we followed the established methodology of Armstrong and Overton (1977) and looked for differences between early and late respondents under the assumption that late respondents are more similar to nonrespondents than early respondents to nonrespondents (c.f. Reuer and Zollo, 2005; Rindfleisch and Moorman, 2003). A one-way analysis of variance (ANOVA) across early and late respondents yielded an insignificant F-value of 0.02 for number of employees and 0.12 for annual sales. Additional tests examining early and late respondents for differences in alliance experience based on the number of current alliances and experiences with alliances in the past were similarly insignificant. More directly, we compared the class of license (Class 3 versus Class 4) held by true respondents and true nonrespondents. We find no significant difference across the groups in this dimension ($p = 0.214$).

To address the possibility of consistency artifacts and common methods bias, we used Harman's (1967) single-factor test to examine whether a significant amount of common method variance exists in the data. If so, a factor analysis of all

of the variables will generate a single factor that accounts for most of the variance in the data (Podsakoff and Organ, 1986). Unrotated factor analysis using the eigenvalue-greater-than-one criterion revealed four factors, and the first factor explained only 24.1 percent of the variance in the data. We also found no evidence of common rater effects identified by Podsakoff *et al.* (2003). Additionally, consistent with recent alliance research (e.g. Faust, 1988; Gulati *et al.*, 2005), our informants were highly placed within the firm and in a position to provide opinions that reflected those of other key decision makers (Li and Atuahene-Gima, 2002; Phillips, 1981). Thus, we concluded that the analysis was reasonably robust to common methods bias.

Measures

Extent of relational and formal governance mechanisms used

To measure the amount of relational governance used, we drew on Martinez and Jarillo (1989), Kale *et al.* (2000), and Makhija and Ganesh (1997) to identify people- and social-based mechanisms that enhance open communication and sharing of information, trust, dependence, and cooperation. These involved six mechanisms: steering committees, project groups, expert committees, a cooperation manager, face-to-face meetings at the top management level, and the filling of key positions.¹² The degree to which each was used in the alliance was measured on a five-point scale ranging from 'not at all' to 'to a large extent' and the average used as our measure of the amount of relational governance.

Drawing on Das and Teng (1998), Sitkin and Weingart (1995), Martinez and Jarillo (1989) and Makhija and Ganesh (1997), we measured the amount of formal governance based on eight mechanisms: business plans, balance sheets, performance indices, profit and loss accounts, internal prices, economic efficiency calculations, reports, and service level agreements. The use of each in the alliance was measured on a five-point scale

¹⁰ Eleven responses described equity alliances. Omitting these observations from the sample does not substantively change our results.

¹¹ The relatively small size of most companies in our sample (<200 employees) reduces the potential 'distance' between respondents and the alliance.

¹² The filling of key, normally boundary-spanning, positions in an alliance—rather than relying on a more haphazard set of personnel, who may have minor and transitory involvement in the alliance's activities—provides for the intense and enduring interpersonal interactions required to form trust and coordination routines.

ranging from 'not at all' to 'to a large extent' and the average used as the overall measure.¹³

Amount of knowledge-based and property-based assets involved

We analyzed the relevant literature in order to identify strategic resources in telecommunications and discussed the list of resources thus identified with experts with regard to relevance, completeness, and comprehensibility. This elicited a final list of 14 resources (nine property-based and five knowledge-based assets), characterized according to the characteristics listed in Table 1. Property-based assets include buildings/facilities, capital, backbone infrastructure, access network infrastructure, licenses, rights-of-way, IN-platforms, sales networks, and brand name.¹⁴ Knowledge-based assets include knowledge of marketing and sales know-how, planning and construction of telecommunications networks, operating a telecommunications network, operating a billing system, and customer care. Respondents indicated on a scale of one (low) to five (high) the extent to which their own company and the partner transferred these resources into the alliance and used the average scores of the nine and five measures respectively.

