Inter-firm Partnerships and Third Parties in Technological Networks

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To my parents,

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Introduction

Most of the innovating firms agree that, to be successful, they must engage in technology partnerships. But it does not mean that they can easily apply it. Questions a manager in an innovating firm might ask are:

- How to find the right partner and make sure that this partner is trustworthy and has the necessary set of resources and skills?
- How to negotiate my contract? Do I have the capabilities to design an appropriate contract that protects my intellectual property?
- How to monitor the relationship with my partner and ensure that this partner respects its commitments, even when its firm is located on the other side of the world?
- How to solve our potential disputes, especially those involving international partners?

In line with John D. Wolpert (Harvard Business Review, August 2002) who wrote: *"The broader question is: How do you break down the barriers to sharing information across companies so you can create more generalized sustainable innovation markets without giving your competitors an advantage? The answer, I believe, lies in a practice that has long been a central element in commerce: the use of independent intermediaries to facilitate the exchange of sensitive information among companies."*; this dissertation is an attempt to answer these four questions through the investigation of the role played by third parties in technological networks.

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MOTIVATION AND PURPOSE

To deal with the sustained pace of scientific and technological development and the continuously rising risks and costs imposed by research and development (R&D) projects, firms involved in technology development and commercialization increasingly need to collaborate and engage in technology agreements (Hagedoorn, 2002). Indeed, technology agreements such as licensing agreement, cross-licensing and technology sharing agreements, research joint venture and research consortium enable firms to share risks and costs of R&D, to access complementary skills and competences, to gain synergies leading to cost savings or improvements in R&D productivity, and/or to improve the speed to market (e.g., Nohria and Garcia-Pont, 1991; Hagedoorn, 1993; Hagedoorn and Schakenraad, 1994; Robertson and Gatignon, 1998; Dyer and Singh, 1998; Stuart, 2000; Baum, Calabrese and Silverman, 2000). In light of this, the last three decades have witnessed important growth in a variety of agreements used to exchange knowledge and technology (Rivette and Kline, 1999; Rigby and Zook, 2002). We have now entered an era of what Chesbrough (2003) calls 'Open Innovation', by which he means that firms do not exclusivity rely on their own R&D anymore but tend, instead, to leverage the discoveries of others *(inbound open innovation)*. Moreover, firms increasingly look for partners with business models that could be better suited to commercialize their own R&D *(outbound open innovation)*. As Chesbrough (2003) writes it: *"Firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology"*. In fact, whilst integrating R&D and the complementary assets in manufacturing and marketing inside the firm emerged as the dominant paradigm for many decades (Nelson and Winter, 1982; Teece, 1988; Chandler, 1990), it does not guaranty lasting commercial success anymore. Due to the increasing pace of technological development, the shortening product life cycles, and the rising costs of R&D projects, innovation processes have now to transcend organizational boundaries.

In conjunction with this trend towards open innovation, we can observe the emergence of new entities partly or fully dedicated to favoring and supporting technology partnerships. Indeed, given the increasing levels of collaboration and outsourcing in technology industries and the heterogeneity between organizations involved (small firms, large firms, universities, or federal labs), entities (that we call 'third parties') have progressively emerged and developed skills that are highly valuable for firms wishing to engage in technology agreements. Even where technology agreements are mostly bilateral, the preliminary and exploratory interviews we conducted with managers in technological firms, lawyers specialized in intellectual property (IP) and consultants in technology management, shed light on the firms' propensity to use services offered by third parties in order to ease and secure their relationships. Examples of key third parties are technology or knowledge brokers, knowledge-intensive business services firms (KIBS firms), patent attorneys, auditing firms, arbitrators, trade associations, regional development agencies, and collective research centers (or federal labs). These third parties can assist firms in identifying partners, negotiating contracts, monitoring relationships and enforcing contractual terms. Surprisingly, even if these third parties seem to play a critical role in many technology agreements, they have received very limited attention in the strategic management and business economics literature up to now. Our main purpose in this dissertation is to investigate the **decisions made by firms to use third-party services at one or another contractual stage of their technology agreements**.

In the following, I first introduce specific challenges found in the market for technology that may render technology agreements particularly difficult to manage: (1) most of the knowledge to be transferred is tacit, (2) great uncertainty usually surrounds the innovation process, (3) high levels of specific investment are often required, and (4) labor division among partner firms is typically complex. These specific challenges magnify two concerns that may hinder the formation of inter-

firm agreements in technology industries and jeopardize their success: the partners' opportunistic behavior and the complex coordination of inter-dependent tasks. In the second section, I briefly expose how Transaction Cost Economics and Social Network Theory, the two main streams of literature used in this dissertation, have studied ways firms can use to deal with these opportunism and coordination concerns. The third section introduces the third parties and sheds light on the role they can play in the market for technology. Although Transaction Cost Economics and Social Network Theory contribute to the understanding of the role played by these entities, they have virtually ignored their existence. Throughout this dissertation, the main purpose will be to understand firms' motives to use third parties for the management of their technology agreements and to determine the extent to which these third parties help firms address the opportunism and coordination concerns. Fourth, I explain how Transaction Cost Economics and Social Network Theory complement each other to understand the role played by third parties. Finally, I outline the content of the three essays composing this dissertation: one theoretical and two empirical essays.

How do the specific challenges found in the market for technology magnify the opportunism and coordination concerns?

While engaging in technology agreements can be highly beneficial for firms in many respects, selecting the appropriate type of agreement (licensing, cross-licensing, joint venture, etc.) and the right partner, and forming and managing these agreements can pose thorny challenges. These challenges emerge to a large extent from the way the market for technology operates; namely, (1) most of the knowledge to be transferred is tacit, (2) great uncertainty usually surrounds the innovation process, (3) high levels of specific investment are often required, and (4) labor division among partner firms is typically complex. As explained below, under these conditions,

two main concerns become particularly salient: the partner's opportunistic behavior and the complex coordination of inter-dependent tasks.

Most of the knowledge to be transferred is tacit. Knowledge can take very different forms: designs, ideas, information, skills, competences, routines, practices, or technologies. The way firms transfer their knowledge varies with its form, and notably with its level of tacitness. Knowledge is tacit when it is difficult, if not impossible, to articulate, formalize and communicate it to others (Polanyi, 1962; Winter, 1987). This is the case when the knowledge is grounded in the experience and expertise of individuals and embodied in "organizational routines"; i.e., firm's system and habits of coordinating and managing tasks (Nelson and Winter, 1982). A great deal of the knowledge developed by firms is highly tacit, either held by individuals or held collectively[1], and transmitting it requires face-to-face contacts and sometimes the transfer of key individuals such as engineers and scientists.

Defining property rights on codified knowledge such as blueprints, formulas, or computer codes is far easier than on tacit knowledge. Given that much useful knowledge or know-how developed by firms is tacit and cannot be appropriately protected by patents, a "market failure" arises (Arrow, 1962). According to Arrow's formulation of this market failure, as soon as a seller discloses information or an idea, a potential buyer can use the information without paying for it. The seller will therefore be reluctant to disclose this information and the buyer will not agree to pay the price asked by the seller. This can result in a market failure in a sense that the transaction

[1] As written by Matusik and Hill (1998): *"Individual tacit knowledge can be found in individual schemas, skills, habits, and abstract knowledge (Lyles and Schwenk, 1992; Starbuck, 1992), whereas collective tacit knowledge typically resides in top management schemas, organizational consensus on past experiences, firm routines, firm culture, and professional cultures (Lyles and Schwenk, 1992, Nelson and Winter, 1982; Nonaka and Takeuchi, 1995). […] Individual explicit knowledge consists of knowledge and skills that can be easily taught or written down, whereas collective explicit knowledge resides in standard operating procedures, documentation, information systems, and rules (Brown and Duguid, 1991; Lyles, 1988; Starbuck, 1992)".*

may not take place at all. Patents are a means to deal with this issue as they enable the seller to disclose information while preventing the potential buyer to use it without the patent holder's permission. However, as written before, much useful knowledge cannot be appropriately protected by patents.

When the transaction eventually takes place and an inter-firm agreement is formed, appropriability problems can still arise (Teece, 1986, 1988; Oxley, 1997; Oxley and Sampson, 2004). Indeed, firms engaging in agreements designed to transfer knowledge or technology must beware the potential for leakage of valuable proprietary information to partners or for loss of control over their intellectual assets. In order to restrict partners from opportunistically using proprietary knowledge, the contract must include a clear delineation of the relevant property rights and a mechanism for enforcing those rights (Pisano, 1989). However, know-how and R&D capabilities cannot be clearly defined or adequately described in a contract as they are by nature highly tacit and non-codifiable (Mowery and Rosenberg, 1989). Consequently, firms may be unable to attach claims to much of the valuable IP that is engaged or created during the agreement.

We cannot mention the appropriability problems without stressing the critical influence of the diversity of IP rights systems along countries and industries in this respect (Williamson, 1991; Oxley, 1999, Anand and Khanna, 2000). According to Barzel (1989) and North (1990), a property rights system is a set of rules and mechanisms that delimits rights of uses over economic resources and allocates them to decision makers so as to enable them to take economic actions. Barzel distinguishes two operations: measurement and enforcement. The measurement operation consists in delimiting the rights of uses and in allocating these rights. The enforcement operation implements these rights of uses by excluding every untitled agent from access to the protected resource, or from capturing the output of its use. In light of this, the strength and completeness of

IP rights systems have commonly been assessed through the levels of IP rights measurement and enforcement achieved by public institutions (e.g., Ginarte and Park, 1997; Ostergard, 2000; Park and Wagh, 2002[2]). Regimes of IP protection and national institutional features in general impact directly the risk of appropriabilty. Previous research has shown that appropriability problems are more likely to occur when the knowledge transfer involves firms established in countries with poor IP rights systems (Teece, 1986; Lee and Mansfield, 1996; Oxley, 1999). Where the judicial system is corrupt or property rights and contracts are not respected, firms' ability to contract for the use of valuable IP will be compromised.

Great uncertainty usually surrounds the innovation process. Technology development and commercialization are usually surrounded with high uncertainty. This uncertainty renders almost impossible the accurate assessment and specification of costs, duration, activities to be performed jointly and individually, and of outcomes in contracts (Pisano, 1989; Oxley, 1997). As Klein (1980) puts it, *"uncertainty implies the existence of a large number of possible contingencies and it may be very costly to know and specify in advance responses to all of these possibilities"*. The number of possible future situations may indeed exceed the imaginative and cognitive capacity of firms (Hart, 1987) and it would be inefficient and prohibitively costly to consider all of them in a contract and to delineate individual and joint activities under each of these situations (Al-Najjar, 1995). Uncertainty can only be resolved as the project progresses (Nelson and Winter, 1982). As a result, the inability to fully specify future joint and individual activities and their costs, duration and outcomes renders the contract unavoidably incomplete and leaves either party open to opportunistic behaviors by the other, notably under the form of free-riding on innovative efforts and opportunistic recontracting.

[2] The Index of Patent Rights developed by Park and Wagh (2002) includes five dimensions of patent protection: (1) coverage (the subject matter that can be patented); (2) duration (the length of protection); (3) enforcement (the mechanisms for enforcing patent rights); (4) membership in international patent treaties; and (5) restrictions or limitations on the use of patent rights.

High levels of specific investment are often required. A transaction involving exploitation or creation of knowledge often requires firms to invest in assets that are specific to this transaction. Williamson (1991) defines 'asset specificity' as the degree to which the assets used in support of a specific transaction can be redeployed to *"alternative uses and by alternative users without sacrifice of productive value"*. Four main types of asset specificity[3] can be distinguished (Williamson, 1985): site specificity, physical asset specificity, human asset specificity, and dedicated assets. Assets characterized by high specificity represent sunk costs as they have little value outside the particular transaction they support and, hence, their value cannot be fully recovered should the transaction be prematurely terminated. When partner firms invest in specific, or idiosyncratic, assets, they must face higher switching costs and "lock-in" problems, in which the party with less idiosyncratic investment at risk expropriates surplus from the other party (Williamson, 1985; Klein, Crawford and Alchian, 1978). This risk becomes particularly salient when the transaction is surrounded with a high level of uncertainty. Indeed, a high level of uncertainty renders the contract unavoidably incomplete, and increases the vulnerability of the party with more specific investments to opportunistic recontracting and rent extraction.

Labor division among partner firms is typically complex. Besides the opportunism concern mainly caused by tacitness, uncertainty and specific investment, technology agreements may impose an important coordination concern (Gulati and Singh, 1998). Indeed, even in agreements where partners have complete confidence in each other, risks of failure may still arise due to possible complex coordination of activities across firm boundaries. The innovation process is

[3] As Leiblein (2003) puts it: "*Site specificity refers to the co-location of facilities so as to minimize inventory or production costs […]. Physical asset specificity refers to the use of co-specialized assets that are customized for a particular use or purpose […]. Human asset specificity refers to an employee's development of firm-specific skills or knowledge […]. Dedicated asset refers to additional investments in plant or equipment made in order to sell the increased output to a particular customer.*"

particularly hard to partition into independent and self-contained tasks (Kline and Rosenberg, 1986; von Hippel, 1990). Throughout the process from research to manufacturing and commercialization, tasks can be difficult to conduct in isolation and thus can ask for a great deal of communication and sometimes systematic interactions. This inter-dependency can jeopardize the success of technology agreements as it requires firms to acquire a good understanding of each other's problems and needs, to share common objectives and beliefs, and to adopt a common language (Arrow, 1974; Teece, 1988). As a result, where technology agreements require the technology recipient to undertake many of the activities that are part and parcel of the original innovation process (Cohen and Levinthal, 1990; Rosenberg, 1990), it becomes tricky to successfully conduct the division of innovative labor.

