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Third Parties and Contract Design: The Case of Contracts for Technology Transfer

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Given the challenges associated with drafting technology-transfer contracts, we examine decisions to involve third parties offering technical or legal support in the contract-drafting process. We first argue that the attributes of the transaction are key drivers of third-party involvement. We then draw on the behavioral theory of the firm to develop arguments regarding the influence of third parties on contract complexity. Our results reveal that the involvement of legal third parties tends to magnify the contract's overall complexity. In contrast, the involvement of technical third parties reduces the inclusion of monitoring provisions and increases the inclusion of coordination provisions. Copyright © 2015 John Wiley & Sons, Ltd.

INTRODUCTION

The transfer of technologies among organizations has become increasingly important in the last two decades (Arora *et al*., 2001; Laursen and Salter, 2006). Technology-based partnerships include R&D joint ventures, licensing and cross-licensing, and contracted R&D (e.g., Mowery *et al*., 1996; Hagedoorn, 2002). Despite the attractiveness of these partnerships and the numerous benefits they offer to firms, contracting for technology transfer faces a number of challenges. For example, some types of knowledge can be difficult to articulate and transfer (Simonin, 1999; Martin and Salomon, 2003). Moreover, asymmetrical information gives rise to adverse selection hazards (Arrow, 1969; Teece, 1986). Important and specific investments are often required to develop or commercialize the technology (Arora and Ceccagnoli, 2006; Somaya *et al*., 2010) and, thereby, pave the way for hold-ups (Klein *et al*., 1978; Williamson, 1985). Possible unintended leakage of proprietary know-how is also a critical concern (Arora, 1996; Oxley, 1997). In this context and given partners' bounded rationality (Williamson, 1985; March and Simon, 1993), it is challenging for firms to write comprehensive contracts that safeguard exchanges (Joskow, 1988; Parkhe, 1993) while fostering fruitful coordination and adaptation (Gulati *et al*., 2005; White, 2005). In turn, the strategic and organizational issues raised by contractual governance choices have spawned a vast amount of literature.

In the contract-design stage, partners have an opportunity to include provisions aimed at achieving incentive alignment and establishing a framework for the exchange (see Schepker, Oh, Martynov and Poppo, 2013, for a recent review). One stream of research, which mostly draws on transaction cost economics (TCE), focuses on transaction attributes as the main drivers of contract design and, in particular, of contract complexity, that is, the extent of provisions included in the contract (e.g., Anderson and Dekker, 2005; Mellewigt *et al.*, 2007; Reuer and Ariño,

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2007). However, scholars have begun to criticize the assumptions traditionally found in TCE-grounded studies that partners are able to 'look ahead', to foresee threats, and to make optimal governance choices (Argyres and Liebeskind, 2002; Weber and Mayer, 2014). These scholars call for a broader view of contractual governance choices that accounts for the sets of knowledge as well as the interpretative frames of the decision makers involved in the contract-drafting process (Argyres and Mayer, 2007; Bercovitz and Tyler, 2014). This stream of research also suggests that in-house experts (e.g., managers, engineers, scientists, and lawyers) influence contract design (Weber and Mayer, 2011; Bercovitz and Tyler, 2014) on the basis of their backgrounds, assigned roles, and responsibilities.

In this paper, we draw upon the logic of behavioral theory (Cyert and March, 1963; March and Simon, 1993) to investigate the influence of expert third parties on contractual governance choices. More specifically, we analyze the divergences between third parties used for technical support ('technical third parties') and those used for legal support ('legal third parties') in terms of their sets of knowledge and their interpretative frames. While the main goal of technical third parties is to facilitate the knowledge transfer (Weick, 1976; Daft, 1978), legal third parties emphasize the need for protection (e.g., Weber and Mayer, 2011; Bercovitz and Tyler, 2014). We first investigate the antecedents of firms' decisions regarding whether to involve third parties when designing technology-transfer contracts. We then develop arguments regarding the influence of this choice on contract complexity.

To test our theoretical framework, we collected data on technology-licensing partnerships. Our findings indicate that transaction attributes explain firms' decisions regarding whether to involve third parties. Specifically, our evidence shows that firms are more likely to rely on technical or legal support from third parties when transactions necessitate salient-specific investments. In addition, our analysis suggests that legal third parties are less likely to be involved when the knowledge to be transferred is mostly tacit. Our findings also reveal that contract complexity increases when legal support for the design of technology-transfer contracts is provided by third parties. Moreover, we observe differences in the ways in which external technical support influences the design of specific contractual dimensions – it fosters the inclusion of coordination-related contractual provisions and reduces the inclusion of monitoring-related contractual provisions.

Our study makes two main contributions. First, much of the previous research on inter-organizational governance choices has focused on the *what* (i.e., the transaction and its attributes) and the *how* (i.e., the governance structures) of such choices, while it has neglected the *who* (Oxley, 2009). The few studies that do examine the latter (e.g., Argyres and Mayer, 2007; Bercovitz and Tyler, 2014) primarily focus on the partners directly involved in the transaction (e.g., in-house decision makers). In contrast, our study contributes to a better understanding of the role of third parties in partnerships. To the best of our knowledge, this is the first attempt to develop a unified theoretical model that investigates both the antecedents and the consequences of third-party involvement in contract design, and the first study to distinguish among external experts' profiles (i.e., technical versus legal third parties). We specifically suggest that external experts differ from in-house experts in several respects. First, while in-house experts tend to possess knowledge focused on the processes, technologies, and legal issues specific to their firms, third parties are likely to possess a broader range of knowledge. This is explained by their greater exposure to a variety of transactions, clients, and industries (Hagardon and Sutton, 1997; Zhang and Li, 2010), and by their ability to attract high-caliber practitioners (Mayer *et al*., 2012). Second, external experts have key interests, such as gaining reputational advantages (Greenwood *et al*., 2005), legitimizing their interventions, and acting as 'neutral' intermediaries when it comes to assessing the value of assets or knowledge brought to a partnership (Wagner *et al*., 2014).

Second, we contribute to research on contracting by demonstrating the importance of the backgrounds and perceptions of the actors involved in a negotiation when analyzing the alignment between transaction attributes and contractual dimensions. In this regard, we respond to recent calls made by Ariño and Ring (2010), Argyres and Mayer (2007), and Weber, Mayer and Macher (2011) to examine the role played by the identity and functions of decision makers in contract design.

THEORETICAL BACKGROUND

Contract Design

Prior research on contract design, which mostly draws on TCE, views contracts as governance structures for managing exchanges between firms (Klein *et al.,*

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1978; Williamson, 1985). According to this approach, contract complexity depends on the extent of contractual provisions included and aimed at, for instance, specifying what is allowed and what is not allowed in the exchange, imposing penalties in cases of violations, or determining outcomes to be delivered and performance expectations (Barthélemy and Quélin, 2006; Argyres *et al.*, 2007). Due to the costs associated with drafting, implementing, and enforcing contracts (Crocker and Reynolds, 1993), firms only devise complex contracts to safeguard and support transactions characterized by non-trivial hazards (Joskow, 1988) or by coordination challenges (Gulati *et al.*, 2005; Malhotra and Lumineau, 2011). On the one hand, designing relatively simple contracts for complex transactions can leave room for moral hazards, and for possible misinterpretations of respective rights and duties (Crocker and Reynolds, 1993). On the other hand, the potential consequences of adopting excessively complex contracts for simpler transactions include unnecessary negotiation and monitoring costs, a loss of flexibility, and longer decision-making process (Williamson, 1985, 1991; Joskow, 1988). Previous research provides evidence that the provisions to be included are strategically selected with an eye for the transaction attributes (e.g., Anderson and Dekker, 2005; Mellewigt *et al.*, 2007; Reuer and Ariño, 2007). However, by focusing on transaction attributes as the main drivers of contract complexity, previous research largely overlooks the drafting process itself and tends to oversimplify how contractual governance choices are actually made.

We draw on behavioral theory (Cyert and March, 1963; March and Simon, 1993) to suggest that a more complete view of these choices must account for the sets of knowledge as well as the interpretative frames of the actors involved (Argyres and Mayer, 2007; Bercovitz and Tyler, 2014). On the basis of their backgrounds, and their assigned roles and responsibilities, decision makers emphasize certain goals more than others and perceive transactions in ways that are rational to them (March and Simon, 1958). Argyres and Mayer (2007) argue that each type of decision maker (e.g., manager, engineer, or lawyer) serves as a specific repository of contract-design capabilities and is, therefore, expected to play a key part in the specification of the relevant contractual provisions. In their study of research partnerships, Bercovitz and Tyler (2014) suggest that, depending on their organizational role (e.g., scientific personnel or contract administrator), decision makers influence the level of detail in the enforcement provisions in different ways. Weber and Mayer (2011) stress divergences between managers and lawyers in terms of their focal areas, which lead them to favor promotion-framed or prevention-framed contracts, respectively. While evidence confirming the influence of in-house decision makers' profiles on contractual elements is multiplying, our understanding of the influence of external experts on these elements is extremely limited.

