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Do Prior Alliances Influence Alliance Contract Structure?

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Introduction

As the cost and risk of technological development grow, firms continue to look for alternatives to purely in-house R&D. R&D alliances represent one such alternative – a means by which firms can spread the risk and cost of new development and gain access to unique technologies. While such alliances are increasingly attractive to firms in technologically intensive industries, the attendant risks can be substantial. Firms entering into R&D alliances face considerable moral hazard problems, since partner behaviour is often unobservable and the costs of opportunism are potentially high. Firms anticipate such difficulties and often craft formal governance to address these issues.

Formal organizational structures, such as alliance contracts, serve to establish rights and obligations of partner firms and provide some documentation of the original agreement should the alliance go awry. The presumption is that the threat of legal enforcement will keep partners from behaving opportunistically.³ Such formal devices are not the only means to protect against opportunism and create a cooperative environment, however.

Repeated interactions between firms have long been argued to lead to cooperative behaviour, even between competing firms.⁴ Such prior interactions can lead to the development of trust between firms or may signal a firm's valuable reputation; in both cases cooperative behaviour becomes more attractive, since it serves to preserve either the relationship or the reputation.

Despite the growing literature on how firms select the organization form for their alliance activities (Pisano, 1989; Oxley, 1997; Sampson, 2004), we still know little about alliance contract structure and whether selection of this structure is systematic. Here, we examine technology alliance contracts, to explore if and how formal contract terms vary with prior alliances – either with a specific partner or generally. Extending the current literature on contracting to the context of alliances yields two competing predictions

for the relationship between prior alliances and contract structure. Literature on relational governance suggests that prior relationships can substitute for costly, detailed contracts (for example, Macaulay, 1963; Larson, 1992). In contrast, recent empirical evidence suggests that formal contracts are in fact complementary to relational exchange; Poppo and Zenger (2002) find that as relationships between firms deepen, contracts become increasingly customized. Thus, a question arises: do prior relationships complement or substitute for formal governance?

In our analysis summarized below, we examine 52 technology alliance contracts in the telecommunications equipment manufacturing and micro-electronics industries and discuss the empirical results from a test of the relationship between prior alliances and formal contract structure (Ryall and Sampson, 2004). Several interesting patterns emerge from this analysis. First, it appears that prior alliances generally (that is, with any firm) increase the extent to which a contract is well specified or more detailed. Prior alliances with the same partner appear to have a similar effect – contracts are more detailed when firms have allied with each other previously. However, concurrent alliances with the same partner have the opposite effect – contracts are less detailed under these circumstances, even when alliance duration and technology breadth are controlled for. One interpretation is that firms gain experience in drafting effective collaborative agreements with prior alliances, which allows these firms to specify rights, obligations and development processes at lower cost. In contrast, concurrent alliance relationships may operate as an informal means to deter non-cooperative behaviour, since such behaviour can affect the future prospects not only of the current alliance, but also of the concurrent alliance. Overall, these results suggest that prior relationships, via prior alliances, affect formal contract structure.

The remainder of this chapter is as follows. We first define the coordination and contracting problem in alliances in more detail and briefly review the organizational responses to these difficulties, according to prior literature. We also examine the relational contracting literature to understand the possible effect of prior alliances on contract structure. The contract sample, data sources, research context and results are then discussed in the following sections.

Coordination difficulties and solutions in technology alliances

Technology development across firm boundaries is difficult at best. The complexity and uncertainty surrounding collaborative R&D efforts create a fertile environment for partner opportunism. Firms often cannot directly observe their partner's efforts. Further, because of the idiosyncratic nature of R&D (see, for example, Holmstrom, 1989), it is frequently not possible to infer effort provided by observing outcomes. Partners may, for example,

contribute fewer or lesser quality inputs to the alliance than originally agreed. Further, since joint technological development often requires pooling or at least exposure to partner firm technologies, firms are naturally concerned about leakage of intellectual property outside the spirit of the alliance. Firms recognize these issues and often develop alliance governance mechanisms in response.