Ways firms use to deal with the opportunism and coordination concerns: Transaction Cost Economics and Social Network Theory approaches

Two main streams of literature have studied ways to deal with these opportunism and coordination concerns: the Transaction Cost Economics literature and the Social Network literature.

The main question **Transaction Cost Economics** attempt to answer is: Why are institutional structures other than markets necessary for the efficient governance of economic activity? A key argument is that transactions are aligned with governance structures - going from market (i.e., arms-length "spot" contracts) to hierarchy (i.e., organization within the firm) - so as to reduce the costs of transacting (Williamson, 1991). This literature suggests that markets are a more efficient governance structure due to economies of specialization and the administrative and incentive limits of hierarchy, unless the transaction is surrounded with uncertainty and requires to invest in specific assets (e.g., Williamson, 1975, 1985; Klein et al., 1978; Teece, 1982). Indeed,

uncertainty renders market contracts incomplete and may require renegotiation when unexpected contingencies occur. Renegotiation, however, is a hazardous process for the party that has invested in specific assets as these assets limit its ability to switch partners and generate "hold-up" problems (Klein et al., 1978; Williamson, 1985). Transaction-specific assets therefore make this party vulnerable to opportunistic recontracting. Under those conditions of uncertainty and specificity of the assets, internalization of the transaction within the firm is preferred as it eliminates the *ex post* bargaining problems. Of course, internalization should only take place if it engenders governance economies that exceed costs caused by possible additional administrative burdens, incentive distortions, and losses in production efficiency (Williamson, 1985; Grossman and Hart, 1986; Pisano, 1989).

Between these two polar forms, market and firm, we can find hybrid forms of governance such as equity joint venture[4] (Williamson, 1985; Hennart, 1993; Ménard, 2004). The term 'hybrid' is used to refer to arrangements where parties maintain autonomy but are more bilaterally dependent than in pure market contracts. They retain some of the incentive characteristics of markets, while allowing enhanced monitoring and bilateral adaptation and avoiding some of the bureaucratic and shirking costs associated with hierarchy (Williamson, 1991). In general, hybrid forms correspond to long-term contracts. Firms tend to opt for hybrid forms when the uncertainty surrounding the transaction and the extent of joint and inter-dependent activities render the drafting of complete contract almost impossible. Hybrid forms enable them to deal with this incompleteness via governance mechanisms designed for coordinating activities, organizing transactions, and solving disputes (Ménard, 2004). For instance, in equity joint venture, board of directors composed of members from all partner firms is formed. This joint board eases communication of information between partners and coordination of inter-dependent tasks (Pisano, Russo and Teece, 1988;

[4] Rich research has focused attention on equity joint ventures (e.g., Geringer and Hebert, 1989; Gomes-Casseres, 1989; Harrigan, 1986; Hennart, 1991; Killing, 1983; Pisano et al., 1988).

Pisano, 1989). Moreover, such joint management enhances monitoring and control over activities as partners have veto rights over strategic decisions regarding the joint venture operations (Killing, 1983). Consequently, incentives are more closely aligned given that the ongoing returns to each partner are based on the profits of the venture as a whole, and a hostage situation is created where each partner has a continued interest in the maintenance of the agreement (Williamson, 1983; Pisano, 1989)

The **Social Network literature** has also studied ways to deal with these opportunism and coordination concerns. The main tenet developed in this literature is that understanding the formation and success of an inter-firm agreement requires to go beyond the agreement itself and to consider the whole network of agreements in which this agreement is embedded (e.g., Uzzi, 1997; Gulati, 1998; Gulati and Garguilo, 1999; Hagedoorn, 2006). This literature studies, in particular, the 'social embeddedness' of firms within their network. This concept of social embeddedness has been introduced in economic sociology by Granovetter (1985, 1992), who has studied how the economic actions of actors and the outcomes of their behavior can be affected by both their dyadic relationships (referred to as 'relational embeddedness') and the broad structure of their overall network of relationships (referred to as 'structural embeddedness'). Relational embeddedness increases with the quality and depth of personal connections and relationships between the partners (Granovetter, 1985; Uzzi, 1996, 1997). It therefore captures a variety of phenomena such as trust, respect, information sharing, confiding, familiarity and friendship (Uzzi, 1997) but also the degree to which partners consider one another's needs and goals (Granovetter, 1992). Structural embeddedness goes beyond the dyadic level to the broader network in which the dyadic relationship is embedded (Granovetter, 1992; Gulati, 1998). Structural embeddedness refers to direct ties between firms but also indirect ties in the sense that two firms can be tied to a common third-party partner (i.e., they have a same third partner but are not linked through partnership themselves). Nahapiet and Goshal (1998) have taken this

distinction one step further by considering three levels of embeddedness - relational, structural and cognitive embeddednesses -, where cognitive embeddedness refers to the similarity in systems of meaning among partner firms composing the network.

Scholars have recently applied this concept of social embeddedness to inter-firm partnerships in technology industries (e.g.; Hagedoorn, 1993; Stuart, 1998, 2000; Duysters, Kok and Vaandrager, 1999; Gulati, 1999; Baum, Calabrese and Silverman, 2000; Vanhaverbeke and Noorderhaven, 2001; Reagans and Zuckerman, 2001; Duysters and Lemmens, 2003). They show that characteristics of the overall composition of a firm's network of agreements such as its partners' diversity, the number of agreements in which it participates, the extent of its direct vs. indirect linkages, the existence of so-called 'structural holes', and its history of prior ties may significantly contribute to the ability to deal with the opportunism and coordination concerns and, thereby, to the success of inter-firm agreements

On the one hand, each level of embeddedness can contribute to the reduction of the risk of opportunism. At the relational level, the mutual trust and confidence that characterize high relational embeddedness reduce the need for protection by minimizing the likelihood that a party will engage in opportunistic behavior aimed at unilaterally absorbing or stealing information or know-how that is core or proprietary to the other parties (Sabel, 1994; Kale, Singh and Perlmutter, 1999). At the structural level, when the network structure presents dense ties with several common third-party ties (i.e., indirect ties), information (or gossip) about uncooperative behaviors circulates more readily among the network's members, who can jointly mobilize sanctions (Brass, Galaskiewicz, Greve and Tsai, 2004). At the cognitive level, common values, beliefs, and rules enable a convergence of interests that renders opportunistic behaviors less likely (Ouchi, 1980).

On the other hand, the three levels of embeddedness can also play a significant role. At the relational level, the existence of a close relationship between partners helps them better understand where the relevant information, know-how and expertise reside in the partner and who exactly possesses it (Dyer and Singh, 1998; Kale et al., 2000). At the structural level, closed networks (where direct ties are also indirectly tied to each other) enhance the coordination of actions and facilitate the exchange thanks to mutual trust and frequent interactions and communication (McCain, O'Reilly and Pfeffer, 1983; Coleman, 1988; O'Reilly, Caldwell and Barnett, 1989; Zenger and Lawrence, 1989). At the cognitive level, a consistent cognitive embeddedness within a network of technology agreements can ease the coordination in each agreement thanks to the idiosyncratic and shared language and vocabulary used in this network as a whole (Nahapiet and Ghoshal, 1998).

What about the role played by third parties in technological networks?

In this dissertation, we are interested in the decisions made by firms to use third parties to address the opportunism and coordination concerns in their technology agreements. Previous research on the role played by these entities in technology industries is theoretically fragmented (Howells, 2006). Few scholars have attempted to develop a typology of services that third parties may offer in technology industries. In the following, I propose to remedy this by introducing services that various third parties offer at each of the four main contractual stages: (1) identification and selection of a partner firm; (2) negotiation of the contract; (3) monitoring of the relationship, and (4) enforcement of the contractual terms. As summarized in Table 1, opportunism and coordination concerns can appear at each contractual stage and, thereby, can jeopardize the success of the agreement.

Contractual Stages	Opportunism and coordination concerns
1st Stage: Identification and selection of a partner	*Opportunism:* to find a trustworthy partner
	Coordination: to find a partner with the necessary set of resources, skills and capabilities
2nd Stage: Negotiation of the contract	*Opportunism:* to negotiate a contract incorporating the necessary safeguards
	Coordination: to negotiate a contract allowing the necessary flexibility
3rd Stage: Monitoring of the relationship	*Opportunism:* to monitor the contractual commitments
	Coordination: to ease communication, continuity and adaptation
4th Stage: Enforcement of the contractual terms	*Opportunism:* in case of conflict, to apply a binding and enforceable resolution mechanism
	Coordination: in case of conflict, to apply a flexible resolution mechanism favoring continuity

Table1
Opportunism and coordination concerns at each contractual stage

At the first stage, firms have to identify and select partners that are trustworthy and have the necessary set of resources, skills and capabilities to perform the complementary tasks. Third parties such as technology brokers[5] or trade associations[6] may help firms in this process as they have the ability to collect and diffuse information about potential partners' resources, capabilities and needs (Hargadon and Sutton, 1997; McEvily and Zaheer, 1999), and information about potential partners' reputation (Hadfield, 2000). A main task of technology brokers is, in fact, to develop databases on potential partners and to ease the rapprochement between various and heterogeneous firms (Hagardon and Sutton, 1997). They play this brokering role by having a wide range of clients from different sectors. Their central position helps to compensate firms that have a poor advice network and lack bridging ties (McEvily and Zaheer, 1999; Burt, 2004), and to favor the process of knowledge and technology transfer between otherwise unconnected groups. Trade associations may also be helpful at this primary contractual stage by organizing

[5] Examples of technology brokers are IDEO (a well-known product design consulting firm in the United States studied by Hargadon and Sutton (1997)), Tallinn Group and Techexchange.com.
[6] Trade associations such as AGORIA (technology industry) or Essenscia (chemicals industry) in Belgium have voluntary membership and are not for profit organizations.

networking events such as meeting days, seminars and professional fairs. As written by Tucker (2008), *"trade associations usually have voluntary membership, are not-for-profit organizations formed by policy entrepreneurs within firms located in the same industry to collect, share and disseminate industry-relevant information and provide a platform for collective representation and lobbying (Lorenzoni and Lipparini, 1999; Streech and Schmitter, 1985)"*[7]. Through their collective activities, trade associations give firms the opportunity to meet each other more easily. Given the difficulties firms may encounter identifying trustworthy partners that have the necessary resources and skills, these third parties, and their national or international networks, can play a critical role at this first contractual stage. They contribute to the appropriate match between partners but also reduce the risks for firms to ally with recurrent opportunistic partners.

Third parties like regional development agencies (sponsored by the governments to promote specific technological innovation like Europe's EUREKA and ESPRIT programs) and collective research centers or federal labs[8] (created in numerous countries to stimulate the technological development of firms in major industries through collective research) can also be the initiators of large technology agreements. Indeed, they have as their main mission promoting broad technological developments and initiating changes within the regional, national, or international technology environment (Callon, 1994). These third parties thus bridge the policy level and the operational level (research performers) (Van der Meulen and Rip, 1998). In line with the technological development they promote, these third parties have to select which projects and

[7] Moreover, as pointed out by Tucker (2008): *"Although competing firms are legally forbidden from forming cartels or colluding in the US and Europe, they have been historically encouraged to form associations to present their industry's interest (Aldrich and Staber, 1988). Trade associations often serve a self-regulatory function, embody shared values and articulate shared norms for their members, cohering the members of the industry by drawing them together around common interests like lighter regulation, easier access to markets, and more flattering media profile".*

[8] Examples of collective research centers in Belgium are SIRRIS (technology industry) and Centexbel (textile industry).

firms to support and fund on the basis of experts' reviews and evaluations. This gives these third parties a role of filter (Johnson, 2008).

At the second stage, negotiating the contractual terms and reaching an agreement regarding the value and price of the technology transferred are critical. Specially, when the transaction is complex, having the capabilities to design appropriate contracts incorporating the necessary safeguards while allowing the needed flexibility will be crucial for the future governance of the partners' relationships (Argyres and Mayer, 2007). Regarding the legal aspects, third parties such as law firms, KIBS firms[9], technology brokers or thematic professional associations like the Licensing Executives Society[10] put their own negotiating and contractual skills at the firms' disposal. Besides the legal aspects, third parties such as patent attorneys[11] or collective research centers share with firms their expertise regarding the assessment of the value of the technology transferred and its obsolescence rate. At both legal and technical levels, third parties can assist partner firms in packaging the technology to be transferred and in negotiating the contractual terms of their agreements (Watkins and Horley, 1986; Shohert and Prevezer, 1996); a process becoming increasingly delicate due to the rising complexity of the technology involved and the frequent international scope of technology agreements.

While the activities leading to the signing of the contract are critical for the success of the agreement, the **third stage** - monitoring the relationship throughout the contractual duration - is also extremely important and not trivial; especially when the partners are strongly heterogeneous,

[9] As Muller and Zenker (2001) write it: *"KIBS may be defined as 'consultancy' firms in a broad sense, more generally 'KIBS can be described as firms performing, mainly for other firms, services encompassing a high intellectual value-added' (Muller, 2001) […]. It is worthwhile to […] establish a separation between 'traditional professional services' liable to be intensive users of new technology (such as marketing, advertising and so on) and 'new technology-based KIBS' (such as software design and other computer-related activities'"*.

[10] Licensing Executives Society is an international business-oriented organization grouping professionals involved in licensing and other aspects of IP rights transfers.