Two exceptions are noteworthy. Schwarcz (2007) offers one of the few studies examining drivers for involving external experts when negotiating inter-firm contracts. His findings reveal that, although in-house lawyers may be assumed to be roughly as skilled as external lawyers and able to mitigate information asymmetries between firms and external experts, external lawyers enjoy several advantages. For example, they are able to smooth out fluctuating transactional workloads, they possess unusual or highly complex expertise, and they may enjoy reputational advantages. In an in-depth case study, Lumineau, Fréchet, and Puthod (2011) investigate the consequences of external experts' involvement. They highlight the strong influence of law firms specialized in intellectual property (IP) and legal consultants on clients' learning in contracting. While these two studies provide preliminary insights into either the antecedents or the consequences of third-party involvement, we aim to further our current understanding by considering the antecedents and consequences in a unified theoretical framework and by distinguishing among experts' profiles.

Technical and Legal Third Parties

In the context of technology transfer, expert third parties are likely to be hired for support in two main areas: technical and legal (e.g., Boone *et al.*, 2008; Zhang and Li, 2010; Wagner *et al.*, 2014). Third parties solicited for technical support can take many forms, such as 'technology brokers' (Hargadon and Sutton, 1997; Hargadon, 2003), consulting firms (Glückler and Armbruster, 2003; Verona *et al.*, 2006), patent agents (e.g., Thinkfire or IPValue) (Benassi and Di Minin, 2009; Hagiu and Yoffie, 2013; Wagner *et al.*, 2014), and regional institutions and semi-public bodies (Saxenian, 1990; McEvily and Zaheer, 1999). They are repositories of knowledge about professional norms, current practices, and operational routines (Hargadon and Sutton, 1997). Given the exposure of these third parties to inter-industrial and inter-organizational technologies, they can help partner firms combine their respective skills, data,

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and assets to achieve the objectives of the exchange (Greenwood *et al.*, 2005; Zhang and Li, 2010). They are also well-positioned to anticipate external contingencies and technical problems that may affect the success of the implementation or the commercialization of a technology (Ruef, 2000; Benassi and Di Minin, 2009; Mayer *et al*., 2012). Thanks to their learning opportunities and knowledge stocks, technical experts may propose solutions to clients' issues and questions in a rapid and efficient manner (Hargadon and Sutton, 1997; Boone *et al*., 2008).

In addition to technical support, third parties can be solicited for legal support. The knowledge possessed by legal third parties, such as law firms, comes from the ample opportunities they have to study and compare contracts designed for a large variety of transactions, firms, and industries (Atwell, 2000; Zhang and Li, 2010). Accounting firms and financial-service providers can also be solicited for guidance in legal matters (Atwell, 2000; Zhang and Li, 2010). Notably, the 'big four' accounting firms have extended their service portfolios to include legal advice (Verona *et al.*, 2006; Kipping, 2011). Their exposure to a broad range of scenarios enables such third parties to stay abreast of developments in knowledge protection and risk management (Daft, 1978), and they have expertise in a wide range of governance solutions.

In addition to their different sets of knowledge, technical and legal third parties differ in terms of their interpretative frames. The main goal of technical third parties is to reduce possible misunderstandings between the partners and to facilitate knowledge transfer between them (Weick, 1976; Daft, 1978). In particular, they emphasize the need for accurate expectations with regard to the skills and efforts to be deployed as well as the routines to be implemented. A better understanding and improved 'sense making' foster proper commitment and can prevent disputes (Ariño and de la Torre, 1998; Lumineau and Malhotra, 2011). In contrast, the main goal of legal third parties is to stress the need for formal legal protection against risk and value appropriation (Ferlie *et al.*, 2005; Chreim *et al.*, 2007). As they are more risk averse than their clients (Langevoort and Rasmussen, 1996), their focus lies on properly aligning incentives and on restricting potential free-riding behaviors or IP misappropriation. Legal third parties tend to adopt an adversarial mindset and to approach negotiations from a distributive perspective (i.e., assuming zero-sum stakes) (Menkel-Meadow, 1983; Mnookin *et al.*, 2000). In addition, they are inclined to address aspects of what partners will get (e.g., money or proprietary technologies), what they must do (e.g., experiments and reports), and what rights they have in relation to the IP they provide or the jointly generated IP in order to protect the firms' interests and mitigate opportunism (Reitzig and Puranam, 2009).

HYPOTHESES DEVELOPMENT

Echoing previous studies on technology-based partnerships (e.g., Oxley, 1999; Li *et al.*, 2010), we first consider the main sources of transactional hazards that may justify decisions to involve or refrain from involving technical or legal third parties: the specificity of the investments (Klein *et al.*, 1978; Williamson, 1985), the tacitness of the knowledge to be transferred (Teece, 1986; Oxley, 1997; Simonin, 1999), and the level of IP rights protection (Luo, 2005; Oxley, 1999). As in the transaction economics tradition (e.g., Williamson, 1985; Teece, 1986; Oxley, 1997), we assume that the transaction attributes are exogenous and that they influence future decisions, such as contractual governance choices and decisions to use third parties.

Investment Specificity

Specific investments have little value outside the transaction that they support, and they cannot be fully recovered if the transaction is prematurely terminated (Klein *et al.*, 1978; Williamson, 1985). In order to mitigate possible opportunistic behaviors and hold-ups (Klein, 1996), and avoid over-dependence (Anderson, 1988), firms have to assess and delineate the extent of these investments as precisely as possible before committing to them. It is equally critical to anticipate and be aware of the damages and consequences that may arise in the event of premature termination. The achievement of a common understanding on these issues when drafting contracts may encourage firms to properly commit to the exchange (Ariño and de la Torre, 1998). In this regard, technical third parties are usually well equipped to judge the nature, extent, and scope of necessary investments, and to assess the complementarity between partners' proficiency and skills for undertaking these investments (Zhang and Li, 2010). Thanks to their technical expertise and their understanding of operational issues, technical experts should be able to help partner firms anticipate external contingencies and technical problems that may affect the development and effectiveness of the investments (Mayer and Argyres, 2004). For instance, technical-consulting firms develop relevant analytical procedures, and they tend to be well aware of current

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practices and routines important for guiding interactions in relation to IP valuation and commercialization (Ruef, 2000). Patent agents, who are also known as 'patent dealmakers', are trained to perform preliminary technical and business investigations. As outsiders, third parties can offer a more 'objective' and neutral assessment of the economic value of a patent, while partner firms may over-value or under-value it depending on their position as seller or buyer in the technology transfer (Benassi and Di Minin, 2009; Wagner *et al.,* 2014).

We also expect that third parties providing legal support will be called upon when specificity of the required investments is important. Throughout the contract-design process, legal third parties can play a key role in encouraging partner firms to discuss the hazards that may arise when there is a need for specific investments. In addition, they can provide guidance regarding which provisions to include in order to foster each partner's commitment to the deal and reduce *ex post* vulnerabilities. Lawyers are trained to protect firms' interests (Weber *et al.*, 2011) and to look ahead and anticipate issues that might negatively affect a transaction (Argyres and Mayer, 2007). Due to hold-up concerns caused by specific investments, firms may be tempted to contribute fewer or less valuable inputs. Such behaviors, in turn, reduce the overall chances of exchange success (e.g., Leiblein *et al*., 2002; Sampson, 2003). Hence, when specific investments are required, we expect the likelihood that both technical and legal support will be solicited from third parties to increase:

Hypothesis 1a:
A high level of specific investments increases the likelihood of using technical support from third parties when designing technology-transfer contracts.

Hypothesis 1b:
A high level of specific investments increases the likelihood of using legal support from third parties when designing technology-transfer contracts.

Tacitness of the Knowledge to be Transferred

The information flow between third parties and their clients is bidirectional. However, tacit knowledge is difficult to legally protect from unintended leakage (Teece, 1986; Oxley, 1997; Mayer and Nickerson, 2005). While non-disclosure agreements protect client firms from blunt transfers of confidential information to competitors, there are less perceptible ways through which third parties can misuse confidential information (Glückler and Ambrüster, 2003). As technical third parties have multiple clients, their duties can conflict to some degree. For example, external technical experts can be used by direct competitors at either the same time or sequentially.