Alliance performance

Our measure of overall alliance performance is based on the degree to which the alliance achieved 13 goals, weighted according to the extent to which each goal was rated as 'relevant to the alliance.' Seven goals came from the prior literature (e.g., Bleeke and Ernst, 1991; Inkpen and Currall, 2004;

Mowery, Oxley, and Silverman, 1996): cost reduction, risk reduction, time advantages, access to capital, extension of product line, access to new markets, and spreading of financial burden. Six goals were industry specific, confirmed with nine practitioners from the telecommunications industry: access to network infrastructure, access to sales network, access to technical know-how, access to marketing/sales know-how, higher utilization of own network infrastructure, and higher utilization of own sales network. The degree to which each goal was reached was rated on a scale of one (not at all) to five (to a high extent). The final measure is an average of these weighted ratings.

Prior alliance experience, number of current alliances, and organizational fit

We need identifying instruments in order to perform two-stage least squares (2SLS) regression as described below. We use *prior experience with alliances* and *number of current alliances* as identifying instruments in the formal governance mechanisms equation. We expect larger firms and firms with greater experience to make more use of formal control mechanisms (Mayer and Argyres, 2004; Poppo and Zenger, 2002). We adapted a scale from Kale *et al.* (2000) to measure *organizational fit* as our identifying instrument in the relational governance mechanisms equation. Companies indicated on a five-point scale to what degree organizational culture and management and operating styles of the partners are compatible with each other. We expect more compatible firms to make greater use of relational governance mechanisms and have no theoretical basis for believing compatibility to be directly associated with the use of formal mechanisms.

Control variables

Control variables include the number of alliance partners (Das and Teng, 2002; Gulati, 1995); prior knowledge of the alliance partner (Gulati, 1995; Kale *et al.*, 2000), rated from one (not at all) to five (very good); an indicator of whether the partners were of the same nationality (Gulati, 1995); and the degree of asset specificity, calculated as the average response to two items on a five-point scale (drawn from Reuer and Ariño's 2002 study, and ranging from 'negligible' to 'substantial'): (1) 'If we decided to stop this venture, the difficulty that

¹³ Factor analysis would be inappropriate for these and similar subsequent variables as we have formative measures of a composite construct, rather than reflective measures of a latent construct (Fornell and Bookstein, 1982; MacCallum and Browne, 1993). Following Podsakoff, Shen, and Podsakoff (2006) and Diamantopoulos and Winklhofer (2001), our measures are formative because they: (a) jointly determine the construct in question, rather than manifesting an underlying construct, (b) are not interchangeable—removing one alters the domain of the construct, (c) will not necessarily covary positively, and (d) do not have similar antecedents.

¹⁴ For clarification, rights-of-way and licenses in our empirical setting represent the legal permission to use ground for telecommunication purposes and to build network infrastructure/offer telephony service respectively. Very little knowledge is embedded in either.

we would have in redeploying our people and facilities presently serving the venture to other uses would be ...' and (2) 'If this venture were to dissolve, our non-recoverable investments in equipment, people, etc. would be ...' ($\alpha = 0.74$).

In our model of alliance performance, we wished to control for the possibility that the firm's evaluation of the alliance's performance might be colored by the firm's overall success. Thus, we included a measure of the average degree to which the firm has accomplished eight key strategic goals over the last three years (*success in last three years*). These goals were drawn from the existing literature and include network utilization, profits, growth, return on investment (ROI), adaptability, acquiring new customers, liquidity, and satisfaction of employees.

Lastly, we included the *duration of the alliance*, since the governance mechanisms we observe reflect both the initial conditions of the alliance and subsequent development (Mayer and Argyres, 2004; Ring *et al.*, 1989). We control for this via the duration variable and discuss the intertemporal dynamics of governance mechanisms in the Discussion section.

Table 2 summarizes our measures, while Table 3 presents descriptive statistics and correlations. There is no evidence of multicollinearity difficulties (mean VIF: 2.26; maximum VIF: 3.65).

STATISTICAL MODELS

Since formal and relational governance mechanisms are chosen simultaneously, they may be endogenous to each other, in which case OLS would yield biased coefficients. Therefore, we apply 2SLS, generating consistent coefficient estimates (Davidson and McFetridge, 1984; Greene, 1997). This benefit must be balanced against the fact that 2SLS coefficients are subject to bias when samples are small and instruments may be weak. In response, we report both OLS and 2SLS estimates in our Results section.