[11] Patent attorneys have the specialized qualifications necessary for representing clients in obtaining patents and acting in all matters and procedures related to patent law and practices.

young and inexperienced. In order to deal with the opportunism and coordination concerns, it is indeed important to be able to ensure that the partner respects its contractual commitments and also to favor communication and adaptation when necessary. Regarding the opportunism issue, some third parties can monitor the partner's activities and behaviors throughout the duration of the contract. Auditing firms[12], for instance, may be in charge of this monitoring as they inspect, control and certify activities and notably the respect of the contractual commitments via pre-defined mechanisms and rules. Regarding the coordination issue, third parties like collective research centers, or federal labs, may help the technology recipient understand, assimilate and implement the technology. These latter third parties perform activities like testing, prototyping, and training, put at the partners' disposal their specialist facilities and organize seminars. Their technological expertise can greatly enhance monitoring of the knowledge transfer. KIBS firms, as another example, are third parties that provide legal, accountancy, and many management consultancy and marketing services (O'Farrell and Moffat, 1991; Wood, 2002a and b; Bettencourt, Ostrom, Brown and Roundtree, 2002).

Some third parties are also able to ease the monitoring stage through indirect mechanisms. For instance, trade associations and regional development agencies can reduce the opportunistic behaviors by implementing mechanisms like standards, norms, conventions and regulation. These indirect mechanisms can be used by partner firms to 'formally' drive and calibrate their contractual relationships (Jones, 1996; Jones, Hesterly and Borgatti, 1997). Third parties can also develop and diffuse less 'formal' mechanisms like values and culture. By fostering a commonality of values, visions, and languages, they enable to reduce the risk of opportunism but also to ease the coordination (Reddy and Rao, 1990; Abrahamson and Fombrun, 1992; Jones et al., 1997).

[12] Auditing firms such as Deloitte make it possible to audit the accounts of the other party and to verify claims about costs or revenues.

Finally, arbitrators[13] are third parties increasingly solicited at the **fourth stage**; enforcement of the contractual terms. Arbitration enjoys numerous sources of efficiency compared to public courts (Bonn, 1972; Dessemontet, 1996; Richman, 2004): expertise of arbitrators in the subject matter in dispute; specialized rules tailored to the idiosyncratic needs; arbitral procedures acting more swiftly, at lower costs and with more nuances; and confidentiality of the arbitral procedure. Arbitration corresponds to a dispute resolution mechanism that is simultaneously binding and flexible. On the one hand, agreeing to include an arbitration provision in the contract can be seen as a signal of credible commitment as it leads to binding situations with very limited possibility of legal appeal (Williamson, 1983; Richman, 2004; Drahozal and Wittrock, 2008). On the other hand, the arbitration mechanism enables the partners to deal more easily with unanticipated contingencies and to have a more elastic contract (Williamson, 2005).

While arbitration leads to formal sanctions in case of opportunistic behaviors, other third parties such as trade associations are able to apply less formal sanctions like reputation damage. These latter third parties can indeed be seen as repositories of information about firms' reputation. They can make the opportunism more costly (Gulati, Nohria and Zaheer, 2000; Tucker, 2008) as they are able to easily publicize defaults under the rules and, thereby, to damage firms' reputation. Collective sanctions going from gossip and rumors to ostracism can be mobilized and make the opportunistic behavior damage not only the specific agreement in which a firm behaved opportunistically, but also its other current and potential agreements (Blumberg, 2001).

[13] CEPANI is a Belgian center for mediation and arbitration.

Transaction Cost Economics and Social Network Theory frameworks to understand the role played by third parties

Firms in technology industries know that their survival and growth increasingly require them to engage in technology partnerships going from licensing to research joint venture. This imperative is mainly due to the current context of increasing pace of technology development, shortening product life cycles and rising costs of R&D projects. While managers recognize that inter-firm partnerships have become essential, they often struggle to find a right partner, to negotiate the contracts, to monitor the relationships, or to enforce the contractual terms. Each contractual stage - identification of a partner, negotiation of the contract, monitoring of the relationship and enforcement of the contractual terms - may indeed become particularly complex due to the specific challenges imposed by the market for technology: (1) most of the knowledge to be transferred is tacit, (2) great uncertainty usually surrounds the innovation process, (3) high levels of specific investment are often required, and (4) labor division among partner firms is typically complex.

Our main purpose in this dissertation is to show that many forms of third parties, each with specific services, are able to help firms by easing and securing their partnerships. It is important that managers acknowledge that the technology industries do not only consist of firms but also of these third parties, and take advantage of them. Our approach, however, is that using third-party services is not systematically appropriate but, instead, it can be very efficacious under certain conditions. Indeed, resorting to third-party services may engender some costs as well. Identifying the right third party, informing it about the details of the technology agreement and interacting with it may ask time, resources, and money. Resorting to third-party services may, therefore, increase the global costs of the agreement while not having a substantial positive impact on its success.

In order to understand the role played by third parties in technology agreements and to examine the conditions under which the use of third-party services is appropriate, we borrow the arguments developed by Transaction Cost Economics and Social Network Theory. Indeed, given the diversity of third parties that we study and the specific services they offer, both streams of literature provide specific pieces of the puzzle. We argue that relying on third parties will be variously beneficial depending on (1) the characteristics of the transaction and (2) the firm's social embeddedness. Our results show that the likelihood to use third-party services increases with the 'costs of control' and 'costs of coordination' imposed by the transaction. These costs vary with the transaction attributes; namely tacitness of the knowledge transferred, relationship-specific investments, uncertainty, and task inter-dependency. We can, therefore, establish a relationship between the levels of 'costs of control' and 'costs of coordination' imposed by the transaction and the firms' propensity to rely on third parties. However, firms' social embeddedness may also contribute to the reduction of the 'costs of control' (via the reduction of the risks of opportunism) and 'costs of coordination' (via the reduction of the difficulty of coordinating the inter-dependent tasks). Previous research has indeed shown that the three levels of embeddedness - relational, structural, and cognitive- impact the risk of opportunism and the difficulty of coordinating inter-dependent tasks through mechanisms such as trust, mutual respect, familiarity, reputation, commonality of values, business rules and culture. As a result, besides the transaction attributes, firms' social embeddedness also contributes to the understanding of firms' motives to use third-party services.

OUTLINE

In light of the limited knowledge about third parties, this dissertation consists of three essays devoted to their study: one theoretical essay and two empirical essays.

In the first essay, we focus on a critical conflict found in most technology partnerships, namely, the conflict between learning and protecting. This conflict stems from the fact that conditions necessary to facilitate the learning process simultaneously magnify the danger of losing core and proprietary knowledge. Previous research in the Social Network literature has shown how firms' 'social embeddedness', which can be decomposed into relational, structural, and cognitive embeddednesses, can mitigate the intensity of this conflict via mechanisms such as mutual trust, familiarity, reputation, common systems of meaning, and network culture. However, reaching an 'ideal' level of social embeddedness is far from simple. It is for firms a long, hazardous and highly resource-consuming process. In this essay, our intent is to show that alternatives exist for firms that cannot benefit from favorable levels of embeddedness. In that case, firms may indeed try to enter an 'intermediary-governed network' and, hence, benefit from the mechanisms implemented by an intermediary entity to ease the learning process and protect against possible opportunistic behaviors. This network governance model implies that a separate entity is set up specifically to manage and coordinate the network and its activities. A common form of intermediary-governed network in technology industries is the government-sponsored R&D consortium like SEMATECH in the United States, EUREKA in Europe and the VLSI project in Japan. In this first essay, we argue that entering an intermediary-governed network becomes highly valuable for firms when they cannot benefit from their social embeddedness to deal with the conflict between 'trying to learn' and 'trying to protect'; in other words, when the relational embeddedness is low, the structural embeddedness is unfavorable, and the cognitive embeddedness is limited.

The second and third essays are empirical. In these two essays, we focus on a specific form of technology agreement: the technology licensing agreement. Licensing is a means by which technology can be transferred from one party (the 'licensor') to another (the 'licensee'). The

licensee buys the right from a licensor to use its IP for a period of time and with a precise purpose. The licensing contract specifies the content of the technology transferred and the rights and duties of each party, and formalizes the agreement. Licensing enables the licensee to acquire the right to use new technology without having to undertake costly R&D, and simultaneously enables the licensor to derive royalties and, in some cases, to obtain reciprocal licenses to any technical improvements made by the licensee. Both licensee and licensor have the opportunity to capitalize on the other party's reputation and expertise.

The second essay investigates the motives for firms to resort to services offered by third parties like technology brokers, consulting firms, collective research centers, patent attorneys, auditing firms, law firms and professional associations in the licensing context. Although licensing agreements are essentially dyadic agreements, licensors and licensees frequently decide to resort to services offered by third parties in order to secure and ease their relationships. In this second essay, we restrict our analysis to the first three contractual stages: to identify a licensing partner, to negotiate the licensing contract, and to monitor the contractual relationships. We argue that the main motive for the use of third-party services is their ability to help partner firms face two main managerial imperatives in inter-firm agreements such as licensing agreements: the need to control and the need to coordinate. In other words, these third parties enable the licensing partners to reduce the 'costs of control' and the 'costs of coordination' associated with managing their licensing agreement.

In the third essay, we examine the last contractual stage: the enforcement of the contractual terms. In particular, we investigate the role played by arbitrators in licensing agreements. Despite the rising popularity of arbitration, few studies have examined the factors motivating firms to use the arbitration mechanism in their technology agreements. Empirical research on this issue is surprisingly rare in the strategic management and business economics literature. In this essay, we

propose to palliate this important lack of empirical research by studying the trade-off between arbitration and litigation in licensing agreements. Given the expertise of the arbitrators, the confidentiality of the arbitral procedure, and the use of idiosyncratic rules, the arbitration mechanism offers numerous advantages when disputes involve technology and IP. However, licensing partners do not systematically decide to include an arbitration provision in their licensing contract. It is therefore important to understand the advantages offered by arbitration but also its drawbacks. To this end, we develop a theoretical framework addressing the trade-off between arbitration and litigation by using as our frame of reference Transaction Cost Economics. We argue that the likelihood that an arbitration mechanism will be included in the licensing contract increases when the transaction governed by this contract presents high risk of opportunism and great difficulty of writing a complete contract.

To test our conceptual frameworks in the second and third essays, we use a detailed database of licensing transactions. This database was collected through an online survey launched with the support from AGORIA, the Belgian technology trade association.

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Intermediary-governed networks as remedies to unfavorable levels of social embeddedness*

ABSTRACT

While technology alliances like research joint ventures, joint research and development agreements, or technology sharing programs enable firms to achieve numerous benefits such as economies of scale and scope, reduction of risk and uncertainty, and access to new technologies and know-how, they often require these firms to cope with an inherent conflict between two competing objectives: the need to learn and the need to protect. This conflict stems from the fact that conditions necessary to facilitate the learning process simultaneously magnify the danger of losing core and proprietary knowledge. Previous research in the Social Network literature has shown how firms' 'social embeddedness', which can be decomposed into relational, structural, and cognitive embeddednesses, can mitigate the intensity of this conflict via mechanisms such as mutual trust, familiarity, reputation, common systems of meaning, and network culture. However, reaching an 'ideal' level of social embeddedness is far from simple. It is for firms a long, hazardous and highly resource-consuming process. In this essay, our intent is to show that alternatives exist for firms that cannot benefit from favorable levels of embeddedness. In that case, firms may indeed try to enter an 'intermediary-governed network' and, hence, benefit from the mechanisms implemented by an intermediary entity to ease the learning process and protect

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against possible opportunistic behaviors. This network governance model implies that a separate entity is set up specifically to manage and coordinate the network and its activities. A common form of intermediary-governed network in technology industries is the government-sponsored R&D consortium like SEMATECH in the United States, EUREKA in Europe and the VLSI project in Japan. In this essay, we argue that entering an intermediary-governed network becomes highly valuable for firms when they cannot benefit from their social embeddedness to deal with the conflict between 'trying to learn' and 'trying to protect'; in other words, when the relational embeddedness is low, the structural embeddedness is unfavorable, and the cognitive embeddedness is limited.

Keywords: intermediaries; relational, structural and cognitive embeddednesses; network of technology alliances; R&D consortia.

INTRODUCTION

A growing stream of research in the strategic management literature is devoted to the study of networks of technology alliances (e.g.; Hagedoorn, 1993; Stuart, 1998, 2000; Duysters, Kok and Vaandrager, 1999; Gulati, 1999; Baum, Calabrese and Silverman, 2000; Vanhaverbeke and Noorderhaven, 2001; Reagans and Zuckerman, 2001; Duysters and Lemmens, 2003). This research is mainly aimed at showing that to understand the formation process of an alliance (e.g., Stuart, 1998; Duyster and Lemmens, 2003) or the performance of an alliance (e.g., Reagans and Zuckerman, 2001), it is important to go beyond the alliance itself and to consider the whole network of alliances in which this alliance is embedded. In particular, this research shows that the characteristics of the overall composition of a firm's network of alliances (such as its partners' diversity, the number of its alliances, the history of prior ties, or the extent of direct vs. indirect ties) may significantly contribute to the performance and growth of this firm and influence its selection of future alliance partners.