Researchers in organizational economics argue that the governance mechanisms we observe reflect a rational attempt to induce either efficient ex ante investments (that is, property rights theory, as developed initially by Grossman and Hart, 1986) or to reduce ex post bargaining and hold-up threats (that is, transaction cost economics, Williamson, 1975). This current literature on the choice of alliance organizational form, while informative, has certain limitations. For example, current research in the transaction cost vein relies on discrete choice analysis, which assumes that average differences exist between form choices and that the extent of variance within groups does not render the average differences meaningless. In other words, discrete choice analysis is problematic if there is very substantial overlap between groups such that it becomes difficult to argue that the groups are truly discrete choices. Property rights research, such as Lerner and Merges (1998), moves away from this discrete choice analysis to examine contract terms specifying control rights. However, given the fundamental assumptions underlying the property rights literature,⁵ this literature focuses almost exclusively on the allocation of residual control rights and equity among partners. Thus, we still lack information on other dimensions of contracting that may be relevant to solving the coordination problem in alliances.

There are two ways of thinking about contracting choice that differ from the current literature: first, there may be a wide variety of contract terms used to guard against non-cooperative behaviour and ensure effective collaboration, distinct from incentive alignment mechanisms like equity and residual control rights. Second, contracts may go beyond purely legal documents – their only value may not simply be to the extent that contract terms are enforceable – and these agreements may form blueprints for exchange and a means to plan the collaboration, set partner expectations and, consequently, reduce misunderstandings and costly missteps. Under either of these two approaches, we would expect that more detailed contracts would lead to better outcomes and, therefore, be preferable, because such contracts set clear expectations for behaviour or provide a means to identify and curtail opportunistic behaviour.

Formal contracting, though, is not the only solution to the coordination difficulties inherent in alliances. Means exist apart from such formal mechanisms to curtail opportunism and encourage cooperative behaviour. The economics literature emphasizes how repeated interactions can, through implicit mechanisms, serve to mitigate moral hazard. For example, Green and Porter (1984) demonstrate that a cartel is sustainable when firms

repeatedly interact. Telser (1980) also argues that agreements can be self-enforcing, even if not complete, when the parties value the future relationship sufficiently. Repeated interactions in the marketplace rather than with a specific firm may lead to development of reputation, which may also support economic exchange through less formal means (Kreps, 1990). Klein and Leffler (1981) lend empirical support to these arguments through simulation, finding that the threat of lost reputation is a means to enforce promises on quality, which are otherwise unenforceable.

Sociologists also discuss the role of repeated interactions in achieving cooperation. Macaulay (1963) argued that firms rarely rely on legal sanctions to uphold terms of economic exchange and that reputation or social norms may serve to ensure cooperative behavior. Granovetter (1985: 490) notes that, 'individuals with whom one has a continuing relation have an economic motivation to be trustworthy, so as not to discourage future transactions; and departing from pure economic motives, continuing economic relations often become overlaid with social content that carries strong expectations of trust and abstention from opportunism.' Empirical evidence in the context of alliances provides some support for this link. Gulati and Singh (1998) find that firms with prior ties are less likely to choose more hierarchical controls for their alliance activities and suggest that trust developed over these prior ties may alleviate concerns of opportunism.

Given the cost of drafting more detailed contracts (see for example, Crocker and Reynolds, 1993), the impact of prior alliances on alliance contracting appears straightforward. Where alternative discipline mechanisms exist, contracts are less detailed or less 'complete'. Prior alliances between partners may serve to develop trust or may signal a high relative value for the specific relationship, leading to a reduced need for more formal governance. Similarly, prior alliances generally may signal a positive reputation that curtails a firm's opportunistic behaviour in the current alliance. However, recent evidence from Poppo and Zenger (2002) suggests the opposite, at least in the context of data entry outsourcing relationships; prior relationships between firms lead to more detailed or customized contracts, perhaps because prior relationships allow parties to learn more about each other. Via better information on likely partner behaviour or the contingencies that arise in particular types of deals, the cost of more detailed agreements is reduced, relative to those firms that have no repeated experiences.