The exception to reporting OLS and 2SLS is Model 5, in which we model alliance performance. Because this model involves interactions between asset types and potentially endogenous governance choices, we would require six instrumental variables: two main effects and four interactions (see Wooldridge, 2002: 236). Even if six valid instruments were available, the bias induced by having

so many instruments would yield highly suspect results. Given these inescapable limitations, we ran in unreported regressions the performance model with only the main effects, once with OLS and once using instruments for relational and formal governance mechanisms. A Durbin-Hausman-Wu test shows that we cannot reject the null hypothesis that the governance variables are exogenous ($\chi^2(2) = 0.742$, $p = 0.6902$). This gives us some confidence that, even with the interaction terms added, the impact of endogeneity is limited, but the results should be interpreted in light of this limitation.¹⁵

Hypotheses 1 and 4 are tests of a null, that is, the lack of a significant relationship. Our analysis of these hypotheses follows Lane *et al.* (1998).¹⁶ While a null hypothesis is never strictly true, meaning absolutely no correlation exists between the independent and dependent variable (Lane *et al.*, 1998), Cohen (1988: 16–17) argues that a null can be accepted when the expected relationship is found to be 'trivial' using power analysis. A relationship is trivial (Cohen, 1990) when the sample size used in a test is large enough for the risk β of a Type II error (incorrectly accepting the null) to be equal to the commonly accepted five-percent risk α of a Type I error (incorrectly rejecting the null). If, given a sufficient sample size, the relationship is found to be insignificant, the null can be accepted.

The definition of a 'trivial' relationship is, of course, critical. Cohen (1992) provides values for 'small,' 'medium,' and 'large' effects. While a 'small' effect is intuitively appealing, Cohen points out that this is often impractical and suggests that a 'large' effect, meaning a 0.5 standard deviation change in the dependent variables for a one standard deviation change in the independent variable, is often reported in economics (Cohen, 1988: 13). Tables provided by Cohen (1988: 452) indicate a required sample size of 49 to detect a 'large' effect, well below our sample size of 71.¹⁷ Thus, a finding of no statistical significance for a variable means

¹⁵ In reporting OLS results for the interactions, we parallel the approach of Poppo and Zenger (2002), who faced a similar problem.

¹⁶ See Gulati and Sytch (2008) for another application of power analysis in related research.

¹⁷ Cohen (1988: 414) suggests that his suggested 'large' effect may actually be too small for research in economics. A more stringent test for a large effect, setting $\beta = 0.01$, would require a sample of 64.

Table 2. Summary of measures

Formal governance mechanisms	<ol style="list-style-type: none"> 1. Business plans 2. Balance sheets 3. Performance indices 4. Profit and loss accounts 5. Internal prices 6. Economic efficiency calculations 7. Reports 8. Service level agreements
Relational governance mechanisms	<ol style="list-style-type: none"> 1. Steering committees 2. Project groups 3. Expert committees 4. Cooperation managers 5. Face-to-face meetings at the top management level 6. Filling of key positions
Property-based assets	<ol style="list-style-type: none"> 1. Buildings/facilities 2. Capital 3. Backbone infrastructure 4. Access network infrastructure 5. Licenses 6. Rights of way 7. IN-platforms 8. Sales network 9. Brand name
Knowledge-based assets	<ol style="list-style-type: none"> 1. Knowledge of marketing and sales know-how 2. Planning and construction of telecommunications networks 3. Operating a telecommunications network 4. Operating a billing system 5. Customer care
Alliance performance	<ol style="list-style-type: none"> 1. Cost reduction 2. Risk reduction 3. Time advantages 4. Access to capital 5. Extension of product line 6. Access to new markets 7. Spreading of financial burdens 8. Access to network infrastructure 9. Access to sales network 10. Access to technical know-how 11. Access to marketing/sales know-how 12. Higher utilization of own network infrastructure 13. Higher utilization of own sales network
Organizational fit	<ol style="list-style-type: none"> 1. Compatibility of organizational culture and management of the partners 2. Compatibility of operating styles of the partners
Asset specificity	<ol style="list-style-type: none"> 1. Difficulty of redeploying people and facilities serving the venture 2. Nonrecoverable investments in equipment, people, etc.
Firm performance	<ol style="list-style-type: none"> 1. Network utilization 2. Profits 3. Growth 4. ROI 5. Adaptability 6. Acquiring new customers 7. Liquidity 8. Satisfaction of employees