Gulati (1995) has defined the term 'alliance' as any independently initiated inter-firm link that involves exchange, sharing, or co-development. In line with Hagedoorn and Sadowski (1999), we consider as 'technology alliances' any inter-firm agreements involving joint technology development or technology sharing. Hagedoorn and Sadowshi (1999) distinguish contractual alliances, which are *"joint R&D pacts and joint development agreements through which companies undertake innovative projects with shared resources"*, and joint ventures, which are *"combinations of the economic interests of at least two different companies in a 'distinct' firm which also performs R&D or undertakes innovative projects"*. Firms engage in technology alliances for various reasons: to gain competitive advantage through market power or efficiency, to access or internalize new technologies and know-how, to exploit economies of scale and scope, or to share risk (Powell, 1987; Bleeke and Ernst, 1991; Baum et al., 2000). Whatever the type of alliance, one of the main reasons remains the opportunity to learn from the partner and, in particular, to access and acquire critical information, know-how, or capabilities (Hamel, 1991; Yoshino and Rangan, 1995; Khanna, Gulati and Nohria, 1998).

Despite their numerous benefits, technology alliances may require firms to overcome important tensions between two competing objectives: 'trying to learn' and 'trying to protect' (Gulati and Singh, 1998; Kale, Singh and Perlmutter, 2000). These tensions are especially present in so-called 'learning alliances', where the main purpose is to learn or internalize critical information or capabilities from the partners (Prahalad and Hamel, 1990; Hamel, 1991; Khanna et al., 1998; Kale et al., 2000). Tensions between learning and protecting stem from the fact that, on the one hand, firms participate in alliances to learn know-how and capabilities from their partners and, on the other hand, they want to protect themselves from the behavior of these same partners that may also have the desire to acquire their own know-how and capabilities (Kale et al., 2000). Consequently, beyond the usual concern about the real efforts made by each party within the alliance (i.e., free riding), these absorption and learning purposes raise concerns about the release of core and proprietary know-how and capabilities, and the potential use by the partner of these know-how and capabilities for purposes other than the alliance's, thereby resulting in the possible dilution of competitive advantage.

Previous research in the Social Network literature has shown how firms' social embeddedness may help them overcome the duality between learning and protecting via mechanisms like mutual trust, respect, reputation, or common systems of values and norms. However, reaching an 'ideal' level of social embeddedness is far from simple. It is for firms a long, hazardous and highly resource-consuming process. In this essay, our intent is to show that alternatives exist for firms that cannot benefit from favorable levels of embeddedness. In that case, firms may indeed try to enter intermediary-governed networks. Provan and Kenis (2008, 2009) have recently stressed the importance of considering the different network governance models. Intermediary-governed networks correspond to what Provan and Kenis call the 'network administrative organization' (NAO) governance model[1]. Under this model, the network is governed by a separate and external entity in a

[1] We prefer to use the term 'intermediary-governed network' as the activities undertaken by intermediary entities may be much broader than administrative in technology industries; i.e., they can perform tests, develop prototypes, undertake fundamental research, and prepare technological 'road maps'. We find rather 'restrictive' to call them administrative entities in technology industries.

centralized way. A common form of intermediary-governed network found in technology industries is the government-sponsored R&D consortium. Indeed, governments have supported the establishment of R&D consortia in numerous countries and regions to spur the development of cooperative R&D and help their industries gain a strong competitive position on the international scene. SEMATECH in the United States, EUREKA in Europe and the VLSI project in Japan are government-sponsored R&D consortia that have extensively been covered in the trade press. While these R&D consortia differ along various governance aspects, their broad mission is rather similar; i.e., to offer a framework that stimulates and eases collective research. They have all emerged in contexts where the innovation process could not be undertaken efficiently. When the innovation process requires the contribution of several firms linked through technology alliances, two dimensions are essential for its success: a wide exchange of knowledge and information, and mutual trust. These two dimensions are highly intertwined: when the partner firms share their knowledge and information, trust progressively emerges; in turn, when trust is present, partner firms are less reluctant to share core knowledge and information. As exposed below through the examples of SEMATECH, EUREKA and the VLSI project, we see that when firms alone are not able to successfully undertake the innovation process through spontaneous networks of technology alliances, these intermediary-governed networks offer a highly valuable framework where knowledge and information can be exchanged more easily and where trust progressively emerges.

In 1987, SEMATECH (SEmiconductor Manufacturing TECHnology) has been established in the United States in reaction to the domination of the global market for semiconductor memory chips by Japanese firms. 14 firms proposed the creation of this research, development and testing consortium in the semiconductor manufacturing industry and called for federal contributions. The initial purpose of this R&D consortium was to recover market share from Japanese firms and to reestablish supply and materials infrastructure in the United States (Ferguson, 1988; Browning, Beyer and Shetler, 1995). SEMATECH is only open to firms headquartered in the United States or substantially

controlled by U.S. citizens. SEMATECH supports three broad categories of research projects[2]: Joint Development Projects (JDP), Equipment Improvement Projects (EIP) and SEMATECH Improvement Projects (SIP) (Link, Teece and Finan, 1996). SEMATECH's board decides which projects, from a large number of projects proposed, to initiate. In each of these projects, the SEMATECH research facility in Austin, member firms, equipment suppliers, and sometimes universities or national laboratories can be involved. SEMATECH's staff includes many employees of member firms, in order to improve the transfer of knowledge from SEMATECH to member firms (Grindley, Mowery and Silverman, 1994). Clear intellectual policies are implemented, and goals, technological 'road maps', rules, cooperative practices, and contracts are consensually defined. This framework of research collaboration favors contribution of each member firm and fosters trust among them (Browing, Beyer and Shetler, 1995).

In the European Union, the creation of a "European research area" has taken place to reduce the overlap among national research policies of the member states, and to remedy the absence of a coherent European policy on research (Georghiou, 2001). EUREKA (European Research Coordination Agency) is an inter-governmental[3] and 'industry-led' initiative that was launched in 1985 to foster transnational cooperation in Europe on high technology R&D. In particular, EUREKA has been intended to stimulate cooperation between firms and research institutes in advanced civilian technologies. In contrast to SEMATECH, EUREKA has not developed its own central research facility. It has adopted a 'bottom-up' and non-bureaucratic style with a very small secretariat (Georghiou, 2001). It mainly 'labels' selected cooperative projects[4] and makes them eligible for national funding programs. As pointed out by Georghiou (2001) regarding EUREKA,

[2] A JDP is intended to develop a new tool, material, or process supporting phase requirements of future generations of technology. In an EIP, either existing manufacturing equipments or systems are improved from a competitive manufacturing perspective. Finally, a SIP is conducted at the SEMATECH research facility in Austin and requires at least six months to be completed.

[3] EUREKA is not an institution of the European Union. It has always had a wider membership, initially including the ten EFTA countries and Turkey and later extending to the current 27 members, including Russia.

[4] Three main types of projects can get the EUREKA label (Mothe and Quélin, 2000; Georghiou, 2001): large 'strategic' projects mobilizing dozens of partners, commanding very large budgets and aiming to structure entire networks; 'umbrella' structures encouraging meetings and new projects, and especially involving small firms; and ordinary projects.

"characteristics which are particularly appreciated include the flexibility to change the direction of work, 'variable geometry'[5] *in choice of partners, strong and controllable IPR and confidentiality protection, a low administrative burden and a clear position with respect to competition law"*. In accordance with the 'industry-led' style adopted, firms, rather than the EUREKA secretariat or any government, propose and define their project in response to their needs. Once the project has been selected, firms' managers decide alone who is involved, how the project is managed, who contributes what, and how the results will be shared. Firms also own 100 % of the intellectual rights of all results deriving from the project. The EUREKA secretariat simply acts as a facilitator, helping participants to communicate, collaborate, and obtain funding from their national government. Participants must define in advance the legal aspects of the collaboration, including confidentiality, cooperation agreement, protection and ownership of results, and exploitation of results (Mothe and Quélin, 2000).

Finally, the promotion of R&D consortia has a long history in Japan (Branstetter and Sakakibara, 1998). The Ministry of International Trade and Industry (MITI) has taken a central role in fostering the development of these consortia (Hayashi, Hirano and Katayama, 1989; Okimoto, Sugano and Weinstein, 1994; Yamamoto, 1994). One of the famous and most successful R&D consortia in Japan is the VLSI (Very Large Scale Integrated Circuit) project that was established in response to the dominance of IBM and its threat to Japanese computer industry. VLSI's committee was made up of member-firm vice presidents and departmental managers. This committee selected research topics and allocated resources (Sakakibara, 1983), and revised the decisions over the life of the R&D consortium (Kartz and Ordover, 1990). Research employees of each member firm and researchers from MITI's electro-technical laboratory participated in the consortium. VLSI developed clear-cut R&D tasks and goals; hence, better collaboration was possible. Formal and informal exchanges of information among researchers from different laboratories and firms increased throughout the duration of the R&D consortium. The success of VLSI can be attributed in large part to MITI officials, who guided the

[5] As Georghiou (2001) puts it: *"the term 'variable geometry' is a common usage in the realm of European co-operation. It refers euphemistically to a situation in which countries participate in actions on an à la carte basis with a lack of any obligation to include partners from a particular country for reasons of political or financial equity"*

projects, engaged in pre-planning of the research with the interested firms, and assigned scientists from the MITI electro-technical laboratory to participate in the consortium (Katz and Ordover, 1990). Moreover, the expectation of future subsidies from the ministry and the potential threat of exclusion from future projects encouraged the contribution of member firms and prevented free-riding and cheating.

These three examples of intermediary-governed networks show how mechanisms developed and implemented by intermediary entities may help firms reach their innovation goals. Some of these mechanisms are aimed at facilitating the exchange of knowledge and information between partner firms, and others at generating trust and confidence among them. When spontaneous networks of technology alliances face difficulties in achieving the innovation goals, these intermediary-governed networks offer a highly valuable framework. Therefore, our main questions are: Can we consider these intermediary-governed networks as remedies to imperfections in inter-firm technological networks? Under which conditions should firms try to enter these intermediary-governed networks?

The essay proceeds as follows. First, we examine the inherent conflict between the 'trying to learn' and 'trying to protect' objectives found in technology alliances, and especially in learning alliances (Kale et al., 2000). On the basis of the existing literature, we show, in the second section, how relational, structural, and cognitive embeddednesses can mitigate the intensity of this conflict. Our third section explores the various network governance models. Finally, we develop propositions regarding the decisions made by firms to enter intermediary-governed networks.

IMPACT OF SOCIAL EMBEDDEDNESS ON THE CONFLICT BETWEEN LEARNING AND PROTECTING

Conflict between 'trying to learn' and 'trying to protect' in technological networks

As explained in the introduction, although firms can benefit in various ways from engaging in technology alliances, it requires them to cope with an inherent conflict between two competing objectives: the need to learn and the need to protect (Gulati and Singh, 1998; Kale et al., 2000). This conflict originates from the firms' desire to learn know-how and capabilities from their alliance partners and their simultaneous fear of being threatened by the behavior of these partners having similar incentives (Kale et al., 2000). Indeed, as the learning process requires firms to expose their proprietary knowledge to their alliance partners, it simultaneously raises concerns relative to the release of their core know-how and capabilities, and the potential use by these partners of their know-how and capabilities for purposes other than the alliance's. Given that firms do not 'unlearn' and may have hidden agendas driven by the opportunistic desire to access and internalize the partners' core proprietary skills much faster than their partners can, protecting core proprietary know-how and capabilities remains highly relevant within technology alliances.

Relational, structural and cognitive embeddednesses as a means to mitigate the conflict

The duality between learning and protecting in technology alliances and the possible ways to cope with this duality have been explored within diverse theoretical frameworks, and in particular, within Transaction Cost Economics and Social Network frameworks. The driving research question has been: *"What factors enable a firm to not only learn critical skills or capabilities from its alliance partner(s), but also protect itself from losing its own core proprietary assets or capabilities to the partner?*" (Kale et al., 2000). Research on learning alliances has, first, analogized this duality to a 'learning race' (Pucik, 1988; Reich and Mankin, 1986; Hamel, 1991), in which partners try to 'outlearn' each other. This leads to situations where if one partner contributes too little to the

relationship for fear of being outlearned, the alliance may be doomed to fail (Khanna et al., 1998), and if it contributes too much, its alliance partners can gain the upper hand (Doz, 1988).

According to Transaction Cost Economics research, when the risks of conflict are high, the level of transaction costs will be important and, therefore, more hierarchical governance structures such as equity joint ventures become more appropriate (Williamson, 1985). Transaction Cost analysis argues that, equity joint ventures help to align incentives by creating "hostages" that assure each partner has a continued interest in the maintenance of the agreement (Williamson, 1983; Pisano, 1989).

Another stream of research rooted in the Social Network literature has, instead, explored the way so-called 'social embeddedness' can mitigate conflicts in alliances. The majority of strategic alliances are contractual in nature without equity-sharing (Hagedoorn, 1996). Therefore, it is interesting to analyze whether social embeddedness contributes to the reduction of transaction costs and so reduces the need for more hierarchical governance structures (Gulati, 1995). The concept of social embeddedness has been introduced in economic sociology by Granovetter (1985, 1992), who studied how the economic actions of actors and the outcomes of their behavior can be affected by both their dyadic (one-on-one) relationships (referred to as 'relational embeddedness') and the broad structure of their overall network of relationships (referred to as 'structural embeddedness'). Since then, an extensive body of research has emerged studying the distinct levels of embeddedness (Granovetter, 1992; Uzzi, 1997; Lam, 1997; Gulati, 1998; Gulati and Gargiulo, 1999; Dacin, Ventresca et Beal, 1999; Hite, 2003; Simsek, Lubatkin and Floyd, 2003; Hagedoorn, 2006) and, especially, the distinction between relational and structural embeddednesses.