In addition to appropriability concerns, tacit knowledge tends to be difficult to communicate to an outside firm (Polanyi, 1962; Rosenkopf *et al*., 2001). Such transfers require considerable time and effort and, as such, involve direct costs and opportunity costs. Tacit knowledge tends to be highly specific to the partners involved and to their exchange. The risk that this knowledge falls outside a third party's domain of technical expertise is therefore non-negligible (Yusuf, 2008; Mayer *et al*., 2012). Consequently, a third party's ability to ease the contract-drafting process could be limited given the various obstacles, including the transaction costs associated with sharing tacit knowledge and the communication barriers encountered across organizational boundaries (Mayer *et al.*, 2012). In this regard, we argue that when the knowledge to be transferred is mostly tacit, partner firms are likely to avoid soliciting third-party technical support. In such contexts, the benefits of their involvement should be outweighed by the threats of additional hazards and transaction costs.

When compared with technical third parties, legal third parties are not expected to have an in-depth understanding of the focal technology (Argyres and Mayer, 2007). Moreover, by emphasizing possible future IP conflicts and leakages, these third parties could inhibit further adaptation (Ghoshal and Moran, 1996) and dampen firms' efforts to establish a framework that promotes tacit knowledge transfer. It has been argued that excessive safeguards aimed at mitigating self-interests derail the intrinsic motivation and effort required to transfer tacit knowledge (Madhok and Tallman, 1998; Adler, 2001). In addition, when firms contract for technology transfer, the effectiveness of their contracts in mitigating the hazards associated with valuable knowledge appropriation remains limited, even when those contracts are highly detailed (Shapiro and Varian, 1999). We therefore contend that the likelihood of using third parties for both technical and legal support is reduced when the knowledge to be transferred is highly tacit. Hence the following:

Hypothesis 2a:
A high level of tacitness of the knowledge to be transferred decreases the likelihood of using technical

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support from third parties when designing technology-transfer contracts.

Hypothesis 2b:
A high level of tacitness of the knowledge to be transferred decreases the likelihood of using legal support from third parties when designing technology-transfer contracts.

Intellectual Property Rights Protection

Strong IP protection is achieved when property rights are easy to establish and strictly enforced with substantial penalties for non-compliance (Oxley, 1999). In countries where legal systems do not properly enforce contracts or where IP law is lacking, we do not expect widespread use of third parties for technical expertise. Weak IP protection uncertainly renders the results of legal actions taken to uphold the validity of IP or prove that there has been an infringement. Therefore, the propensity to involve external technical experts in the contract-development process should be reduced. Even if the technology is patented, the involvement of third parties magnifies the possible misuse or unintended transfer of proprietary information (Mansfield, 1985; Glückler and Ambrüster, 2003). Moreover, a weak IP rights regime makes it more difficult to sue third parties for malpractice.

Similarly, we do not expect widespread use of third parties for legal support in contexts with weak IP regimes. If laws are not consistently enforced, then legal institutions cannot create the credibility, stability, and certainty needed to support the use of contracts (North, 1990; Peng, 2003). In such environments, firms tend to rely on alternative governance mechanisms, such as those of a relational nature (Zhou and Poppo, 2010). In fact, research shows that informal (non-contractual) mechanisms can act as substitutes for formal governance (e.g., Barney and Hansen, 1994; Gulati, 1995). In such contexts, the adoption of a 'legalistic approach' may inhibit relational reliability and induce the opportunistic behaviors that legal third parties' involvement is meant to prevent (e.g., Ring and Van de Ven, 1994; Ghoshal and Moran, 1996; Malhotra and Lumineau, 2011). As a result of their training, legal experts tend to develop an adversarial mindset, which could encourage opportunistic behaviors among partners (Mnookin *et al*., 2000). As firms in these contexts value less formal governance, we argue that they should also place less value on the use of legal experts at the outset of their exchange. Thus, we propose the following:

Hypothesis 3a:
The high protection of IP rights increases the likelihood of using technical support from third parties in designing technology-transfer contracts.

Hypothesis 3b:
The high protection of IP rights increases the likelihood of using legal support from third parties in designing technology-transfer contracts.

Third Parties and Contract Complexity

In the early contracting stages, misinterpretations and misunderstandings are common (Carson *et al.,* 2006). Third parties with technical expertise, knowledge of professional norms, and operational routines and processes can greatly contribute to mutual understanding regarding technology-related tasks and expectations and, thereby, sense-making (Weick, 1976; Daft, 1978). There are two reasons to assume a positive relationship between technical third parties' involvement and contract complexity. First, provisions of an operational nature tend to be highly specific to the product, technology, and partners; their focus and wording can greatly vary across transactions (Ryall and Sampson, 2009; Vanneste and Puranam, 2010). Therefore, boilerplate provisions of an operational nature are typically not available for contracts (Argyres and Mayer, 2007; Vanneste and Puranam, 2010). Consequently, a reliance on technical experts for guidance should make their drafting less challenging, which favors their inclusion. Second, external experts are likely to encourage partner firms to agree on and draft the provisions needed for facilitating the knowledge transfer. Given third parties' interests in protecting their own reputations (Greenwood *et al*., 2005; Schwarcz, 2007), their aversion to damages caused by possible failures or conflicts *ex post* may contribute to their positive influence on contract complexity. Technical third parties should try to avoid contracts that leave room for misunderstandings regarding expectations, especially in terms of efforts to deliver. Properly drafted provisions enable firms to reach a clear meeting of the minds with regard to what is expected from both sides in terms of skills and efforts, and in terms of the routines to be implemented. Overall, therefore, we argue that the use of third parties for technical support tends to increase contract complexity. Hence the following:

Hypothesis 4a:
The use of third parties for technical support when designing technology-transfer contracts increases contract complexity.

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We also contend that third parties used for legal expertise will positively influence the level of contract complexity. As legal experts are highly risk-averse (Langevoort and Rasmussen, 1996), they view contract design as a key means for establishing rights and obligations, and for giving partners more confidence that the spirit of the agreement will be upheld (Sampson, 2003). The minimization of risks through formalized governance may be prioritized even at the expense of facilitating the achievement of the operational objectives of the technology-based partnership (Bagley and Dauchy, 2011). Legal third parties can use their repositories of related contracts to identify likely issues and viable safeguards (Argyres *et al.*, 2007). Therefore, they should be better equipped than individual firms to highlight the significance of subtle problems that may occur *ex post* (Gilson, 1984) – problems that firms might underestimate when negotiating and drafting contracts. Moreover, e*x post* disputes occurring because of procedural matters (in which experts have authority) or substantive decisions (in which clients have authority) may tarnish third parties' reputations (Rosenthal, 1974; Mureiko, 1988). In order to avoid damages to their own reputations and to legitimize their interventions in the negotiation process, legal third parties should favor highly detailed contracts. Hence, we expect the involvement of external legal experts to enhance the recognition of potential hazards and, consequently, increase the inclusion of contractual provisions. In other words:

Hypothesis 4b:
The use of third parties for legal support when designing technology-transfer contracts increases contract complexity.

METHODS

Sampling and Data Collection

To test our hypotheses, we obtained data from a survey on transfers of technology through licensing. Given the transactional challenges evident in the market for technology, and the variety of licensing transactions and licensing-contract details (Bessy and Brousseau, 1998; Brousseau *et al*., 2007; Hagedoorn and Hesen, 2007), these transactions provide a relevant and suitable context for examining the use of expert third parties in the contract-design process. Moreover, licensing is a type of transfer for which the empirical literature is relatively limited (Somaya *et al.,* 2010)

In collaboration with Agoria, one of Belgium's largest trade associations, we obtained an initial list of 1946 firms – members and non-members of Agoria – active in the sectors represented by the association: aerospace, industrial automation, electronics, mechanical and mechatronic engineering, automobile, metals and materials, assembly and cranes, plastics, building products, information and communication technologies, and metal fabrication. We selected Agoria for three reasons: First, the sectors represented are among the most prolific in terms of technology transfers (Arora and Ceccagnoli, 2006; Kim and Vonortas, 2006). Second, we were able to conduct an exploratory study, including six semi-structured field interviews, with Agoria's representatives prior to designing the questionnaire.[1] Finally, given its high level of legitimacy among technology-oriented firms in Belgium and the size of its membership, Agoria's support was a means to positively influence the response rate (Dillman, 2007).

To build our questionnaire, we used the total design method developed by Dillman (2007). We first relied on items developed in previous studies, which we adapted when necessary on the basis of pre-testing discussions, and interviews with managers, lawyers, technology-oriented consultants, representatives of Agoria, and other academics. Our online survey package included a letter that was written, signed, and sent by Agoria, as well as a customized cover letter. Follow-up messages were transmitted by email and phone in between two and five contacts per firm. We received assistance from Agoria in identifying key informants, as Agoria regularly updates its list of contacts and their positions. Questionnaires were sent to each contact deemed relevant for our study. We explicitly asked each executive contacted to redirect the questionnaire if other individuals in the organization were viewed as more knowledgeable on the subject of technology transfer.