On the basis of this literature, there appear to be two different, but equally logical, links between prior alliances and contract structure. Both the marginal benefit and marginal cost of additional contract precision decrease in the presence of prior deals, and the optimal level of contract detail depends upon the relative magnitude of these two effects. Given this ambiguous relationship, whether and how repeated deals affect contract structure becomes an empirical question that we investigate below.

Data: technology alliances in the telecommunications equipment and microelectronics industries

To examine whether and how contract structure varies with prior alliances, we examine technology alliance contracts in the telecommunications and microelectronics industries. These alliances take many forms, including cross-licensing arrangements, joint technology development agreements and formal joint ventures for development and manufacturing. Consistent with prior observations on the change in focus of cooperative R&D efforts, we do not see any examples of truly basic research in our sample contracts.

Our source of alliance contracts is SEC filings. Public firms, under SEC disclosure requirements, submit 'material contracts' as part of their 8K, 10K, 10Q and S-1 filings, including alliance contracts. From these filings, we obtained over 120 technology alliance contracts for the years 1991 to 2000, inclusive. However, we confine our consideration to those alliances involving some form of joint development (52 contracts), whether this joint development is very limited in scope or involves co-location of research personnel in the case of some joint ventures. These alliances cover a broad spectrum of purposes, from development of new microprocessor cores based on existing technology to developing a 'next-generation' ferroelectric chip.

To obtain information about pre-existing relationships between allying firms, or prior deals, we supplement this data with information on prior alliances from the Securities Data Company (SDC) Database on Alliances and Joint Ventures. The SDC database compiles information on a firm's alliance activity from news reports, SEC filings, industry and trade journals. Using SDC data, we capture all alliance activity for a firm and break this information down into two components: information on prior alliances with a specific partner (where we have a contract for a later alliance with the same firm) and all prior alliances for the firm, irrespective of partner. Prior alliances are counted for the five years prior to the focal alliance (the alliance where a contract has been collected). We begin with a broad description of our coding scheme developed via case analysis to categorize the variety of formal mechanisms used by alliance partners to deal with the underlying moral hazard and coordination problems (Ryall and Sampson, 2004). This coding scheme exposes the diverse clauses used to specify inputs and outcomes.

Coding scheme and empirical summary

In designing their contracts, allying firms have to devise means to make expectations explicit and facilitate cooperation while constraining non-cooperative behaviour. Here, we focus on the role of contract detail to better define cooperative behaviour. This contractual detail can be considered on multiple grounds, including whether specific development goals and benchmarks are set or whether goals are more general in nature. Several

other dimensions of contract detail are identified via earlier case analyses, including: (1) the extent to which time frames for completion are set; (2) the specificity of intellectual property rights (for example, whether specific technology improvements are reserved for one firm, rather than equally shared); and (3) the extent to which partner contributions are defined. In addition, firms may also specify individuals to manage the alliance projects. The more detailed the contract is along these dimensions, the easier it is to observe failure to meet objectives and the more efficient is external enforcement. Presumably, more detailed contracts also facilitate greater cooperation between partners, by setting explicit expectations for firm behaviour and forcing the partners to agree in advance on what each hopes to contribute and achieve via collaboration.

To summarize, the terms we use to code contract detail are:

- Development specifications (such as tolerances) included
- Time frame for completion of each stage specified
- Number of employees to be contributed specified
- Specific persons stipulated for management or other development work
- Specific technologies to be contributed described
- Intellectual property rights defined over specific technologies

We expect that the greater the number of these mechanisms used, the 'tighter' the contract and the stronger the formal governance.