In line with Nahapiet and Goshal (1998), we take this distinction one step further and consider three levels of embeddedness: the relational, structural and cognitive embeddednesses. Figure 1 offers a schematic description of these three types of embeddedness. The network of technology alliances of firm A consists of four technology alliances (direct ties) with firm B, firm C, firm D and firm E. Relational embeddedness refers to the quality and depth of these four dyadic relationships. The

network of technology alliances of firm A consists also of two indirect ties resulting from its relationship with firm B, which is itself engaged in two other technology alliances with firm F and firm G. These direct and indirect ties reflect the structural embeddedness of firm A. Finally, cognitive embeddedness refers to the proximity in the representations, interpretations and systems of meaning among firms composing the network of technology alliances of A.

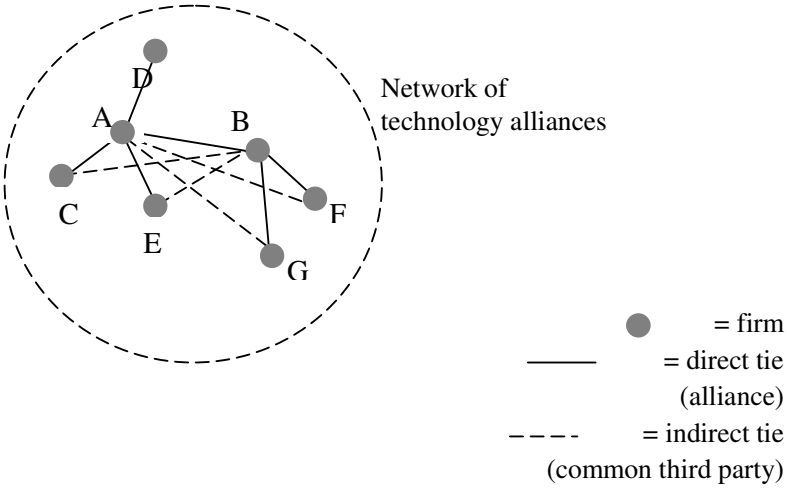

Figure1
Relational, structural and cognitive embeddednesses

In the following, we explain how the levels of embeddedness affect the intensity of the conflict between 'trying to learn' and 'trying to protect'; in other words, we intend to show how relational, structural and cognitive embeddednesses can help partners balance the acquisition of new capabilities with the protection of existing proprietary assets in alliance.

Relational embeddedness refers to specific dyadic ties. The level of relational embeddedness increases with the quality and depth of personal connections and relationships between the alliance partners (Granovetter, 1985; Uzzi, 1996, 1997). It therefore captures a variety of phenomena such as trust, respect, information sharing, confiding, familiarity and friendship (Uzzi, 1997) but also the degree to which partners consider one another's needs and goals (Granovetter, 1992). Previous research has shown that prior relationships between partners tend to increase the relational embeddedness for subsequent alliances thanks to mutual trust, respect and friendship (Podolny, 1994; Burt and Knez,

1995; Gulati, 1995; Gulati and Gargiulo, 1999). Indeed, Gulati (1995) and Dyer and Singh (1998) explain that firms have a higher propensity to engage in alliances with firms with which they have collaborated before. Allying with previous partners enables firms to economize on costs and time necessary to search for trustworthy and valuable partners.

Relational embeddedness can affect the intensity of the conflict between learning and protecting in technology alliances for two main reasons. First, at the learning level, the existence of close relationship between the alliance partners can facilitate the learning process. A close relationship enables them to better understand where the relevant information, know-how and expertise reside in the partner and who exactly possesses it (Dyer and Singh, 1998; Kale et al., 2000). Moreover, prior research has shown that the presence of close and intense interaction (von Hippel, 1988; Marsden, 1990) and an iterative process of exchange (Arrow, 1974; Badaracco, 1991) facilitate the transfer of know-how, which is tacit and sticky by nature. Second, at the protection level, the mutual trust and confidence that characterize high relational embeddedness reduce the need for protection by minimizing the likelihood that a party will engage in opportunistic behavior aimed at unilaterally absorbing or stealing information or know-how that is core or proprietary to the other parties (Sabel, 1994; Kale et al., 1999). This type of trust, based upon close interaction and relationship and mainly developed at the personal level, has been compared to 'behavioral trust' by Madhok (1995) and 'knowledge-based trust' by Gulati (1995). This form of mutual trust contributes to the reduction of opportunistic or self-serving behaviors.

Structural embeddedness goes beyond the dyadic level to the broader network in which the dyadic alliance is embedded (Granovetter, 1992; Gulati, 1998). In this essay, we use the concept of structural embeddedness to refer to the overall pattern of connections between firms (Burt, 1992) and, in particular, the presence or the absence of alliance ties between them (Scott, 1991; Wasserman and Faust, 1994). This type of embeddedness includes direct ties between firms (alliance ties) but also indirect ties in the sense that two firms can be tied to a common third-party partner (i.e., they have a same third alliance partner but are not linked in an alliance themselves).

Structural embeddedness can affect the intensity of the conflict between learning and protecting in technology alliances for two main reasons as well. First, at the learning level, studying the influence of various network structures on the efficiency of the learning process and information collection has been at the root of an extant research and has led to numerous debates (Brass, Galaskiewicz, Greve and Tsai, 2004). While closed networks (where direct ties are also indirectly tied to each other) generate trust (Coleman, 1988), networks with 'structural holes' (where direct ties are not themselves indirectly connected but are tied to different portions of the networks) give access to a greater diversity of knowledge and information (Burt, 1992, 2001). Two views thus coexist regarding the influence of network structures on the learning process. One view is that a closed network enhances the coordination of actions and facilitates the exchange thanks to mutual trust and frequent interactions and communication (O'Reilly and Pfeffer, 1983; Coleman, 1988; McCain, O'Reilly and Pfeffer, 1989; Zenger and Lawrence, 1989). The other view is that a network with structural holes favors diversity of skills, information and experience, and gives access to broader array of ideas and opportunities; hence, it enhances capacity for creative problem solving (e.g., Bantel and Jackson, 1989; Ancona and Caldwell, 1992; Pelled, Eisenhardt and Xin, 1999).

Second, at the protection level, common third-party ties (i.e., indirect ties) create an information channel, where opportunistic behavior becomes more easily reported. When network ties are dense and redundant[6], information (or gossip) about uncooperative behaviors circulates more readily among the network's members, who can jointly mobilize sanctions (Brass et al., 2004). This information channel can damage reputation and, thus, serves as an effective deterrent (Raub and Wessie, 1990; Burt and Knez, 1995). It intensifies what Gulati (1995) has called 'deterrence-based trust' and Madhok (1995) calls 'structural trust'. This type of trust arises from the costly (formal or informal) sanctions that might be imposed if partners engage in opportunistic behavior. It thus alleviates the fear that partners act opportunistically (Bradach and Eccles, 1989).

[6] Alliances are considered as redundant when they provide access to the same information (Burt, 1992), or complementary capabilities (Gomes-Casseres, 1994).

Finally, cognitive embeddedness refers to the proximity in the representations, interpretations, and systems of meaning among firms (Cicourel, 1973; Abrahamson and Fombrun, 1994; Nahapiet and Ghoshal, 1998*;* Simsek et al., 2003) within a network. As developed by Tsai and Ghoshal (1998), cognitive embeddedness *"is embodied in attributes like a shared code or a shared paradigm that facilitates a common understanding of collective goals and proper ways of acting in a social system"*.

Cognitive embeddedness can also affect the intensity of the conflict between learning and protecting in technology alliances for two main reasons. First, at the learning level, a consistent cognitive embeddedness within a network of technology alliances can ease the learning process in each alliance thanks to the subsequent idiosyncratic and shared language and vocabulary used in the network as a whole (Nahapiet and Ghoshal, 1998). As explained by Nahapiet and Goshal (1998), a shared language can facilitate the learning process and information collection in three ways: it increases access to people and their information and fosters the transfer of this information; it provides a frame of reference for observing, interpreting and understanding the partners' know-how, but also for evaluating the benefits of the exchange; and it enhances the combination capability. Second, at the protection level, the need for protection will be reduced as expectations converge (Williamson, 1991) and common broad rules are used for action under uncertainty (Camerer and Vepsalainen, 1988). Common values, beliefs, and rules enable a convergence of interests that renders opportunistic behaviors less likely (Ouchi, 1980).

Figure 2 summarizes the three levels of embeddedness.

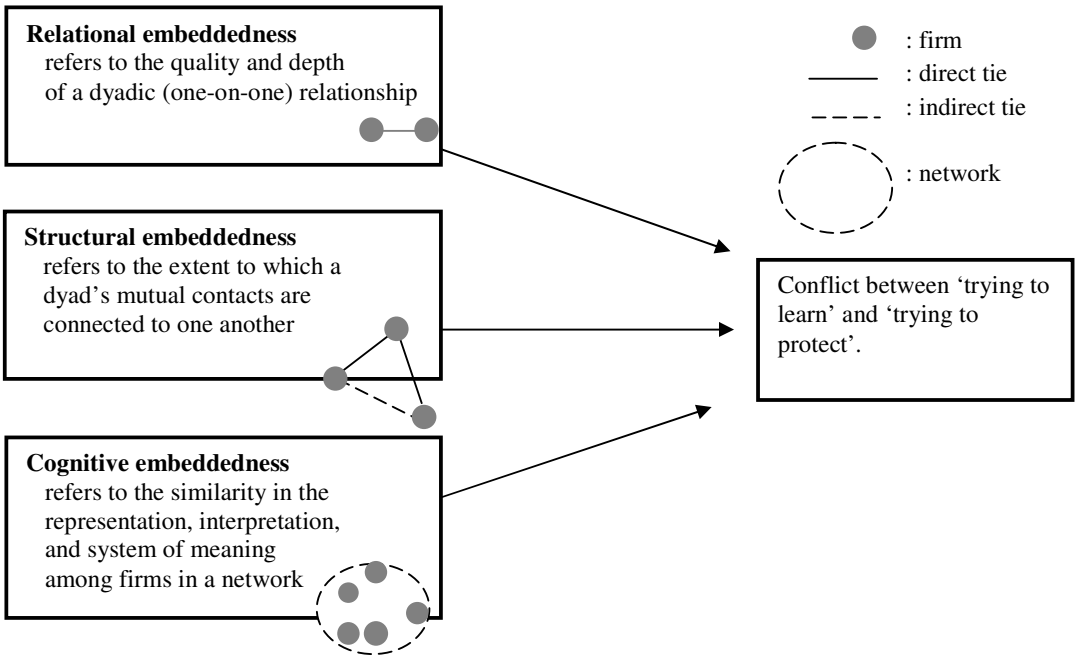

Figure 2
Social embeddedness and the limitation of conflicts in technology alliances

NETWORK GOVERNANCE MODELS

Considering the influence of social embeddedness on the conflict between 'trying to learn' and 'trying to protect', it becomes clear that low relational embeddedness, unfavorable structural embeddedness and limited cognitive embeddedness can be damaging for the success and performance of a technology alliance. However, reaching an 'ideal' level of social embeddedness is far from simple and automatic. Indeed, building a network of technology alliances is for firms a long, hazardous and highly resource-consuming process. Moreover, networks do not 'naturally' offer favorable levels of embeddedness. When firms face difficulties in developing their network of technology alliances or cannot efficiently benefit from their social network, they can decide to enter intermediary-governed networks, where an intermediary entity is able to facilitate the learning process and to protect against possible opportunistic behaviors.

Provan, Fish and Sydow (2007) and Provan and Kenis (2008, 2009) have recently pointed out the dearth of research on the way inter-organization networks govern themselves. In contrast to traditional research in the Social Network literature, their focus is on the structures and processes of the entire network rather than on the organizations that compose the network. Networks should not only be seen as mechanisms of social embeddedness but also as mechanisms of coordination and governance (Jones, Hesterly and Borgatti, 1997; Grabher and Powell, 2004; Provan, Fish and Sydow, 2007). In reaction to the lack of research exploring how activities occurring within a network are managed and coordinated, Provan and Kenis have developed a typology of network governance models. They have identified three basic network governance models: shared or participant governance, lead organization governed, and network administrative organization (NAO) governed. First, networks adopt the shared or participant governance model when they are collectively governed by the network members themselves with no distinct and formal administrative entity. The strength of this model is its flexibility and its responsiveness to the needs of network members. Second, networks with lead organization governance are coordinated through and by one of the members. Usually, this member can play this lead role due to its size, bargaining power, resources or legitimacy. It makes all the decisions, manages the network activities and assists the member firms in achieving network goals. An example of this model is the Japanese Keiretsu. The strength of this second model is to avoid the frequent inefficiency of the shared governance models in the long run. However, resentment, resistance and lack of contribution may appear under this second model; especially when the agenda of the lead organization dominates the other network members. Third, the NAO governance model corresponds to what we call the intermediary-governed network. This model implies that a separate administrative entity is created specifically to manage and coordinate the network and its activities. This entity may be a single individual playing the role of facilitator or broker, or it may be a formal organization consisting of an executive director, staff, and board (McEvily and Zaheer, 2004; Provan, Isett and Miward, 2004). Regarding the specific case of government run NAOs, Provan and Kenis (2008) write: *"Government run NAOs are generally set up when the network first forms, to stimulate its growth through targeted funding and/or network facilitation and to ensure that network goals are met (Goldsmith and Eggers, 2004). Such NAOs are established locally for purposes of accomplishing*

broad goals, such as those related to regional economic development (Gebauer, Nam, and Parsche, 2005; Piore and Sabel, 1984; Saxenian, 1994)".