Table 3. Summary statistics and correlation

	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Alliance performance	3.28	0.69	1.62	4.67	1.00												
(2) Extent of formal governance	2.94	0.88	1.00	4.62	0.19	1.00											
(3) Extent of relational governance	2.70	0.79	1.00	4.67	0.14	0.30	1.00										
(4) Amount of knowledge-based assets	2.80	0.92	1.00	5.00	0.22	0.29	0.40	1.00									
(5) Amount of property-based assets	2.57	0.75	1.22	5.00	0.31	0.32	0.29	0.77	1.00								
(6) Asset specificity	2.19	0.99	1.00	5.00	0.05	0.16	-0.02	0.12	0.06	1.00							
(7) Number of current alliances by the company	5.25	6.80	0.00	50.00	0.27	0.26	0.17	0.26	0.21	0.01	1.00						
(8) Duration of the alliance	2.38	2.62	0.50	18.00	0.11	0.15	0.02	0.11	0.08	0.12	0.09	1.00					
(9) Fit between partners	2.87	1.16	1.00	5.00	0.14	0.00	0.18	-0.04	-0.14	-0.03	0.00	-0.04	1.00				
(10) Experience with alliances	3.17	0.99	1.00	5.00	0.06	0.32	0.23	0.20	0.21	0.08	0.32	0.26	-0.01	1.00			
(11) Same nationality	0.82	0.39	0.00	1.00	0.25	-0.13	-0.16	-0.12	-0.14	0.03	0.08	0.14	0.12	0.04	1.00		
(12) Knowledge of alliance partner	3.51	1.12	1.00	5.00	0.21	0.02	-0.02	0.04	0.18	0.09	-0.03	-0.12	0.02	0.13	0.32	1.00	
(13) Success in last three years	4.59	0.77	2.50	6.75	0.22	0.24	0.03	0.14	0.14	-0.11	0.29	0.07	-0.07	0.30	-0.13	-0.16	1.00

that either its relationship to the dependent variable is trivial in the context of economic research, or we have been the victim of the five percent risk of making a Type II error (Cohen, 1992).

RESULTS

Choice of governance mechanisms

We used several tests to detect potential endogeneity in governance choice, including the difference in Sargan-Hansen statistics test, which is more robust to heteroskedasticity than the Hausman test. None indicate the presence of endogeneity (*p*-values for rejecting the null of exogeneity > 0.22). However, given the small sample and the theoretical rationale to suspect endogeneity, we present results for both OLS and heteroskedastic-robust 2SLS estimations.

Our first-stage regressions (Table 4) indicate that we have achieved meaningful instrumentation. In the first stage of the regression for formal governance mechanisms, we find *organizational fit* is a significant (*p* = 0.046) predictor of relational governance mechanisms. The Cragg-Donald chi-squared test rejected the null of underidentification (*p* = 0.028). In the first stage of the regression for relational governance mechanisms, we find that *experience with alliances* and *number of current alliances* are jointly significant predictors of formal governance ($F(1, 61) = 3.29$ Prob > $F = 0.043$). The Cragg-Donald chi-squared test rejects the null of underidentification (*p* = 0.021). Since we have two instruments for formal governance, we conducted an overidentification test (Hansen's J test, since we are using robust standard errors) and were unable (*p* = 0.386) to reject the null hypothesis that the instruments are valid. We could not perform a similar test for relational governance, as that equation is exactly identified.

Models 1 and 2 of Table 5 present our OLS results for the choice of governance mechanisms. The 2SLS results appear in Columns 3 and 4 and are substantively similar except where noted. We report both in the text (as OLS result; 2SLS result). All tests are two-tailed.