After identifying the coding scheme, the question becomes, can we link the strength of formal governance (in the form of contract detail) to the presence of prior alliances? On the basis of our case studies, contracts appear to be more specific when firms lack a pre-existing relationship. This may, however, reflect other alliance characteristics that we cannot control for with the case study approach. For example, greater uncertainty associated with broader technology development tasks may lead to less detailed contracts simply because firms cannot accurately anticipate the needs and outcomes of the collaborative development in advance. Firms may be more willing to enter into such broad technology collaborations where that firm has prior experience with a specific partner. Thus, comparisons between contracts with similar purposes become more important.

We code the contracts in our sample according to the scheme set out above and analyse the differences using standard regression techniques. In these regressions, we also include several other dimensions of the contracts. Generally, we expect that anything increasing the uncertainty or complexity associated with alliance activities will make contracts less detailed, since specifying development steps and time frames for completion of each step, etc., becomes more difficult under such circumstances. We identify four factors that we expect may increase uncertainty and/or complexity associated with the alliance: (1) technology breadth (that is, whether the technology development was largely incremental, for example customization

of existing technologies for new uses, or next generation, where partners are focused on relatively radical changes to technology); (2) long duration of the alliance (greater than one year in duration); (3) manufacturing and/or marketing activities in addition to joint development; (4) cross-border coordination between partners (international alliance).

The average alliance in the sample is two years in length, of moderate technology breadth, involves manufacturing in addition to joint development, and is international (involving partners headquartered in different countries). Further, most alliances are between firms that have not previously allied – only 14 of the 52 alliances coded involve firms that have collaborated together previously (according to the SDC data). However, most firms have some degree of prior alliance experience with, on average, 25 alliances in the five years prior to the focal alliance.

Several interesting patterns emerge from our coding. First, the contracts exhibit substantial variance. Alliance contracts in this sample are far from identical, utilizing different combinations of detailed specifications, termination clauses, and division of property rights, for example. A few details are worth mentioning: (1) most contracts have fixed termination dates; (2) the majority of allying firms choose to divide the intellectual property rights based upon who is the primary developer, rather than sharing the new intellectually property equally; and (3) development work is infrequently co-located.

We estimate the choice of contract detail clauses as a function of prior alliances and variables capturing alliance task complexity or uncertainty. We rank the contracts according to how many 'detail' clauses each contract contains and distinguish between prior alliances with the same partner (that is, the same firms as in the contract) and prior alliances generally with other partners (that is, firms other than in the contract). From this analysis, two patterns emerge. First, prior or concurrent alliances appear to decrease the degree of contract detail. This result is consistent with the argument that firms develop 'trust' (Gulati and Singh, 1998) or a desire to maintain the relationship with the current partner that may curtail non-cooperative behaviour and reduce the need for more formal governance mechanisms. However, when we break these alliances down into their prior and concurrent counterparts, another interpretation is possible. Prior alliances between partners in the focal alliance increase the probability that firms draft detailed contracts, while concurrent alliances decrease this probability. Firms may learn about their partners from their experience with them such that more detailed or customized contracts become less costly. This finding is consistent with Poppo and Zenger (2002), who argue that formal and relational governance are complementary. This is consistent with MacNeil's (1981: 1041) observation that, 'the exercise of choice [about contract content] is thus an incremental process in which parties gather increasing information and gradually agree to more and more as they

proceed.' When firms have prior relationships, they have more opportunities to work through agreed terms, which are then embodied in later alliance agreements. Concurrent alliances, in contrast, may operate to reduce the need for formal governance by creating a 'mutual hostage' – the potential for reciprocity may curtail the threat of non-cooperative behaviour (Williamson, 1985). Thus, in this sense prior alliances may facilitate learning between partners, while concurrent alliances provide mutual hostages.

Prior alliance experience with any partner consistently increases the customization and detail of alliance contracts. This suggests that a firm's ability to draft more detailed contracts improves with alliance experience. Thus, while extensive prior experience may signal a strong firm reputation that may curtail non-cooperative behaviour in the current alliance, we do not find the negative effect of such experience on detail that would be consistent with this argument.