For each completed questionnaire, we know the function of the respondent (e.g., chief executive officer, chief financial officer, R&D department manager, IP department manager, or head of the legal department) and can infer from these functions that informants were well positioned to provide the requested information (Kumar *et al.*, 1993). The initial response rate was 14% (289 responses). One hundred eighteen responses came from respondents who indicated that their firms had engaged in technology licensing.[2] After eliminating surveys with incomplete information for our variables of interests as well as outliers, the final sample consisted of 93

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observations. The extent of the information we were able to obtain through the survey counter-balances the relatively low number of observations.[3] In addition to the data acquired through the questionnaires, secondary data, mainly relating to firm characteristics (such as sector and size), were collected from the ORBIS-AMADEUS database.

The 93 responses used in our statistical analyses referred to a total of 77 firms. The firms in our sample were of various sizes: 56% had 100 or less employees; 23% had between 100 and 500 employees; and 19% had more than 500 employees.[4] The sample firms were mostly active in the manufacture of metal products (15%), electronic products (14%), machinery and equipment (30%), information and communication technologies services (13%), and scientific and technological activities and services (15%).[5] Most of the licensing contracts in our sample were international: 53% were intra-European (and non-domestic) and 27% involved North American partners (USA and Canada). Licensing partners were Japanese in six cases, Chinese in two cases, and Thai or Russian in other cases. The sample included six cases of domestic (Belgian) licensing contracts (6%). We asked the respondents to select one specific licensing partnership that was still active and representative of licensing partnerships negotiated by the focal firm. The questionnaire was completed by a licensor (i.e., describing an out-licensing) in 30 cases and by a licensee (i.e., describing an in-licensing) in 63 cases.

We analyzed the potential for response bias by comparing early and late respondents (Armstrong and Overton, 1977). Specifically, we tested the first and last quartiles of the sample for significant differences among means for each explanatory variable. The results of the *t*-tests indicated no significant differences ($p > 0.10$). We also examined whether the non-responding firms differed from the responding firms in terms of size and sector using the Kolmogorov–Smirnov test (Siegel and Castellan, 1988). We found no significant differences ($p > 0.10$). Therefore, response bias does not appear to be a problem in our data. While our research design utilizes cross-sectional econometric techniques, we paid particular attention to wording our questions in a way that respected the temporality of the contracting phases suggested in our model (i.e., terms like '*during* the negotiation of the partnership' or '*in the implementation* of the knowledge *after* transferring it to your partner'). Pre-testing discussions and interviews on patent licensing supported the view that firms first develop a technology and then negotiate licensing contracts. The nature of the technology to be transferred, and more broadly, the transaction attributes are therefore initial conditions that drive future governance choices.

Measurement

Dependent Variables. The first dependent variable is *contract complexity*. For this variable, we relied on prior work on contractual provisions (Anderson and Dekker, 2005; Vanneste and Puranam, 2010; Lumineau and Henderson, 2012). The items were adapted to the licensing context based on licensing literature (Bessy and Brousseau, 1998; Brousseau *et al*., 2007; Aulakh *et al*., 2013), and based on discussions and interviews undertaken during the pre-testing phase. Our variable corresponds to the summation of the presence of eight provisions that are not merely boilerplate. These provisions, which are detailed in Table 1, relate to roles, controls and safeguards, rights assignment, and IP protection. Survey respondents were asked to indicate whether each provision was included in the contract. In line with recent research (Reuer and Ariño, 2007; Malhotra and Lumineau, 2011; Bercovitz and Tyler, 2014), which found no differences between using an unweighted or stringency-weighted measure of contract complexity, we used an unweighted measure defined as follows:

$$\text{Contract complexity (unweighted)} = \sum X_i$$

where X_i equaled one if the ith provision was employed and zero otherwise (Lui and Ngo, 2004; Mesquita and Brush, 2008). Therefore, the summation is a variable ranging from zero to eight.

Technical third parties and *legal third parties* represent the second set of dependent variables. These two variables were set equal to one if technical or legal support from third parties, respectively, was used during the contract-development process for the focal technology transfer and equal to zero otherwise.

Specific investment. This variable was measured using three survey questions based on prior research (Artz and Brush, 2000; Reuer and Ariño, 2007) that were adapted to the licensing field. These items focused on the following: (i) whether the technical skills required for the licensing partnership were unique; (ii) the difficulty the licensee would have in redeploying the people and facilities serving the licensing partnership to other uses; and (iii) the licensee's non-recoverable investment in, for example, equipment and people. Respondents were asked to use a five-point Likert scale ranging from 'not at all' to 'to a great extent' for the first item and from 'negligible'

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Table 1. Contractual dimensions (promax factor pattern)[a]

Provisions	Coordination (Factor 1)	Monitoring (Factor 2)
Licensee's use of the licensor's trademark	**0.77**	−0.16
Transfer of marketing test data and other commercial data from the licensor to the licensee	**0.93**	−0.06
Technical assistance and consultancy services provided by the licensor to the licensee	**0.74**	0.39
Training of the licensee's personnel by the licensor	**0.83**	0.09
Transfer of the technical improvements made by the licensor to the licensee	**0.71**	−0.36
Supervision of the licensee's products by the licensor	−0.24	**0.91**
Supervision of the licensee's industrial installation and R&D installation by the licensor	0.49	**0.61**
Reporting to the licensor of the results of technical and commercial tests undertaken by the licensee	0.27	**0.62**
Eigenvalue	3.81	1.73
Proportion of variance explained	0.48	0.22

[a]$N = 118$.
Bold print indicates the largest factor loadings for each contract dimension.

to 'substantial' for the second and third items. Cronbach's alpha is 0.75.

Tacitness. The tacitness of the transferred technology was measured using a scale adapted from Simonin (1999, 2004). The first two survey questions investigated the following: (i) whether the licensed technology was easily codified (e.g., in blueprints, instructions, or formulas) and (ii) whether the licensed technology was more explicit (i.e., easy to explain and describe to others) than tacit. These two items were recorded on a five-point Likert scale ranging from one ('strongly disagree') to five ('strongly agree') and reverse-coded. Cronbach's alpha for this scale is 0.81.

IP rights protection. We considered the quality of the institutional environment in the country of the partner firm (Hennart, 1991; Aulakh *et al*., 2013), as all respondent firms were located in Belgium. We used the patent-rights index developed by Park (2008). This index is based on five dimensions of patent protection: coverage, duration, mechanisms for enforcement, membership in international patent treaties, and restrictions or limitations on the use of patent rights.

Controls. We included a variety of control variables that might affect the level of contract complexity, the use of third parties, or both. First, as size difference between partners tends to intensify the bargaining-power differential (Heide and John, 1992), we included *size difference*. To compute this variable, we first assigned firms to one of five categories based on the number of employees: (i) 100 or fewer employees; (ii) between 100 and 250 employees; (iii) between 250 and 500 employees; (iv) between 500 and 1000 employees; and (v) more than 1000 employees. We then considered the absolute value of the difference in size category between partners.

Second, as prior interactions enable partners to learn about each other and to design more elaborate contracts (Ryall and Sampson, 2009), we controlled for the existence of prior ties between partners. *Prior ties* was a dummy variable set equal to zero in the absence of a prior tie and equal to one when the partners had engaged in partnerships prior to the described transfer. *Prior ties* took the value of zero if the option 'I don't know' was selected.[6]

Third, in order to account for the complexity of the transaction, we included *transaction scope.* This measure refers to the range of joint activities or tasks likely to be undertaken by the partners along their value chains (Child and Faulkner, 1998; Oxley and Sampson, 2004). It was assigned with a value of one if joint efforts in manufacturing and supply or joint efforts in marketing were expected in addition to the actual transfer of technology. It was assigned a value of two if joint efforts in both manufacturing and supply and in marketing were expected. In all other cases, it was assigned with a value of zero.

Fourth, we controlled for the level of *technology intensity* in the sector in which the respondent firm operated. To compute this variable, we referred to the Statistical Classification of Economic Activities in the European Community (NACE) Rev. 2 codes (two-digit level) for the respondent firms' sectors and the Eurostat categorizations. Six sector categories were relevant: high-tech, medium-high-tech, medium-low-tech and low-tech manufacturing sectors, and knowledge-intensive and less knowledge-intensive service-based sectors. Our control variable *high-tech* was set equal to one if the respondent firm's sector fell into the high-tech manufacturing sectors or into the knowledge-intensive service-based sectors, and it was set equal to zero otherwise.