Figure 3 offers a graphic illustration of the NAO governance model. Under this model, firms can still interact and work with one another outside the network governed by the intermediary entity (as it is the case between firm A, firm B and firm F, and between firm E and firm G). However, the alliances taking part in the intermediary-governed network are coordinated through and by the separate intermediary entity.

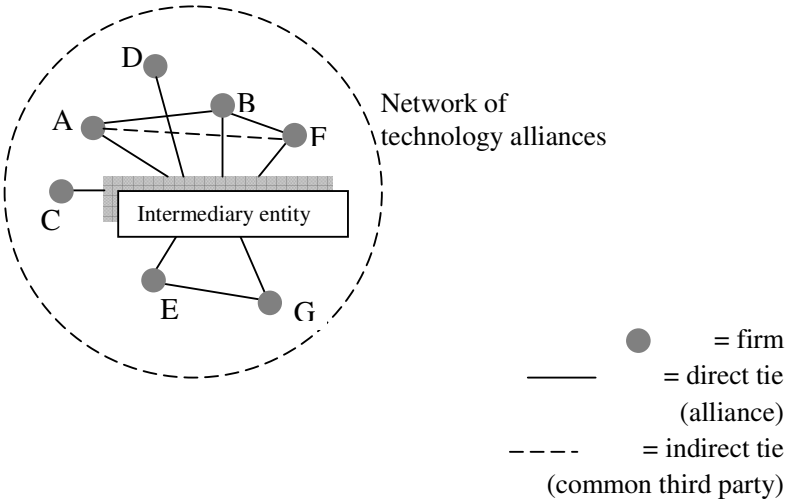

Figure3
Intermediary-governed network

INTERMEDIARY-GOVERNED NETWORKS AS REMEDIES TO UNFAVORABLE LEVEL OF SOCIAL EMBEDDEDNESS

For the sake of clarity of exposition, we consider, in the following analysis, each type of embeddedness separately and examine how intermediary-governed networks can help firms remedy unfavorable levels of relational, structural and cognitive embeddednesses respectively.

Intermediaries and relational embeddedness

As explained before, high relational embeddedness can help partners overcome the duality between learning and protecting in technology alliances. However, a close relationship between alliance partners is not always present and the level of mutual trust, respect and friendship may be low. In this context, firms can decide to enter an intermediary-governed network like a government-sponsored R&D consortium. Indeed, at the learning level, the intermediary entity can directly intervene in the dyadic tie and assist the learning process by putting at the firms' disposal specialist facilities, performing collective activities such as training and seminars, developing prototypes and pilot facilities, or conducting tests and diagnostics. When firms have no potential partner that is close enough to successfully transfer knowledge, entering an intermediary-governed network might become valuable.

> *Proposition 1: The lower the relational embeddedness between a firm and its current and potential alliance partners, the higher the likelihood that it enters intermediary-governed networks to benefit from mechanisms - like tests, diagnostics, or development of prototypes - enabling to favor the learning process at the dyadic level.*

Second, at the protection level, intermediary-governed networks can reduce the risk of opportunistic behavior in the dyadic tie via standards, norms and regulation. Indeed, when mutual trust is absent, standards, norms and regulation promoted by intermediary entities such as SEMATECH or EUREKA are useful mechanisms to counteract possible opportunistic or self-serving behaviors. While these mechanisms can 'formally' drive and calibrate the dyadic relationship; intermediary entities may also use less 'formal' mechanisms such as the development and diffusion of values and culture (Jones, 1996; Jones et al., 1997). These formal and informal schemes enable partners to reduce the risk of opportunism but may also lead to direct sanctions ranging from ostracism to financial penalties. These sanctions make the opportunism more costly and reduce the likelihood that firms will exploit the alliance partners' vulnerabilities even if there is an opportunity to do so. As a result, when a firm

cannot benefit from strong relational embeddedness with its current or potential partners to prevent opportunistic behaviors, it will find valuable to enter intermediary-governed networks to remedy the absence of mutual trust and confidence.

Proposition 2: The lower the relational embeddedness between a firm and its current and potential alliance partners, the higher the likelihood that it enters intermediary-governed networks to benefit from mechanisms - like standards, norms, regulation, values or sanctions - enabling to reduce the risk of opportunistic behaviors at the dyadic level.

Intermediaries and structural embeddedness

We have previously explained how structural embeddedness can mitigate the conflict between 'trying to learn' and 'trying to protect' in technology alliances. First, the structure of a network is critical for firms to determine with whom to ally - as direct and indirect ties convey information about the resources and capabilities (important for learning aspects) and reliability and credibility (important for protection aspects) of potential partners. Second, network structure can promote learning - a closed network facilitates coordination, and structural holes enhance creativity in the problem solving - and protection - the structure can create information channels through which information about opportunistic behaviors is easily diffused and thus reputation damaged.

However, developing a network of technology alliances that enables identification of 'ideal' partners and optimal learning from alliance partners while simultaneously protecting against opportunism is far from trivial. Intermediary-governed networks form an important option in this respect as governance is centralized. First, intermediary entities can act as brokers and permit firms to gather superior information on each other as they have the ability to collect and diffuse information about firms' resources, capabilities, and needs (Hagardon and Sutton, 1997; McEvily and Zaheer, 1999) as well as information about firms' reputation (Hadfield, 2000). They contribute to the appropriate match between partners in terms of resources and skills but also reduce the risks for firms to ally with

recurrent opportunistic partners. Moreover, they can encourage and ease the rapprochement between firms that might not normally work together (Provan and Kenis, 2008).

Proposition 3: The less favorable the structural embeddedness of a firm within its own network of technology alliances, the higher the likelihood that it enters intermediary-governed networks to benefit from mechanisms - like collection of information about partners reputation, and partners' resources, skills and capabilities - enabling to identify partners that are trustworthy and have the necessary set of resources, skills and capabilities.

Second, the intermediary entity and its staff may play a key role of governance as they can coordinate the inter-dependent tasks, ensure the transfer of the knowledge among member firms, but also monitor the interactions and resolve possible disputes and conflicts (Provan and Kenis, 2008). Moreover, they are able to publicize defaults under the rules and, thereby, can threaten firms to damage their reputation in the event of opportunistic behavior. Their ability to implement reputation mechanism is highly valuable for firms when their own network structure does not allow mutual hostage situation. One might consider this intermediary entity as a nexus of multiple relationships (Howells, 2006) and, thus, as a keeper of indirect channels for information and reputation effects. Opportunistic behaviors become more easily reported within the intermediary-governed network and sanctions can be mobilized.

Proposition 4: The less favorable the structural embeddedness of a firm within its own network of technology alliances, the higher the likelihood that it enters intermediary-governed networks to benefit from mechanisms - like coordination of network activities - enabling to favor the learning process throughout the network.

Proposition 5: The less favorable the structural embeddedness of a firm within its own network of technology alliances, the higher the likelihood that it enters intermediary-

governed networks to benefit from mechanisms - like threat of reputation damage or internal dispute resolution mechanism - enabling to reduce the risk of opportunism.

Intermediaries and cognitive embeddedness

As mentioned before, when the network of technology alliances is characterized by strong cognitive embeddedness, the conflict between 'trying to learn' and 'trying to protect' is likely to be reduced. However, a commonality of values, visions, and languages is not observed in every network. Developing this commonality is a long process and does not necessarily appear with the 'natural' evolution of the network. Sometimes, the intervention of intermediary entities can be determinative in this respect. Specifically, intermediary entities can foster a convergence of goals and visions within the network. As explained by Howells (2006), numerous intermediaries have emerged in technology industries to respond to the difficulties firms sometimes meet in identifying their own precise technological potentials and needs, and in defining an innovation and business strategy to adopt. To this end, these intermediary entities, often at the strategic level between the policy level and the operational level, perform fundamental activities such as technology forecasting (for instance, road maps and technological watch), and may also help individual firms articulate their needs and requirements. Services supplied by intermediary entities at this preliminary innovation stage are then various: diagnostics, scanning and technology consulting. When assisting firms at this preliminary stage, intermediary entities have the ability to influence the strategic and innovation choices of the members, and thereby to promote a convergence of representations, interpretations, and systems of meaning among them. As a result, when the firms' technology alliance network does not show a commonality of values and visions, it is more likely that this firm will enter intermediary-governed network, where potential partners are committed to network-level goals (Provan and Kenis, 2008). As written by Provan and Kenis (2008): *"when there is general consensus on broad network-level goals, both regarding goal content and process, and in the absence of hierarchy, network participants are more likely to be involved and committed to the network and more likely to work together"*.

Moreover, intermediary entities may be involved in the protection and commercialization of results. They can provide alliance partners with IP advice and management, and help them identify market opportunities and develop business plans. When guiding firms at these downstream stages in the innovation process, intermediary entities have the ability to increase the legitimacy of the network as a whole and of its members as they foster the speed of diffusion and uptake of new products and services for subsequent customers. Hence, this is another opportunity for intermediary entities to stimulate a network culture, a convergence of representations, interpretations, and systems of meaning among them.

> *Proposition 6: The more limited the cognitive embeddedness within a firm's network of technology alliances, the higher the likelihood that it enters intermediary-governed networks to benefit from mechanisms - like diffusion of network goals, visions and values - enabling to favor the learning process and to reduce the risk of opportunistic behaviors within the network.*

CONCLUSION

The main purpose of this essay has been to understand the role intermediary entities can play in technology alliance networks. Technology alliances, and specially learning alliances, require the partners to overcome the conflict between two competing objectives: the need to learn and the need to protect. Research in the Social Network literature has shown that social embeddedness through each of its dimensions - relational, structural and cognitive - can influence the intensity of this conflict. In this essay, our intent has been instead to examine how entities other than the alliance partners themselves can help to deal with this conflict. Particularly, we have examined the decision made by firms to enter intermediary-governed networks such as government-sponsored R&D consortia. In intermediary-governed networks, activities are managed and coordinated by a separate and external entity in a centralized way. We argue that entering intermediary-governed networks becomes highly valuable for alliance partners when they cannot benefit from their social embeddedness to deal with

the conflict between 'trying to learn' and 'trying to protect'. Indeed, reaching an 'ideal' level of social embeddedness is far from simple. It is for firms a long, hazardous and highly resource-consuming process. When entering an intermediary-governed network, firms can benefit from the mechanisms implemented by an intermediary entity to ease the learning process and protect against possible opportunistic behaviors.

Despite the novelty of our research question, this essay is not without its shortcomings as it does not consider the interrelation between each level of embeddedness. Several studies have however shown that these levels are interrelated in a complex way (Dacin et al., 1999; Hagedoorn, 2006; Hagedoorn and Frankort, 2008); in some cases, they will mutually reinforce each other, in other cases, they won't. We have essentially considered the levels of embeddedness in isolation. While this limits the richness of our present contribution, it identifies an important area for future works.

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Resorting to Third Parties as a means to reduce the 'Costs of Control' and 'Costs of Coordination' in Licensing Agreements*

ABSTRACT

Although licensing agreements are essentially dyadic agreements, licensors and licensees frequently decide to resort to services offered by third parties in order to secure and ease their relationships. Key third parties in the licensing context are technology brokers, consulting firms, collective research centers, patent attorneys, auditing firms, law firms, and professional associations. Our intent in this essay is to shed light on these third parties, which have been largely neglected by scholars investigating inter-firm agreements, and to understand the factors motivating firms to resort to third parties' services in the licensing context. We argue that the main motive for the use of third-party services is their ability to help partner firms face two main managerial imperatives in inter-firm agreements such as licensing agreement: the need to control and the need to coordinate. In other words, these third parties enable the licensing partners to reduce the 'costs of control' and the 'costs of coordination' associated with managing their licensing agreement. To test our conceptual framework, we use a detailed database of 113 licensing transactions. This database was collected through an online survey launched with the support from the Belgian technology trade association. Our findings provide support for our main argument that the use of third-party services is more likely to occur when the licensing agreement imposes high 'costs of control' and high 'costs of coordination'.

Keywords: third parties; licensing agreement; costs of control; costs of coordination.

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INTRODUCTION

The last three decades have witnessed important growth in a variety of arrangements used to govern the exchange of knowledge and technology (Rivette and Kline, 1999; Rigby and Zook, 2002). Firms involved in technology development and commercialization increasingly engage in technology agreements such as licensing, R&D contracts, technology sharing agreements, cross-licensing, joint R&D, research joint ventures and research consortia (Hagedoorn, 1990). Among these agreements, licensing has become an increasingly important channel for diffusing technology. Indeed, world-wide licensing transactions averaged more than USD 36 billion per year between 1990 and 1997, compared to USD 5.6 billion in the 1980s (OECD, 2006), and recent statistics (World Bank) indicate that the value of licensing transactions reached USD 115 billion in 2005 (Zuniga and Guellec, 2009).

Licensing is a means by which technology can be transferred from one party (the 'licensor') to another (the 'licensee'). The licensee buys the right from a licensor to use its intellectual property (IP) for a period of time and with a precise purpose. The licensing contract specifies the content of the technology transferred and the rights and duties of each party, and formalizes the agreement. Licensing enables the licensee to acquire the right to use new technology without having to undertake costly R&D, and simultaneously enables the licensor to derive royalties and, in some cases, to obtain reciprocal licenses to any technical improvements made by the licensee. Both licensee and licensor have the opportunity to capitalize on the other party's reputation and expertise.