Results are in line with Hypotheses 1 to 4. Hypotheses 1 and 2 addressed knowledge-based assets, while Hypotheses 3 and 4 concerned property-based assets. Consistent with Hypotheses

Table 4. First-stage regressions

	(1) Extent of relational governance	(2) Extent of formal governance
Amount of knowledge-based assets	0.293* (0.093)	-0.0212 (0.887)
Amount of property-based assets	0.0460 (0.812)	0.361** (0.036)
Asset specificity	-0.0200 (0.855)	0.136 (0.167)
Experience with alliances	0.135 (0.130)	0.199* (0.089)
Number of current alliances by the company	-0.00321 (0.716)	0.0107 (0.354)
Duration of the alliance	-0.0141 (0.636)	0.0105 (0.711)
Same nationality	-0.220 (0.329)	-0.193 (0.439)
Knowledge of alliance partner	-0.0253 (0.766)	-0.0305 (0.731)
Fit between partners	0.153** (0.046)	0.0810 (0.399)
Constant	1.252** (0.014)	1.111** (0.042)
N	71	71

p-values in parentheses

p* < 0.10, *p* < 0.05, ****p* < 0.01

1 and 2, the presence of knowledge-based assets in an alliance is positively associated with the use of relational mechanisms ($p = 0.048$; $p = 0.048$;) while it has no significant relationship with the use of formal governance mechanisms ($p = 0.606$; $p = 0.414$). As predicted by Hypothesis 3, the extent of formal mechanisms used increases as more property-based assets are involved in an alliance ($p = 0.094$; $p = 0.045$). Consistent with Hypothesis 4, there is no significant relationship between the amount of property-based assets in an alliance and the extent of relational mechanisms used ($p = 0.920$; $p = 0.552$).

Turning to other variables, we find conflicting evidence on the impact of asset specificity on the use of formal governance mechanisms ($p = 0.175$; $p = 0.086$) and the impact of organizational fit on relational governance mechanisms ($p = 0.068$; $p = 0.211$). Contrary to some earlier work (Das and Teng, 1998; Poppo and Zenger, 2002), we find no evidence that the use of formal governance

mechanisms leads to the use of relational governance mechanisms ($p = 0.107$; $p = 0.183$) or the reverse ($p = 0.107$; $p = 0.395$).

As a robustness check, we applied an alternative IV estimation (UJIVE2) that minimizes the small-sample bias in traditional 2SLS (Angrist, Imbens, and Krueger, 1999; Blomquist and Dahlberg, 1999) and limited information maximum likelihood estimation that is more robust to potentially weak instruments. The substantive results were unchanged in both.

Alliance performance

Our final hypotheses, Hypotheses 5 and 6, concern the determinants of alliance performance. As reported in Column 5 of Table 5, we first note that neither the use of relational governance mechanisms nor the use of formal governance mechanisms has a direct effect on alliance performance ($p = 0.226$ and 0.924 respectively). We do not find the positive interaction between formal governance mechanisms and property-based assets predicted by Hypothesis 5 ($p = 0.972$). We also find no interaction between formal governance mechanisms and knowledge-based assets ($p = 0.646$), which is consistent with our theory. The lack of a negative interaction suggests that, while formal governance mechanisms do not support governance of knowledge-based assets, they do not impair it.

The interaction of knowledge-based assets and relational governance mechanisms is significant and positive ($p = 0.050$).¹⁸ As predicted in Hypothesis 6, relational governance mechanisms contribute to the overall success of the alliance to the degree that knowledge-based assets are involved. Furthermore, relational governance mechanisms interact negatively with property-based assets in an alliance ($p = 0.084$). That is, relational governance mechanisms actually impair the performance of alliances involving substantial property-based assets. This result is consistent with our theory, and a stronger result than we were willing to hypothesize.¹⁹

¹⁸ The full model in Column 5 is a statistically significant improvement over an unreported model without the interactions between governance mechanisms and asset types.