In addition, we controlled for the possible lack of familiarity with the counterpart's legal tradition (Peng and York, 2001) by including a variable relative to legal traditions (La Porta *et al.*, 1997). *Civil law* was set

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equal to one if the partner was from a country operating under civil law and zero otherwise (all Belgian firms function under civil law).

We added a variable named *licensor* to account for situations in which the technology originated from Belgium (out-licensing) or was received by a Belgian licensee (in-licensing). This variable was set equal to one if the questionnaire was completed by a Belgian licensor and equal to zero if completed by a Belgian licensee. Finally, to address potential differences in the use of third parties across geographical regions, we incorporated region fixed effects (i.e., the regions of the licensing partner) into the specifications.

Common Method Bias. We used five procedural remedies to address potential common method bias. First, we protected the respondents' identities to avoid socially desirable responses. Second, the dependent variables were 'neutral' items, as they did not relate to attitudes, behaviors, or perceptions. Third, the format and wording of the questions used for the dependent and independent variables differed. Fourth, we obtained data from different sources (i.e., ORBIS-AMADEUS) for several of the control variables. Fifth, the questions related to the dependent and independent variables were not asked in the same phases of the questionnaire (Podsakoff *et al.*, 2003).

To further control for common method bias, we ran Harman's one-factor test. When loading all of the items used in our study into a factor analysis and examining the unrotated factor solution, we found that five factors had eigenvalues of more than one and that 20% of the variance was explained by the first factor. Cumulatively, the five factors explained 65% of the variance. As no single dominant factor emerged, this test suggests that common method variance is not a significant problem in our data (Podsakoff and Organ, 1986).

RESULTS

We report the number of observations, means, and standard deviations for each independent variable in Table 2. The table also provides the correlation matrix. The maximum variance inflation factor is 5.50, which is below the threshold of ten that typically indicates a multicollinearity problem (Neter *et al.*, 1985).

The regression results are reported in Tables 3 and 4. Table 3 presents four bivariate probit regression models in which the dependent variables – technical third parties and legal third parties – are the dummy variables. To allow for the possibility of unobservables that affect the use of technical third parties might influence the use of legal third parties or vice versa, we opt for bivariate probit regressions (Greene, 2003).[7]

As we sometimes have more than one technology transfer described per firm (93 observations from 77 firms), we also consider possible interdependencies between transfers negotiated by the same firm.[8] We therefore cluster our observations for each firm to obtain robust standard errors (Lin and Wei, 1989). In our sample of 93 contracts, 30 were negotiated with the involvement of either technical or legal third parties (32%). For firms describing more than one technology transfer, we note that the use of technical and legal third parties varies across transactions. This confirms the relevance of using the transaction as the unit of analysis rather than the firm. Table 1 provides the relative frequencies of each contractual provision used to assess the level of contract complexity. The mean number of focal provisions observed in our sample of technology-transfer contracts is 2.06, and the contracts are heterogeneous: 29% of contracts have one of these provisions, 16% have two provisions, and 10% have five or more. The most commonly used provision is transfer of the technical improvements made by the licensor to the licensee (56%) followed by provisions related to the technical assistance and consultancy services provided by the licensor to the licensee (53%). The least-used provision concerns the supervision of the licensee's industrial installation and R&D installation by the licensor (6.5%).

The findings obtained in the full model (Model 4 in Table 3) support Hypotheses 1a, 1b, and 2b. The relationships between specific investments and technical third parties, and between specific investments and legal third parties are positive and significant (Hypothesis 1a: $\beta = 1.12$; $p < 0.01$; Hypothesis 1b: $\beta = 0.42$; $p < 0.05$). Model 4 supports Hypothesis 2b; given the significant and negative relationship between tacitness and the use of external legal support ($\beta = -0.27$; $p < 0.10$).

The results do not show support for Hypotheses 2a, 3a, or 3b. There might be situations in which, despite the difficulties of protecting and sharing tacit knowledge, partner firms believe that involving an external expert will reduce, rather than amplify, the contractual challenges and, thereby, magnify the chances of success. In other words, the threat of appropriability hazards should be outweighed by the benefits of the third-party's involvement. For example, Hagardon and Sutton (1997) examine how design firms, such as IDEO, often connect, recombine, and transfer

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Table 2. Descriptive statistics and correlation matrix[a]

	Mean	STD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Contract complexity	2.06	1.57	1.00														
2. Monitoring	0.27	0.49	0.43***	1.00													
3. Coordination	1.79	1.43	0.95***	0.12	1.00												
4. Technical third parties	0.10	0.30	0.01	−0.18†	0.07	1.00											
5. Legal third parties	0.28	0.45	−0.02	0.10	−0.06	0.20†	1.00										
6. Asset specificity	2.92	0.94	0.30**	−0.06	0.34**	0.26*	−0.01	1.00									
7. Tacitness	3.51	1.10	−0.16	−0.04	−0.16	0.15	0.23*	−0.02	1.00								
8. IP rights protection	4.54	0.47	−0.18†	−0.57***	−0.00	0.10	−0.01	0.07	−0.01	1.00							
9. Size difference	0.34	2.20	0.18†	−0.02	0.21*	0.11	−0.20†	0.30**	−0.02	0.16	1.00						
10. Prior ties	0.15	0.36	−0.09	0.08	−0.13	0.06	0.27**	−0.14	0.26*	−0.21*	−0.05	1.00					
11. Transaction scope-1	0.16	0.37	0.43**	0.06	0.45**	−0.14	−0.01	0.13	−0.22*	0.13	0.09	−0.10	1.00				
12. Transaction scope-2	0.02	0.14	−0.01	−0.08	0.02	0.20†	0.24*	0.12	0.03	0.01	0.15	−0.06	−0.06	1.00			
13. High tech	0.35	0.48	0.17	−0.22*	0.26*	−0.09	−0.06	0.21*	−0.11	0.24*	0.22*	−0.06	0.35**	−0.11	1.00		
14. Civil law	0.64	0.48	−0.27**	0.08	−0.32**	0.01	0.21*	−0.22*	0.12	−0.27**	−0.12	0.18†	−0.04	0.11	−0.25*	1.00	
15. Licensor	0.32	0.47	0.00	0.28**	−0.09	−0.07	0.29**	−0.13	0.08	−0.37**	−0.34**	0.16	0.01	0.06	−0.17†	0.22*	1.00

[a]$N = 93$
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$;
IP, intellectual property.

Table 3. Use of third parties (Bivariate Probit Regressions)[a]

	Model 1		Model 2		Model 3		Model 4	
	Technical third parties	Legal third parties	Technical third parties	Legal third parties	Technical third parties	Legal third parties	Technical third parties	Legal third parties
Asset specificity			1.13** (0.37)	0.46* (0.21)	1.12** (0.37)	0.43* (0.20)	1.12** (0.37)	0.42* (0.20)
Tacitness					−0.22 (0.18)	−0.26† (0.15)	−0.22 (0.18)	−0.27† (0.15)
IP rights protection							−0.57 (2.46)	−0.33 (0.67)
Size difference	0.17† (0.09)	−0.00 (0.08)	0.17 (0.10)	−0.07 (0.08)	0.16 (0.10)	−0.06 (0.08)	0.17 (0.11)	−0.06 (0.08)
Prior ties	0.27 (0.54)	1.17* (0.59)	0.21 (0.53)	1.50* (0.61)	0.11 (0.55)	1.27* (0.59)	0.12 (0.55)	1.26* (0.59)
High tech	−1.00* (0.53)		−1.86** (0.66)		−1.80** (0.67)		−1.80* (0.69)	
Civil law		−0.90 (0.56)		−0.90 (0.61)		−0.96 (0.66)		−0.94 (0.67)
Licensor	−0.09 (0.53)	1.35** (0.47)	0.01 (0.61)	1.50** (0.49)	−0.05 (0.62)	1.46** (0.48)	−0.02 (0.67)	1.46** (0.48)
Region fixed effect	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	0.16 (0.84)	1.53† (0.90)	−2.24* (1.10)	0.44 (0.97)	−3.15* (1.22)	−0.53 (1.11)	−0.55 (11.63)	0.96 (3.27)
Prob > χ^2	0.00	0.00	0.00	0.00				
Wald χ^2	1262.45	1732.51	1307.82	1328.68				
Wald test of rho = 0	0.09	0.15	0.17	0.18				

[a]$N = 93$. Robust standard error in parentheses. 77 clusters.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$;
IP, intellectual property.