According to Teece (2000), four main objectives may be followed when engaging in a licensing agreement. The first objective is *efficient commercialization*. A firm's decision to license technology it owns may indeed be driven by its lack of complementary capabilities and assets required to succeed in the marketplace such as downstream manufacturing, distribution, or marketing capabilities. A firm's decision to get a license may, instead, be driven by its inability to conduct the necessary R&D. A second objective may be the *exchange of technology;* i.e., the mutual desire to acquire technology from the other firm. Cross-licensing patent rights is a frequent practice that reduces IP disputes and

litigation. The third objective is *market enhancement*. The decision to license or get a license may indeed be motivated by the strategic desire to establish a standard across a particular industry. Of course, a fourth underlying objective for licensors is often to generate *royalties.* Although some licensing agreements pursue all of these objectives, others focus on only some of them. To sum up, one might say that licensing agreements put technology in the hands of firms best capable of commercializing it and ease the entry of small innovative firms, which often lack the assets needed to commercialize their invention themselves.

The standard framework used to analyze licensing decisions has been Transaction Cost Economics. When studying the licensing agreements, scholars first focused on the trade-off between licensing and alternative governance structures (e.g., Buckley and Casson, 1976, 1998; Dunning, 1981; Rugman, 1981; Hennart, 1982, 1988; Teece, 1986). The main tenet developed in this literature has been that firms align their transactions with governance structures - going from market (i.e., arms-length "spot" contract) to hierarchy (i.e., organization within the firm) - so as to reduce the costs of transacting (Williamson, 1991). Markets form *a priori* a more efficient governance structure due to economies of specialization and the administrative and incentive limits of hierarchy. This is true, unless the transaction is surrounded with uncertainty and requires to invest in specific assets (e.g., Williamson, 1975, 1985; Klein, Crawford, and Alchian, 1978; Teece, 1982). Within this framework, a licensing agreement is a governance structure that was originally associated with pure market contract.

More recently, scholars have put emphasis on the wide variety of licensing agreements (Bessy and Brousseau, 1998; Anand and Khanna, 2000; Brousseau, Coeurderoy and Chasserant, 2007; Hagedoorn, Lorenz-Orlean and Van Kranenburg, 2009). Licensing agreements do not form a homogeneous set of contractual arrangements. They can instead be associated either with a pure market contract (also called 'transactional contract' (Macneil, 1974)) or with a hybrid form (also called 'relational contract' (Macneil, 1974)) according to their characteristics (Borys and Jemison, 1989; Grandori and Soda, 1995; Bessy and Brousseau, 1998; Sattin, 2005). Between the two polar forms, market and hierarchy, we can indeed find various hybrid forms of governance (Williamson,

1985; Hennart, 1993; Ménard, 2004). The term 'hybrid' is used to refer to arrangements where parties maintain autonomy but are more bilaterally dependent than in pure market contracts. They retain some of the incentive characteristics of markets, while allowing enhanced monitoring and avoiding some of the bureaucratic and shirking costs associated with hierarchy (Williamson, 1991). In general, hybrid forms correspond to long-term contracts. Firms tend to opt for hybrid forms when the uncertainty surrounding the transaction and the extent of joint and inter-dependent activities render the drafting of complete contracts almost impossible. Hybrid forms enable them to deal with this incompleteness via governance mechanisms designed for coordinating activities, organizing transactions, and solving disputes (Ménard, 2004). In the licensing context, governance mechanisms such as supervision[1], renegotiation[2], and alternative dispute resolution mechanisms (negotiation, mediation and arbitration) (Brousseau et al., 2007) can be implemented, making licensing agreements closer to a hybrid form.

Scholars have begun to explore the trade-off between distinct forms of licensing agreement either in terms of financial condition, combination of resources transferred in addition to the right to use a patent, regime of exclusivity, unilateral vs. bilateral transfer of technology (cross-licensing vs. licensing agreements) or *ex ante* vs. *ex post* licensing[3] (Caves, Crookel and Killing, 1983; Bessy and Brousseau, 1998; Anand and Khanna, 2000; Arora and Fosfuri, 2003; Brousseau and Coeurderoy, 2005; Sattin, 2005; Brousseau et al., 2007; Hagedoorn et al., 2009; Lichtenthaler and Ernst, 2009; Aulakh, Jiang, and Pan, 2009). These scholars investigate the *raison d'être* of this wide variety of licensing agreements, which cover a sub-spectrum of governance structures between market and hierarchy.

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[1] *"The contractual agreement may grant audit rights to one of the parties or to a third party in order to check that contractual commitments are being enforced"* (Brousseau et al., 2007).

[2] "*A renegotiation provision states the extent to which contractual obligations can, ex post, be redesigned to adjust contractors' behavior either to new environmental conditions, or to changing mutual preferences, or indeed to the accumulation of knowledge*" (Brousseau et al., 2007).

[3] Licensing agreement is considered as being *ex ante* if firms license prospective technologies (Gallini and Winter, 1985; Anand and Khanna, 2000).

Although the literature on licensing is somewhat abundant, the role of third parties in licensing relationships has received extremely limited attention. However, licensors and licensees frequently decide to resort to services offered by third parties in order to secure and ease their relationships. Key third parties in the licensing context are technology brokers, consulting firms, collective research centers or federal labs[4], patent attorneys[5], auditing firms[6], law firms, or professional associations[7]. The purpose of this essay is to gain understanding of firms' motives for using third parties in the licensing context and, in particular, to examine whether the use of third parties is more likely to occur when the licensing transaction causes high 'costs of control' and/or high 'costs of coordination'.

The remainder of the essay is organized as follows. In the next section, we develop our conceptual framework by describing how third parties' assistance can take place in the licensing context and help partners face their two managerial imperatives: the need to control and the need to coordinate. Following this, we develop a set of hypotheses addressing the influence of (1) factors magnifying the costs of control and (2) factors magnifying the costs of coordination on the use of third-party services. We test our hypotheses with a database of 113 licensing agreements collected through an online survey with the support from AGORIA, the Belgian technology trade association[8]. The survey method enabled us to build a highly detailed database of licensing transactions. The description of the research design and empirical methodology is followed by a discussion of the results and the conclusion.

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[4] These centers have been created in numerous countries to stimulate the technological development of firms in major sectors through collective research (Wright, Clarysse, Lockett and Knockaert, 2008).

[5] Patent attorneys have the specialized qualifications necessary to represent clients in obtaining patents and acting in all matters and procedures related to patent laws and practices.

[6] Auditing firms, such as Deloitte, conduct royalties' investigations on behalf of licensor to help assess the completeness of licensing income returns. They also help licenses quantify their potential exposure or rebut allegations of royalty underpayments (www.deloitte.com).

[7] Professional associations such as trade associations *"usually have voluntary membership, are not-for-profit organizations formed by policy entrepreneurs within firms located in the same industry to collect, share and disseminate industry-relevant information and provide a platform for collective representation and lobbying"* (Tucker, 2008).

[8] In line with the Belgian technology trade association, AGORIA, we consider the following sectors as forming the technology industry: aerospace, industrial automation, automobile, contracting and maintenance, electronics, mechanical and mechatronical engineering, metals and materials, assembling and crane, plastics, building products, security and defense, ICT, and metal fabrication.

CONCEPTUAL FOUNDATIONS

Third parties in the licensing context

Third-party assistance may be desirable at one or more contractual stages: (1) for the identification and selection of a licensing partner, (2) for the negotiation of the licensing contract, and (3) for the monitoring of the licensing relationship. At the first stage, third parties such as technology brokers or professional associations can help firms identify and select a licensing partner. These third parties have the ability to collect and diffuse information about potential partners' resources, capabilities and needs and, in some cases, to give firms the opportunity to meet each other. For instance, a main task of technology brokers is to develop databases on potential partners. Professional associations may also be helpful at this first contractual stage by organizing networking events such as meeting days, seminars and professional fairs. Given the difficulties firms may encounter identifying trustworthy partners that are both potentially interested in licensing and have the necessary resources and skills, these third parties, and their national or international networks, can play a critical role at this first contractual stage.

At the second stage, negotiating the contractual terms and reaching an agreement regarding the value and price of the technology transferred are critical and non trivial tasks. Specifically, when the licensing transaction is complex (containing exclusivity, renegotiation, grantback and other provisions), the capabilities to design appropriate contracts (Argyres and Mayer, 2007) will be crucial for the future governance of the licensing relationship. Regarding the legal aspects, third parties such as law firms, consulting firms or professional associations like the Licensing Executives Society[9] put their own experience at the firms' disposal. Besides the legal aspects, third parties like patent attorneys or collective research centers share with firms their expertise regarding the assessment of

[9] Licensing Executive Society is a business-oriented international organization grouping professionals involved in licensing and other aspects of IP rights transfers (management representatives, scientists, engineers, governmental officials, lawyers and consultants): www.lesi.org.

the value of technology transferred and its obsolescence rate. At both legal and technical levels, third parties can assist partner firms in negotiating the contractual terms of their agreements; a process becoming increasingly delicate due to the frequent international scope of licensing agreements and the rising complexity of the technology involved.

While the activities leading to the signing of the contract are critical for the success of the agreement, the third stage - monitoring the contractual relationship throughout the contractual duration - is also extremely important. Third parties like collective research centers can help the technology recipient understand, assimilate, utilize and implement the technology. These third parties perform activities such as diagnostics, testing, prototyping, and training. Their technological expertise can greatly enhance monitoring of the knowledge transfer. In addition to assisting knowledge transfer and implementation, third parties may also monitor the partner's activities and behaviors throughout the duration of the contract. Auditing firms, for instance, can be in charge of this monitoring as they inspect, control and certify activities, and assure the parties respect their contractual commitments via pre-defined mechanisms and rules.

Third parties as mitigators of opportunism and facilitators of coordination

The previous section shows that services vary with the type of third party and the contractual stages. Despite this variety, all of these third parties assist partners - to different degrees - in dealing with one or both of their two managerial imperatives: the need to control and the need to coordinate.

The first managerial imperative is to minimize the likelihood of suffering from the partner's opportunistic behavior (Williamson, 1985, 1991). Indeed, even if inter-firm agreements are in essence cooperative and voluntary, they are characterized by an inherent instability arising from the uncertainty regarding the partner's future behavior and the absence of a higher authority to ensure compliance. In other words, although cooperation is desirable and necessary to achieve the purpose of the agreement, it can be hindered by self-interest and opportunism of each party (Williamson, 1985;

Parkhe, 1993). Research in Transaction Cost Economics argues that aligning the governance structure adequately with the transaction attributes reduces the risk of vulnerability to opportunism. In cases where the transaction exhibits a low risk of opportunistic behavior, the default governance structure is the 'market form'. When the transaction requires investments in specific assets and is surrounded with uncertainty, a more hierarchical governance structure may be needed to curtail opportunism. More hierarchical governance structures such as the equity-based agreement enable partners to reduce the risk of opportunism because these structures foster the alignment of the partners' incentives and create a hostage situation where each partner has a continued interest in the maintenance of the agreement (Williamson, 1983).

The second managerial imperative is to coordinate the inter-dependent tasks across firms' boundaries (Gulati and Singh, 1998). Indeed, while selecting a trustworthy partner and minimizing the vulnerability to opportunism are important for the success of the agreement, it is also important to successfully coordinate the inter-dependent tasks and match the respective profiles in resources and competences. This necessitates selecting a partner with the required pool of resources and competences and also implementing managerial mechanisms that promote the efficient sharing of information and communication, the establishment and maintenance of an inter-organizational interface, and the realization of internal adjustment in response to partners' actions (White and Lui, 2005). As a result, even if partners have complete confidence in each other, they still have to face coordination costs, whose level depends on the degrees of exchange, sharing and co-development imposed by the agreement. In particular, the innovation process can be hard to partition into independent and self-contained tasks (Kline and Rosenberg, 1986; von Hippel, 1990). Throughout this process from research to manufacturing and commercialization, it can be difficult to conduct tasks in isolation. Scholars have argued that more hierarchical governance structures can reduce the costs of coordination when inter-dependency is important as these structures provide superior task coordination (Chandler, 1977; Thompson, 1967; Gulati and Singh, 1998).

Previous research has therefore shown that aligning the governance structure adequately with the need for control (first managerial imperative) or the need for coordination (second managerial imperative) reduces the risk of opportunism and eases inter-partner coordination. Knowledge about the influence of third-party intervention on these opportunism and coordination concerns is, on the contrary, extremely limited. However, as we explain below, the services offered by third parties are mainly aimed at reducing the costs of control and the costs of coordination.

Resorting to services offered by third parties like technology brokers, trade associations, auditing firms, or research collective centers can be considered as a means to deal with the risk of opportunism and/or means to facilitate the coordination of activities. On the one hand, costs of control caused by a high risk of opportunism can be mitigated by resorting to third parties at one or another contractual stage as third parties can propose: (1) assistance for the identification and selection of trustworthy partners; (2) assistance for the negotiation of a contract that integrates the necessary safeguards; and (3) assistance for the monitoring of the contractual relationship and adherence to contractual commitments. On the other hand, costs of coordination caused by a high level of inter-dependency can be mitigated by resorting to third parties at one or another contractual stage as third parties can provide: (1) assistance for the identification and selection of partners having the necessary set of resources, skills and capabilities to value, understand, assimilate and utilize the technology; (2) assistance for the negotiation of a contract that incorporates the necessary flexibility; and (3) assistance for the monitoring of the contractual relationship, which demands communication, continuity, and adaptation.