¹⁹ As noted in the Statistical models section we are unable to apply instrumental variable estimation to control for potential endogeneity in governance mechanisms, which could bias our

Table 5. Governance choice and performance

	OLS		Heteroskedastic-robust 2SLS		OLS
	(1) Extent of formal governance	(2) Extent of relational governance	(3) Extent of formal governance	(4) Extent of relational governance	(5) Alliance performance
Extent of relational governance	0.241 (0.107)		0.528 (0.395)		-0.0111 (0.924)
Extent of formal governance		0.178 (0.107)		0.496 (0.183)	0.163 (0.226)
Amount of knowledge-based assets	-0.0919 (0.606)	0.297** (0.048)	-0.176 (0.414)	0.292** (0.048)	-0.0705 (0.659)
Amount of property-based assets	0.350* (0.094)	-0.0182 (0.920)	0.336** (0.045)	-0.129 (0.552)	0.330* (0.069)
Asset specificity	0.141 (0.175)	-0.0442 (0.623)	0.147* (0.086)	-0.0817 (0.470)	0.0470 (0.540)
Fit between partners	0.0440 (0.624)	0.139* (0.068)		0.114 (0.211)	0.0987 (0.257)
Duration of the alliance	0.0139 (0.718)	-0.0159 (0.630)	0.0180 (0.514)	-0.0181 (0.485)	0.0270 (0.489)
Same nationality	-0.140 (0.622)	-0.185 (0.446)	-0.0767 (0.730)	-0.143 (0.554)	0.397* (0.068)
Knowledge of alliance partner	-0.0244 (0.791)	-0.0198 (0.802)	-0.0172 (0.826)	-0.00798 (0.912)	0.0903 (0.274)
Experience with alliances	0.166 (0.136)	0.0992 (0.303)	0.127 (0.390)		-0.135* (0.058)
Number of current alliances by the company	0.0115 (0.454)	-0.00511 (0.698)	0.0124 (0.242)		0.0181 (0.157)
Success in last three years					0.273** (0.041)
Extent of relational governance × knowledge-based assets					0.348** (0.050)
Extent of relational governance × property-based assets					-0.311* (0.084)
Extent of formal governance × knowledge-based assets					-0.109 (0.646)
Extent of formal governance × property-based assets					0.00972 (0.972)
Constant	0.809 (0.194)	1.054** (0.046)	0.449 (0.651)	0.782 (0.173)	1.257 (0.106)
Observations	71	71	71	71	65

p-values in parentheses

* *p* < 0.10, ** *p* < 0.05, *** *p* < 0.01

Among the other variables, we first note that firms that have been more successful in the three years prior to the study report greater alliance

performance (*p* = 0.041). Interestingly, firms with more alliance experience report less satisfaction with the focal alliance (*p* = 0.058). A speculative interpretation is that this reflects the development of a more discerning (or jaded) view of alliances' benefits in general. Alliances with more

results. While we found no evidence of significant endogeneity, results should be interpreted in light of this limitation.

property-based assets are more successful ($p = 0.069$), while no relationship to performance exists for the amount of knowledge-based assets ($p = 0.659$). Furthermore, alliances involving partners from the same country are more successful than those involving partners from different countries ($p = 0.068$), reflecting the difficulty of managing cross-border alliances (Harrigan, 1988; Parkhe, 1993).²⁰

In summary, when large amounts of knowledge-based assets are involved in an alliance, firms employ more relational governance mechanisms, and these mechanisms have a positive impact on the overall performance of the alliance. When large amounts of property-based assets are involved, firms employ more formal mechanisms and actually find relational mechanisms prejudicial to the success of the alliance, reflecting its relative inefficiency as a means of governing purely property-based assets.

DISCUSSION AND CONCLUSION

We have found evidence that the optimal choice of governance mechanisms in an alliance depends on the types of assets involved. Consideration of this contingency has direct implications for three elements of the literature on alliances: their governance, their scope and content, and—we speculate—the optimal sequence of alliance activities between firms. We believe that our work also informs two underlying literatures: transaction cost economics and the literature on relational governance. We find support for the central tenets of each, while also establishing important boundary conditions for their application.

We advance transaction cost economics by showing that considering the nature of the assets involved in an alliance rather than just the level of potential opportunism, allows more precise predictions about the appropriate choice of governance mechanisms for a transaction. As transaction cost research moves from studying industries dominated by property-based assets,

for example, coal (Joskow, 1987) and shoe manufacturing (Masten and Snyder, 1993), to high-technology, knowledge-intensive settings, for example, technology transfer alliances (Oxley, 1999), it will become increasingly important to do so.