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Table 4. Contract complexity (OLS Regressions)[a]

	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Technical third parties		0.64 (0.40)		0.52 (0.43)		0.42 (0.45)
Legal third parties			0.87† (0.44)		0.81† (0.44)	0.78† (0.45)
Asset specificity	0.20 (0.17)			0.15 (0.18)	0.16 (0.15)	0.12 (0.16)
Tacitness	0.01 (0.13)			0.02 (0.13)	0.05 (0.13)	0.05 (0.13)
IP rights protection	−1.24† (0.67)			−1.27† (0.68)	−1.21† (0.64)	−1.23† (0.65)
Size difference	0.07 (0.08)	0.10 (0.09)	0.11 (0.08)	0.07 (0.09)	0.07 (0.08)	0.07 (0.08)
Prior ties	−0.09 (0.38)	−0.19 (0.38)	−0.41 (0.38)	−0.13 (0.38)	−0.32 (0.37)	−0.34 (0.37)
Transaction scope-1	1.82*** (0.44)	1.99*** (0.46)	1.92*** (0.44)	1.89*** (0.46)	1.83** (0.43)	1.88*** (0.44)
Transaction scope-2	0.14 (0.72)	−0.05 (0.69)	−0.37 (0.87)	−0.01 (0.58)	−0.35 (0.74)	−0.45 (0.62)
High tech	−0.08 (0.34)	−0.08 (0.36)	−0.15 (0.35)	−0.02 (0.33)	−0.08 (0.32)	−0.03 (0.32)
Civil law	−0.14 (0.46)	−0.33 (0.45)	−0.07 (0.42)	−0.18 (0.46)	0.06 (0.44)	0.02 (0.46)
Licensor	0.03 (0.40)	0.05 (0.43)	−0.24 (0.43)	0.04 (0.40)	−0.23 (0.40)	−0.20 (0.40)
Region-fixed effect	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	5.80† (3.19)	0.40 (0.60)	−0.08 (0.63)	5.85† (3.23)	5.22† (3.08)	5.28† (3.13)
Prob > *F*	0.00	0.00	0.00	0.00	0.00	0.00
R-squared	0.45	0.42	0.45	0.46	0.48	0.48

[a]$N = 93$. Robust standard error in parentheses. 77 clusters.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

knowledge and ideas to other firms in order to facilitate their innovation processes. The positive link between the use of external experts and the level of innovation is also demonstrated in Zhang and Li (2010). With regard to Hypotheses 3a and b, the absence of significant results may be due to the ability of third parties to inform partner firms about formal or informal remedies that help to avoid situations in which IP-related conflicts cannot be resolved in an equitable or timely fashion because of a poor institutional framework (Zucker, 1986). In their meta-analysis, Cao and Lumineau (2015) find that in weakly protective institutional environments, contracts and, in particular, their coordination mechanisms tend to be used to complement informal forms of governance, such as trust. Therefore, the assistance of technical and legal third parties might be solicited even in the absence of strong IP protection.

The results for some of the control variables are also noteworthy. The existence of prior ties increases the likelihood of relying on legal third parties ($\beta = 1.26$; $p < 0.05$). Model 4 also shows that the use of technical third parties decreases as technology intensity increases ($\beta = -1.80$; $p < 0.05$). This finding suggests that when there is a high likelihood that the transferred technology falls outside third parties' domain of expertise, mainly because of the rate of obsolescence, partner firms favor an exclusively bilateral relationship at the outset of their exchange (Mayer *et al.*, 2012). Finally, the completion of the questionnaire by a Belgian licensor (rather than a Belgian licensee) has a significant and positive impact on the likelihood of using a legal third party ($\beta = 1.46$; $p < 0.01$).

Table 4 presents the results of the OLS regressions with contract complexity as the dependent variable and the three transaction attributes as control variables. As evident in these results, the relationship between legal third parties and contract complexity is significant and positive. Hypothesis 4b is therefore supported (Model 10, $\beta = 0.78$; $p < 0.10$). However, the findings do not reveal a significant relationship between technical third parties and contract complexity. With respect to our control variables, Model 10 validates the TCE prediction of a positive relationship between the level of uncertainty ($\beta = -1.23$; $p < 0.10$) and contract complexity (Joskow, 1990; Oxley, 1999). Our findings also support the view that as opportunities for free-riding and unintended knowledge transfers rise owing to a wider transaction scope (Oxley and Sampson, 2004; Sampson, 2007), partner firms make greater efforts to incorporate provisions into their contracts (Reuer and Ariño, 2007).

Robustness Tests

We ran several robustness tests. First, in addition to using OLS regressions to predict *contract complexity*, we estimated all models in Table 4 using ordered logit regressions (see Mellewigt, Madhok and Weibel, 2007, and Reuer, Ariño and Mellewigt, 2006, for a similar approach). Second, as contract complexity is a non-negative count-dependent variable, we also ran a negative binomial model (Greene, 2003). The results for these first two checks are qualitatively similar.

Third, rather than including two variables to account for decisions to use either technical or legal

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support, we computed an ordinal variable that was set equal to one if firms used either technical or legal support from third parties when developing their contract, two if they used both categories of support, and zero otherwise. The findings obtained from the ordered logit regression show that the decision to use support from third parties is positively and significantly influenced by the extent of specific investments required ($\beta = 0.53$; $p < 0.01$) and negatively influenced by the level of tacitness ($\beta = -0.28$; $p < 0.10$). We then included the ordinal variable in the OLS regression with contract complexity as the dependent variable. Observations with a value of zero for this categorical variable were used as the reference group. The results indicate that using either one category of support ($\beta = 0.66$; $p < 0.10$) or both categories of support ($\beta = 1.25$; $p < 0.05$) positively and significantly influence contract complexity.

Finally, given our relatively small sample size, we have a limited number of observations for each estimated parameter, which might lead to 'overfitting' of the sample. Small sample size is a concern that most research investigating contractual issues has to overcome. In order to further validate our results, we ran a non-parametric bootstrap regression (with 2000 replications) as an alternative estimation procedure. Bootstrapping prevents us from making assumptions about the form of the population and, thereby, produces more accurate estimates for small sample sizes (Efron, 1979). Again, the results were qualitatively similar.

Additional Analyses

We conducted empirical analyses aimed at studying the influence of technical and legal support received from third parties on distinct dimensions of the technology-transfer contract. Recent studies contend and show that contracts may be viewed as multidimensional constructs (Reuer and Ariño, 2007; Vanneste and Puranam, 2010; Malhotra and Lumineau, 2011). They suggest that each contractual dimension might be explained by specific antecedents. Prior research does not provide specific guidelines on identifying and categorizing provisions in the licensing context. We therefore use a factor analysis to ascertain that these provisions refer to separate dimensions, especially the monitoring and coordination dimensions defined in previous research (Reuer and Ariño, 2007; Faems *et al*., 2008; Ryall and Sampson, 2009; Lumineau and Henderson, 2012). This analysis enables us to determine whether our data and the licensing setting fit with the contractual dimensions established in extant empirical studies. Given the dichotomous nature of the eight contractual provisions used, we must determine the tetrachoric correlations among provisions (Schumacker and Beyerlein, 2000). Based on the tetrachoric correlations, we provide the results of a principal components factor analysis after an oblique rotation in Table 1. We opt for promax because we expect the resultant components to be correlated (Hair *et al*., 2006). Factors are retained if their corresponding eigenvalues exceed one. Given our sample size, factor loadings of 0.60 and higher are considered significant for interpretative purposes (Hair *et al.,* 2006). The factor analysis yields a well-behaved solution, with items typically loading on a single factor, with loadings greater than 0.60 and with no significant cross-loadings.[9] Two factors are considered, which together represent 70% of the total item variance.[10] The communalities exceed 0.50.

In Table 5, we present the results of a seemingly unrelated regression in which the summation of provisions with an emphasis on coordination and the summation of provisions strongly associated with monitoring are used as the dependent variables, respectively. The modeling of interdependencies among these two variables is particularly important in light of theories suggesting that contractual dimensions are jointly determined (Argyres *et al*., 2007; Bercovitz and Tyler, 2014).[11] Our results show that the intervention of third parties has a different influence on the two contractual dimensions depending on the type of support solicited (i.e., technical or legal). The use of external technical support negatively and significantly affects the inclusion of monitoring provisions ($\beta = -0.22$; $p < 0.05$, Model 16). However, the use of third-party technical support increases the inclusion of coordination provisions ($\beta = 0.64$; $p < 0.10$, Model 16). Moreover, our results show that the use of external legal support increases the inclusion of monitoring provisions ($\beta = 0.22$; $p < 0.05$, Model 16).