Control variables behave largely as expected. Broad technology alliances are less likely to have detailed contracts; the greater uncertainty and complexity surrounding broader technology development likely makes detailed specification of rights, obligations and time frames more difficult. International alliances are more likely to have more detailed contracts. Given that international collaborations are more challenging to coordinate because of, for example, geographic distance, firms may place more importance on drafting detailed contracts before collaborating.

Conclusion

In this chapter, we examine technology alliance contracts in detail not only to explore such contracts, but also to determine whether prior alliances affect contract structure. Prior literature in organizational economics and sociology suggests that, given the cost of complete contracting, detailed contracts are less likely in the presence of implicit governance mechanisms, such as trust or the desire to maintain a valuable relationship. Our earlier analysis of 52 alliance contracts in the telecommunications equipment and microelectronics industries suggests that prior alliances do indeed affect formal contract structure (Ryall and Sampson, 2004). However, this relationship is more nuanced than previously expected. Firms draft more detailed contracts when they have prior alliance experience, whether with the same partner or not. In contrast, less detailed contracts result when firms have concurrent alliances with the same partner. Thus, it appears that the informal governance inherent in interfirm relationships has different effects on formal governance depending upon whether these relationships are on-going or past.

In addition to these empirical results, our exploration of contracts reveals that such documents are highly heterogeneous and often incorporate terms that are not readily explained by traditional contract theory. Firms often

include contract terms that are legally unenforceable, suggesting that the purpose of such contracts goes beyond providing guidance to the courts in the case of breach. The fact that firms include such detailed terms even when they will not be upheld in a court of law argues that one role of contracts is to provide a blueprint for collaboration. Via the contract, partners not only set out rights, obligations and contingencies to the extent possible, but also plan how they will collaborate and what their expectations are with respect to the identity of managerial inputs (for example). By defining expectations, even if not legally enforceable, firms may be able to avoid costly misunderstandings. If formal contracts are indeed such a blueprint, they are especially important for technology alliances, given the substantial difficulties of development across firm boundaries. As such, further work is required to better understand whether the quality of such blueprints affects the success of the venture.

Naturally, there are important limitations to our work here. First, the substantial heterogeneity makes true comparison between contracts difficult at best. While we attempt to control for sources of heterogeneity, our measures are blunt instruments, which cannot perfectly capture, for example, the breadth of the underlying technologies developed in the alliance. Further, while access to actual contracts permits more detailed analysis, the difficulty in accessing these contracts prevents collection of large samples. Fruitful directions for future work include further coding to enlarge our sample size and analysis of monitoring and penalty clauses in addition to contract detail. Further access to contracts (for example, all of the alliance contracts for a single firm) would allow us to better control for within-firm boiler plate terms and firm experience. On-going research (for example, Mayer and Argyres, 2004) is particularly encouraging in this area.

Notwithstanding these limitations and the need for further research efforts, this study provides some evidence of the link between prior alliances and contract structure. Further, our data facilitate a greater understanding of how firms organize their alliance development activities and respond to thorny coordination difficulties. Hopefully, this detailed examination of alliance contracts will lead to a better understanding of how firms can more effectively collaborate and, ultimately, the role of contracts in business exchange.

Notes

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2. Rachelle C. Sampson, RH Smith School of Business, Van Munching Hall, 3301, University of Maryland, E-mail: rsampson@rhsmith.umd.edu
3. As Crocker and Masten (1991: 71) note, 'the presumption is clear that courts will either direct specific performance or apply appropriately measured damages to assure that the intentions of the parties are fulfilled.'

4. See, for example, Macaulay (1963), Green and Porter (1984), Gulati and Singh (1998).
5. That is, that contracts are substantially incomplete, largely unenforceable and, thus, the primary means to ensure investment efficiency is allocation of control rights.

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