Consistent with the literature on relational governance, we find that relational governance mechanisms play a critical role in helping firms exploit knowledge-based assets in alliances. However, their costs may be higher than has previously been appreciated. When the only assets being governed are amenable to formal mechanisms, for example, property-based assets, relational mechanisms may be unnecessarily burdensome. Indeed, they may actually be counterproductive due to high costs and oversocialization.

Consistent with recent work examining the interaction of relational and formal governance, we find they often co-occur. However, our findings demonstrate that they are not interchangeable; each has distinct limitations, making the optimal combination of governance mechanisms highly dependent on the alliance content, a formerly unnoted contingency.

Our findings also inform the optimal scope and content of alliances. Both property-based and knowledge-based assets may contribute to the alliance's goals; further, bundling activities together offers governance advantages through raising the cost of opportunistic behavior (de Figueiredo and Teece, 1996). However, when asset types are mixed, the partners will have to choose suboptimal governance arrangements. If the alliance can be narrowed to either predominantly property- (or knowledge-) based assets, managers can employ the optimal mechanisms for the predominant asset type, with fewer repercussions in the management of the other assets. In many cases, however, managers must choose the level of relational governance mechanisms they use as best as they can, given the mix of assets required by the alliance's goals, either under supporting knowledge-based assets or inefficiently governing property-based assets.

Although based on a cross-section, our results allow us to speculate on an optimal sequence of alliance activities between two firms. Relational governance mechanisms effectively manage alliances rich in knowledge-based assets, but cannot be deployed at will. Rather, they depend on the existence of trust and social identification, which

²⁰To avoid multicollinearity problems due to the interaction terms, we mean-centered the governance and asset variables before interacting them (Aguinis, 2002). Results using uncentered variables were substantively the same, although the amount of knowledge assets had a significant negative effect ($p = 0.084$), consistent with the difficulty of managing knowledge across firm boundaries (Kale *et al.*, 2000.)

develop only as firms interact over time (Kale *et al.*, 2000; Macaulay, 1963; Uzzi, 1997). Formal governance mechanisms, in contrast, rely much less on prior interactions. This suggests that, when possible, early activities in an alliance between two firms should primarily involve property-based assets, amenable to governance via formal mechanisms, rather than knowledge-based assets. As the firms develop trust and social identification over time, relational governance mechanisms become more feasible, facilitating increasing inclusion of knowledge-based assets.

Our results are also consistent with recent studies (e.g., Gulati and Sytch, 2008), suggesting that the move to the greater use of relational governance mechanisms over time is not inevitable. If an alliance continues to be based on primarily property-based assets, formal governance mechanisms may remain more efficient.

Our study shares the same limitations of any single industry, single country study. While we have no reason to believe the German telecommunications industry is less generalizable than any other setting, similar studies in other industries and institutional settings would be valuable. Ideally, these studies would allow a larger sample, a significant challenge given the richness of data required. We also note that several of our results were significant at the 0.10 level. Lastly, like all similar studies of which we are aware, we can only present results that are conditional on an alliance being formed.

Alliances are an inherently dynamic process. In particular, there may be a bidirectional influence in which firms that have formal (relational) mechanisms in place may be more likely to invest further in property- (knowledge-) based assets, a process that we cannot observe in cross-section. Our results should nevertheless be robust, as the addition of assets in an alliance will be accompanied by an expansion of governance, meaning that at any point in time, the observed levels of governance and assets should be in approximate balance. We are aware of no study of this dynamic rebalancing of assets and governance and hope that, by establishing a baseline set of facts regarding the relationship between governance and asset type, we set the stage for such work that further explores the dynamics of such strategic change processes (Zajac, Kraatz, and Bresser, 2000).

Additionally, we see opportunities to extend the research by directly studying learning in an alliance as a function of governance mechanisms

and the distribution of assets. The inclusion of knowledge-based assets in an alliance often indicates that learning is an explicit goal of the alliance, beyond creating value by combining the knowledge-based assets of each party. However, learning cannot be separated from the governance of the overall relationship. We believe that this study provides the basis for a detailed understanding of the mechanisms firms use to balance these two tasks.

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