Moreover, our design implies a direct influence of transaction attributes on contract design as well as an indirect influence through the use of third parties. In order to properly account for the direct and indirect effects, we also checked for possible mediating effects of the use of third parties on the relationships between transaction attributes and contract design. Baron and Kenny's (1986) first two conditions for supporting mediation are not met when considering the overall contract complexity, as there are no situations in which one of the transaction attributes significantly influences the mediator variables, which in turn influence the contract complexity. However, the influence

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Table 5. Contractual dimensions (seemingly unrelated regressions)[a]

	Model 11		Model 12		Model 13	
	Monitoring	Coordination	Monitoring	Coordination	Monitoring	Coordination
Technical third parties			−0.23* (0.09)	0.87** (0.33)	−0.19* (0.09)	0.71* (0.35)
Legal third parties						
Asset specificity	−0.04 (0.04)	0.25† (0.14)			−0.02 (0.04)	0.18 (0.15)
Tacitness	0.00 (0.03)	0.01 (0.11)			−0.00 (0.03)	0.02 (0.11)
IP rights protection	−0.85*** (0.17)	−0.39 (0.62)			−0.84*** (0.17)	−0.42 (0.62)
Size difference	0.04* (0.02)	0.02 (0.07)	0.05* (0.02)	0.04 (0.07)	0.04* (0.02)	0.02 (0.07)
Prior ties	−0.03 (0.13)	−0.07 (0.29)	−0.02 (0.14)	−0.17 (0.28)	−0.01 (0.13)	−0.11 (0.27)
Transaction scope-1	0.19† (0.11)	1.63*** (0.42)	0.18 (0.11)	1.80*** (0.42)	0.16 (0.11)	1.73*** (0.42)
Transaction scope-2	−0.43*** (0.12)	0.57 (0.62)	−0.44* (0.20)	0.39 (0.50)	−0.38* (0.15)	0.37 (0.44)
High tech	−0.18* (0.07)	0.10 (0.32)	−0.29** (0.08)	0.20 (0.32)	−0.20** (0.07)	0.18 (0.31)
Civil law	−0.01 (0.17)	−0.13 (0.32)	−0.07 (0.17)	−0.26 (0.33)	0.00 (0.17)	−0.18 (0.33)
Licensor	0.22* (0.10)	−0.19 (0.37)	0.21* (0.10)	−0.16 (0.38)	0.21* (0.10)	−0.17 (0.36)
Region fixed effect	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	4.06*** (0.81)	1.74 (2.89)	0.18 (0.22)	0.21 (0.46)	4.04*** (0.81)	1.81*** (2.92)

[a]$N = 93$. Robust standard error in parentheses. 77 clusters.
†$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$;
IP, intellectual property.

of specific investments on the extent of coordination provisions may be partially mediated by external technical support. Model 4 in Table 3 shows that specific investments significantly influence the use of technical third parties ($\beta = 0.42$; $p < 0.05$). Given the significant relationship between specific investments and the extent of coordination provisions, the second condition is met ($\beta = 0.25$; $p < 0.1$; Model 11 in Table 5). Model 12 in Table 5 validates the presence of the third condition, as technical third parties significantly influence the extent of coordination provisions ($\beta = 0.87$; $p < 0.01$). Finally, Model 16 in Table 5 suggests that the use of external technical support may mediate the influence of specific investments on the extent of coordination provisions. However, the results of the Sobel test, which is conservative (MacKinnon *et al.*, 1995), do not indicate that these mediating effects are statistically significant ($z = -0.17$; $p = 0.86$). We also perform the analysis proposed by Preacher and Hayes (2008), which accounts for the presence of two mediators. This test does not suggest that a substantial proportion of the total effect is mediated by the use of technical third parties. We therefore remain cautious about making conclusions regarding the mediating roles of third parties.

DISCUSSION AND CONCLUSION

In this study, we investigated the antecedents of firms' decisions to involve third parties when designing contracts for technology transfer and the influence of those decisions on contract complexity. On the basis of data on technology-licensing partnerships, we found that third parties are used when transaction attributes give rise to non-trivial hazards. In particular, highly specific-required investments increase the use of both technical and legal third parties. However, the tacitness of the knowledge to be transferred has a negative influence on the likelihood that legal third parties will be used. We also found that, when used for legal support, third parties tend to magnify overall contract complexity. While our findings do not show a significant effect of technical third parties on the overall contract complexity, our follow-up tests reveal that these third parties reduce the inclusion of monitoring provisions and increase the inclusion of coordination provisions. These results suggest that it is important to distinguish among third parties' profiles (i.e., technical and legal) when analyzing the effects of external experts on inter-firm exchanges. Moreover, they imply that it is important to avoid considering contract design as a one-dimensional construct (Faems *et al.*, 2008; Malhotra and Lumineau, 2011).

Contributions

Contributions to Research on Contracts. Although prior research on contracting has identified a complex array of transaction attributes that shape contract design, it provides an incomplete view of how contractual governance decisions are made (e.g., Bidwell, 2010). We have proposed a more refined approach to analyze these decisions that integrates the knowledge sets and interpretative frames into the bounded rationality assumption traditionally found in TCE-grounded studies.

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Model 14		Model 15		Model 16	
Monitoring	Coordination	Monitoring	Coordination	Monitoring	Coordination
				−0.22* (0.10)	0.64† (0.36)
0.19† (0.11)	0.67† (0.60)	0.20† (0.11)	0.61† (0.36)	0.22* (0.11)	0.56 (0.36)
		−0.05 (0.04)	0.21† (0.13)	−0.03 (0.04)	0.16 (0.14)
		0.01 (0.03)	0.04 (0.11)	0.01 (0.03)	0.04 (0.11)
		−0.84*** (0.18)	−0.36 (0.58)	−0.83*** (0.19)	−0.39 (0.59)
0.05* (0.02)	0.06 (0.07)	0.04* (0.02)	0.03 (0.07)	0.05* (0.02)	0.02 (0.07)
−0.08 (0.14)	−0.33 (0.30)	−0.08 (0.12)	−0.24 (0.29)	−0.07 (0.12)	−0.26 (0.28)
0.22* (0.11)	1.71*** (0.41)	0.19† (0.11)	1.64*** (0.41)	0.16 (0.11)	1.72*** (0.41)
−0.64*** (0.15)	0.27 (0.74)	−0.56*** (0.14)	0.21 (0.63)	−0.50** (0.17)	0.05 (0.48)
−0.26** (0.08)	0.12 (0.32)	−0.18* (0.07)	0.10 (0.31)	−0.21** (0.07)	0.18 (0.30)
−0.04 (0.15)	−0.03 (0.34)	0.04 (0.16)	0.02 (0.33)	0.06 (0.16)	−0.04 (0.35)
0.16 (0.11)	−0.40 (0.39)	0.16 (0.10)	−0.38 (0.36)	0.14 (0.10)	−0.35 (0.35)
Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
−0.06 (0.20)	−0.02 (0.67)	3.92*** (0.86)	1.30 (2.75)	3.88*** (0.87)	1.40 (2.78)

One of the key behavioral assumptions of the TCE is that actors are boundedly rational. In other words, they have limited cognitive capabilities to design and write contracts due to their inability to grasp all current and future contingencies that might affect a transaction (Simon, 1957; Williamson, 1985). At the same time, most research on inter-firm contracts assumes that contracting parties are able to 'look ahead, perceive hazards, and factor these back into their contractual relation' (Williamson, 1996: 9). However, firms' abilities to actually recognize important contracting hazards or the incentive misalignments associated with them, as well as their abilities to draft provisions for such hazards, have been questioned (Foss, 2001; Mayer and Argyres, 2004). In this paper, we suggest the use of technical and legal third parties as a means for firms to alleviate their bounds on rationality; to be more cognizant of the risks of opportunism and of the coordination challenges and to access a wider set of formal or informal governance remedies.

Our findings indicate that the involvement of technical third parties reduces the extent to which monitoring provisions are included in contracts (i.e., a substitution effect) and increases the extent to which coordination provisions are included (i.e., a complementary effect). We also find that a reliance on legal third parties tends to increase the extent to which monitoring provisions are included in contracts (i.e., a complementary effect). In other words, legal third parties view a higher complexity of monitoring provisions – aimed at addressing potentially divergent or misaligned interests between the partners (Hamel, 1991; Deeds and Hill, 1999; Park and Ungson, 2001) – as an appropriate response to transactional challenges. However, the use of external technical experts may enable partners to avoid drafting overly complex monitoring provisions. In fact, some scholars argue that extant safeguards tend to inhibit flexibility, cooperation, and joint value creation (Ghoshal and Moran, 1996; Dyer and Singh, 1998). This set of results follows those obtained by Bercovitz and Tyler (2014). While the authors focus on in-house experts, they find that the extent to which monitoring provisions – such as reporting requirements – are included and detailed in contracts, is negatively influenced by the involvement of scientists and positively by the involvement of contract administrators.

The use of coordination provisions for efficiently managing interdependencies and adjusting actions (Gulati *et al*., 2012; Malhotra and Lumineau, 2011) appears to be a relevant remedy for involved technical third parties. In this regard, our study reinforces the importance of including internal but also external actors' backgrounds and perceptions of the transaction (Dearborn and Simon, 1958; Melone, 1994; Tyler and Steensma, 1998) in theoretical frameworks aimed at investigating the alignment between transaction attributes and distinct contractual dimensions.

Contributions to Research on Third Parties. Decisions to use third parties have mostly been examined in the contexts of selecting partners (McEvily and Zaheer, 1999; Zhang and Li, 2010), repairing trust (Mesquita, 2007), filing patents (Mayer *et al*., 2012), and dealing with *ex post* conflicts (Lumineau and Oxley, 2012). To the best of our knowledge, this study

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is the first to propose a unified theoretical model that investigates both the antecedents and consequences of third-party involvement in contract design.

In-house and external experts differ in many respects. For example, external experts tend to have a key interest in protecting their own reputations (Greenwood *et al*., 2005), as their reputations correspond to 'social proof' of their competence (Rao *et al*., 2001). Clients 'cannot judge the expert's advices and reports on substance', as the expertise of third parties is assumed to be beyond clients' own competences (Starbuck, 1992: 731). Therefore, reputation is critical for third parties and may explain third parties' aversion to damages caused by *ex post* conflicts (Rosenthal, 1974; Mureiko, 1988), which leads to greater complexity in the monitoring dimension. This greater complexity may also be explained by third parties' need to justify their interventions in inter-firm partnerships. Expert third parties are well-positioned to hire high-caliber practitioners who are expected to have more knowledge about the contingencies that may jeopardize the success of a partnership and about the governance tools that may be used as remedies (Schwarcz, 2007). Firms wishing to encourage employees to be such 'experts' may not be able to replicate third parties' incentives (Mayer *et al*., 2012). Moreover, external experts face salient incentives to win business and service clients. Given the need to compete with other third parties, highly talented employees must be attracted and incentivized to work in third-party organizations.

Contribution to the 'Trilateral' Governance Literature. Williamson (1979) refers to Macneil's (1973) three-way classification of contracts when proposing trilateral governance, which implies third-party assistance. At one extreme, classical contracting presumably applies to all non-specific transactions in which 'faceless buyers and sellers … meet … for an instant to exchange standardized goods at equilibrium prices' (Williamson, 1979: 247–248). Such transactions can be either occasional or recurrent. At the other extreme, relational contracting develops for transactions of a recurring and non-standardized nature. The recurrent nature permits the costs of the specialized and more hierarchical structures – such as equity joint ventures or internal organization – to be recovered. Trilateral governance is introduced along with neoclassical contracting, which may be needed when transactions are occasional rather than frequent and of an idiosyncratic nature (Williamson, 1979). The idiosyncratic nature of such transactions makes the market relief unsatisfactory. Moreover, the setup costs of hierarchical governance cannot be recovered for occasional transactions. In such circumstances, TCE suggests that it may be appropriate to use third-party assistance and expertise to govern transactions.

Our study extends the TCE's approach of trilateral governance, as Williamson (1979) exclusively refers to third-party assistance that can be provided by expert arbitrators for resolving disputes and evaluating performance. For instance, Williamson (1979: 237) notes that 'third-party assistance in resolving disputes and evaluating performance often has advantages over litigation in serving these functions of flexibility and gap filling'. Parties that resort to litigation magnify the likelihood of transaction ruptures, which must be avoided given the specialized investments. However, the role of third parties at other contractual stages is not directly mentioned in Williamson's work. Therefore, our study complements the notion of trilateral governance by considering the use of third parties in the contract-drafting process. Our results suggest that third parties tend to be used for specific transactions. For occasional transactions, economies of scale may favor the use of third parties that frequently engage in those types of transactions and that are able to apportion the cost of gaining experience and expertise to more than one client. This suggestion is in line with the TCE's arguments.

Limitations and Directions for Future Research

We acknowledge that this study suffers from several limitations. One limitation lies in the fact that we do not address heterogeneity in terms of the level of expertise of the third parties. Thus, rather than referring to third-party intervention as a dummy variable, future research could consider the level of third-party expertise (e.g., previous experience), the actual type of support used, and the timing of third-party intervention in the negotiations. It may be that third parties are used for delineating individual and joint tasks and responsibilities early in the negotiation process, while they tend to be solicited for safeguarding respective existing or to-be-developed assets later in the process (Lumineau *et al*., 2011). It would also be interesting to investigate the performance implications of using third parties. One might assume that by involving these third parties, firms may be able to mitigate possible misalignments between transaction attributes and the contractual governance structure; thereby, reducing the likelihood of inefficiencies *ex post* (Williamson, 1985, 1991; Joskow, 1988). One might also posit that third parties tend to intensify contract complexity in order to legitimize their interventions, even when such complexity is not necessary given the transaction attributes. More

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generally, there is a need for further exploration of how third-party involvement affects the ongoing exchange via its influence on contract design and partners' expectations (Weber and Mayer, 2011).

Another limitation of this study is that we do not account for the heterogeneity in firms' abilities to design contracts. Firms' internal capabilities (Kale *et al.*, 2002) could affect their propensity to rely on external experts (Argyres and Mayer, 2007; Mayer *et al.*, 2012). Our survey allowed us to collect information on the internal capabilities of respondent firms (via such proxies as the number of IP-dedicated employees and the patent activity), but we were unable to collect such information on their partners.[12] We have reproduced the results by including these proxies in our models and found that they significantly reduce the use of third parties, although they do not alter our main findings.

Furthermore, we focused our empirical analysis on technology-licensing partnerships. It would be interesting to examine the generalizability of our findings to other types of partnerships, such as joint ventures. We also acknowledge the limitations inherent in cross-sectional design and call for additional research that explores the negotiation process longitudinally to determine how decisions made during this process – such as decisions regarding the use of third parties – may alter the transaction attributes. Despite these limitations, we believe our study provides important insights regarding the role of third parties in contract development.

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NOTES

1. Details are available upon request.
2. We did not know in advance which firms in the AGORIA list had engaged in licensing. In 171 surveys, the respondents answered that the focal firm had not negotiated licensing contracts.
3. Contractual research typically relies on rather limited samples: Barthélemy and Quélin (2006) collected 82 observations, Reuer and Ariño (2007) collected 88, Malhotra and Lumineau (2011) collected 102, Ryall and Sampson (2009) collected 52, and Reuer, Klijn and Lioukas (2014) collected 101. This can be explained by the reluctance of executives to reveal sensitive information about contract details despite promises of confidentiality (Carson, 2007; Weber *et al.*, 2009). This is particularly true for licensing contracts, which are often kept highly confidential (Bessy and Brousseau, 1998). Moreover, the top executives targeted by research on partnerships, such as our study, tend to be extremely busy individuals (Bednar and Westphal 2006, Baruch and Holtom 2008). This may also explain the relatively low response rate. Even if the questionnaire was sometimes redirected to and completed by middle-level managers, our questionnaires were first sent to the contacts that we obtained from Agoria, most of whom were top executives.
4. There are three firms for which a value is missing for this variable.
5. Other firms were active in 'Electricity, gas, steam and air-conditioning supply' (3%), in 'Construction' (2%), and in 'Wholesale and retail trade, repair of motor vehicles and motorcycles' (8%).
6. As a robustness check, we ran the regressions without including observations where the option '*I don't know*' was selected (i.e., 14 observations were missing) and we obtained similar results. Detailed results are available on request.
7. The result of the likelihood ratio test is insignificant ($p > Chi2 = 0.93$). Therefore, we cannot rule out the null hypothesis that our two dependent variables are independent.
8. Three firms described two partnerships, three firms described three partnerships and two firms described four partnerships.
9. Given the dichotomous nature of the provisions, the communalities, factor loadings and variance explained are likely to be low (Anderson and Dekker, 2005).
10. The variance explained by contractual dimensions obtained in factor analyses reaches 39.1% in Reuer and Ariño (2007), 63% in Anderson and Dekker (2005), and 63% in Mooi and Gilliland (2013).
11. For instance, Argyres, Bercovitz and Mayer (2007) find that contingency planning and task description behave as complements in contract design.
12. Secondary data were collected from the EPO's worldwide patent statistical database (PATSTAT).

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