HYPOTHESES

On the basis of previous research and our understanding of the role of third parties in licensing relationships, we formulate in this section a set of hypotheses related first to the factors magnifying the risk of opportunism (first managerial imperative: the need to control) and second to the factors increasing the extent and complexity of coordination (second managerial imperative: the need to

coordinate) in the context of licensing. Our hypotheses address the link between these two dimensions and the resort to third-party services. It is important to note that using third-party services may impose some costs as well. Identifying the right third party, informing it about the details of the licensing agreement and interacting with it ask time, resources and money. In this essay, we assume that as soon as firms use third-party services, they expect that the costs of using third-party services is lower than the reduction in costs of control and costs of coordination resulting from these services.

The use of third parties to curtail opportunism and reduce the costs of control

Substantial empirical research in Transaction Cost Economics has been devoted to the study of the first managerial imperative: economizing on bounded rationality while simultaneously safeguarding against opportunism. We focus here on three transaction attributes that have been considered in previous research as increasing the threat of opportunism.

Tacitness. Licensing may necessitate transferring not only the technology covered by the patent but also tacit know-how necessary to assimilate and implement this technology. Tacit know-how is usually spread across multiple employees and made up of numerous tacit elements (Chi and Roehl, 1997). It corresponds to implicit and noncodifiable accumulation of skills that essentially result from learning by doing (Reed and DeFillippi, 1990).

Given its nature, the transfer of tacit know-how must, in most cases, be achieved through training of the licensee's personnel by the licensor's engineers (Teece, 1977; Contractor, 1981; Arora, 1996). Tacitness magnifies the risk of opportunistic behavior on both sides of the licensing relationship. On the one hand, when a transfer of technology involves tacit know-how, the licensor risks the escape of its knowledge from its proprietary control due to the difficulty of codifying tacit knowledge in a contract and, thereby, protecting it through the legal system (Arora, Fosfuri and Gambardella, 2001). On the other hand, tacit know-how presents some risks for the licensee as well, as it is difficult for a licensee to assess *ex ante* the extent of tacit knowledge that will be necessary to implement the

licensed technology, and to assure that the licensor actually provides the licensee with the needed know-how (Arora, 1995).

As a result, for licensing transactions where the transferred knowledge is characterized by high level of tacitness, the protection of the IP through the legal system is limited and the quality, extent, and efficiency of the actual knowledge transfer become uncertain. Tacitness thus magnifies the hazards in contracting (Oxley, 1997), and the subsequent risk of opportunism could make the resort to third-party services more likely. Indeed, third parties such as technology brokers and professional associations can first provide firms with assistance regarding the identification and selection of trustworthy partners, which either will not opportunistically take advantage of the unprotected tacit know-how or will respect their commitment in terms of quality and extent of knowledge transfer. Second, law firms, consulting firms, or legal departments of professional associations are third parties that can assist partners in negotiating and drafting a contract that incorporates safeguards to deal with the transfer of tacit know-how; essentially through the design of clauses leading to bilateral hostage situations. Finally, some third parties like collective research centers can formally monitor the licensing agreement and ensure that each party honors its commitments.

Hypothesis1: The higher the level of tacitness of the knowledge transferred through the licensing agreement, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

Relationship-specific investment. Williamson (1991) defines the 'asset specificity' of a transaction as the degree to which the assets used in support of the transaction can be redeployed to *"alternative uses and by alternative users without sacrifice of productive value"*. Four main types of asset specificity[10] can be distinguished (Williamson, 1985): site specificity, physical asset specificity,

[10] As Leiblein (2003) puts it: "*Site specificity refers to the co-location of facilities so as to minimize inventory or production costs […]. Physical asset specificity refers to the use of co-specialized assets that are customized for a particular use or purpose […]. Human asset specificity refers to an employee's development of firm-specific*

human asset specificity, and dedicated assets. In the licensing context, asset specificity is determined by the specific investment made by the licensor to develop the technology and made by the licensee to implement this technology. Licensing partners may indeed have to make substantial specific investments in plants, equipment, human resources, etc.

Assets characterized by high relationship-specificity represent sunk costs as they have little value outside the particular licensing transaction they support and cannot be fully recovered should the transaction be prematurely terminated. The need for relationship-specific investments creates the potential for hold-up, in which the party with less idiosyncratic investment at risk expropriates surplus from the other party (Williamson, 1975, 1985; Klein, Crawford and Alchian, 1978). The greater the level of specific investment, the greater the risk of opportunistic expropriation and, hence, the more likely are the firms to resort to third-party services that can assist them in identifying and selecting trustworthy partners, and in negotiating contracts that provide safeguards for the specific and non-recoverable investments[11] (for instance, by opting for royalties instead of up-front payments, by imposing strong financial penalties to the partner who causes a premature termination or by designing a strict renegotiation scheme).

Hypothesis 2: The higher the relationship-specific investments required by the licensing agreement, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

Institutional environment uncertainty. Features of the institutional environment are critical factors for technology transfers, and in particular for technology transfers that cross national borders. When contracting for technology, the diversity of legal frameworks and particularly of IP rights regimes

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skills or knowledge […]. Dedicated asset refers to additional investments in plant or equipment made in order to sell the increased output to a particular customer."

[11] Masten and Crocker (1996) show, for instance, that some clauses can mitigate the hazards caused by durable and specific investments. In particular, they examine the 'take-or-pay' provision in contracts between natural gas producers and pipelines. This provision *"requires purchasers to pay for a contractually specified minimum quantity of output, even if delivery is not taken"* (Masten and Crocker, 1996).

between countries exacerbates the uncertainty surrounding the transaction (Williamson, 1991; Oxley, 1999; La Porta, Lopez-de-Silanes, Schleifer, and Vishny, 1999) and influences the firms' decision to opt for one or another governance structure (Oxley, 1999; Hagedoorn, Cloodt and van Kranenburg, 2005). Weak and unpredictable IP protection and contract enforcement increase the risk that IP will be illegally invented around or that terms of a license agreement will be reneged on (Teece, 1988; Anand and Khanna, 2000). When institutional environments are more uncertain, a greater number of contingencies exists that could disturb the relationship, and the risk of opportunism increases (Williamson, 1985; Buckley and Casson, 1988). Besides the legal framework and IP rights regimes, political institutions (Levy and Spiller, 1994), governance interference (Oliver, 1991), and institutional environment volatility (Oxley, 1997; Luo and Peng, 1999) can also generate business risks that must be assessed by firms when engaging in technology transfer agreements with a foreign partner. Uncertainty is indeed a multifaceted dimension (Luo and Peng, 1999).

We argue that, where the level of risk and uncertainty caused by the institutional environment in the licensing partner's country is high, firms tend to rely more on third-party services. Third parties may help firms identify and select trustworthy partners (e.g., technology brokers and professional associations), assist the negotiation of a contract that properly addresses the institutional environment uncertainty characterizing the countries involved (e.g., law firms and consulting firms), and check the extent to which the partners honor their commitments, especially when they are located in another country (e.g., auditing firms).

Hypothesis 3: The higher the institutional environment uncertainty in the licensing partner's country, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

The use of third parties to facilitate the coordination of activities and reduce the costs of coordination

Licensing agreements do not form a homogeneous set of contracts. Instead, there is a wide variety of licensing agreements, characterized by different degrees of joint activities. These joint activities can be related to R&D, marketing, or manufacturing and supply. The broader the scope and the higher the intensity of joint activities and efforts, the higher the need to communicate, to establish and maintain an inter-organizational interface, and to make internal adjustments in response to the partners' action; hence, the higher the costs of coordination (Gulati and Singh, 1998; White and Lui, 2005). Coordination costs arise, indeed, from the *"task-related coordination needs and social integration that are necessary in order for partners to combine resources and integrate their activities in the course of undertaking a joint task"* (White and Lui, 2005). In line with White and Lui (2005), we consider that coordination costs stem from two main sources: the task-related coordination needs and the social differences in cultures, values, and so on.

Scope and depth of joint activities. Coordination needs increase with the scope and depth of interaction between the partners (e.g., Garrette and Dussauge, 1995; Bensaou and Venkatraman, 1995). Scope refers to the range of joint activities or tasks undertaken by the partners along their value chain (Child and Faulkner, 1998). Depth refers to the intensity of interaction between the partners. When either scope or depth of joint activities increases, the coordination needs and, therefore, coordination costs increase as well. Third-party assistance and support can contribute to the reduction of these costs. First, third parties like technology brokers and trade associations can provide firms with assistance regarding the identification and selection of partners having the appropriate set of resources, skills and capabilities to provide the needed technology or to implement their technology. Second, third parties like law firms, consulting firms and legal departments of trade associations, can assist the partners in negotiating a contract that allows the flexibility imposed by the high inter-dependency (for instance, by implementing governance mechanisms like renegotiation, mediation or supervision (Brousseau et al., 2007)). Finally, third parties like collective research centers can provide

the partners with assistance in monitoring the more 'relational' contract, which requires communication, continuity, and adaptation, by assisting the partner in implementing monitoring and joint problem solving mechanisms.

Hypothesis4: The broader the scope of joint activities in the licensing agreement, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

Hypothesis5: The deeper the joint activities in the licensing agreement, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

Inter-partner diversity. Inter-partner diversity along social and cognitive dimensions - culture, managerial personalities, priorities, and so forth - may render coordination difficult to manage and thus increase its costs (de Rond, 2003; Child and Faulkner, 1998). On the one hand, this diversity can be the key motive for firms to engage in a licensing agreement. Licensing may, in fact, be driven by the lack of complementary capabilities and assets in marketing and manufacturing or by the inability to conduct R&D. On the other hand, inter-partner diversity along social and cognitive dimensions may make such partnerships difficult to manage (de Rond, 2003; Child and Faulkner, 1998). Conflicts and even failures arise when partners are not able to overcome or accommodate their organizational, industrial or national differences. Again, third parties could play a role in tempering inter-partner diversity. First, they can provide firms with assistance regarding the identification and selection of partners that share at least the necessary set of values, norms and behaviors to ensure successful coordination of inter-dependent tasks. Second, they can assist the partners in negotiating a flexible contract integrating the fact that partners may have different patterns of behaving and believing and different approaches to solve problems and resolve conflicts. Finally, when third parties have knowledge about partners' respective rules, values and culture, they can help them develop an

understanding of the other partner's mode of thinking and implement mechanisms that temper difficulties of interactions and coordination.

Hypothesis6: The higher the diversity between the licensing partners, the higher the likelihood that licensors and licensees will resort to third-party services rather than manage their relationships exclusivity bilaterally.

RESEARCH DESIGN

The context for this study involves the decisions made by Belgian firms to resort to third-party services for their licensing activities. An initial list of 1.946 firms composing the Belgian technology industry was obtained from AGORIA[12]. In line with AGORIA we consider the following sectors as forming the technology industry: aerospace, industrial automation, automobile, contracting and maintenance, electronics, mechanical and mechatronical engineering, metals and materials, assembling and crane, plastics, building products, security and defense, ICT, and metal fabrication.

The questionnaire design, implementation, and the conduct of the survey followed the Total Design Method (TDM) developed by Dillman (2007). Our online survey package included a prenotice letter written, signed and sent by AGORIA and customized cover letters. Follow-up messages were made by electronic mail and phone with between two and five contacts per firm. Distinct stages of pre-testing were conducted: on-site interviews with managers in technological firms, lawyers in IP rights, business consultants in IP, representatives of AGORIA and of the Brussels Enterprises Commerce and Industry association; evaluations by academic colleagues; and reviews by industry associations' executives.

[12] Website: www.agoria.be

A key informant respondent approach was used for the survey. The technical and specialized nature of licensing decisions required sending our questionnaire to top executives[13] whose understanding and field of action related to the overall firm. These executives were, moreover, the best qualified to redirect the questionnaire, if necessary, to other individuals in the organization who may have been more competent on the subject (Aulakh, Kotabe and Sahay, 1996).

The first part of the questionnaire prompted the respondents to complete questions on the global licensing strategy adopted by their firm. In a second part, respondents were invited to select and describe a current, or past but recent, technology licensing agreement in which the firm had participated (see dissertation appendix). In addition to data acquired through the questionnaires, secondary data, mainly related to the characteristics of the respondents' firm (such as industry and size), were collected from the ORBIS-AMADEUS database.

After eliminating surveys with incomplete information, the sample consists of 289 responses (15% response rate). Because numerous firms having completed our questionnaire have not negotiated licensing agreements; we end with 113 usable questionnaires completed by 94 firms for the purpose of this paper. Indeed, we did not know in advance which firms in the list received from AGORIA had negotiated licensing agreements or not. In case the respondent answered that his firm had not negotiated licensing agreements, which is the case for 156 firms in our sample, we asked him to identify the main reasons for this absence of licensing agreements[14]. We cannot use these latter 156 questionnaires for this present study that focuses on licensing transactions.

Since the sample is based upon AGORIA's listings that represent the overall firm populations, sample selection bias is unlikely (Tomaskovic-Devey, Leiter, and Thompson, 1994). Firms composing our

[13] Chief Executive Officer, Chief Financial Officer, Manager R&D department, Manager IP department, and Head of the legal department.

[14] We developed and proposed a list of possible reasons: no intellectual assets can be licensed by your firm to a licensee; your firm is not familiar with licensing practices and prefers other modes of technology transfer; intellectual assets could be licensed but potential licensees were not identified; your firm does not need external technology; etc.

sample are of various sizes[15]: 100 employees or less in 50 firms, between 100 and 500 employees in 21 firms, and more than 500 employees in 18 firms. They can be regrouped into 5 distinct sectors[16] on the basis of their NACE code: new materials (10 firms); mechatronic and electronic (29 firms); ICT (15 firms); automobile (4 firms); and construction (4 firms). Their experience in licensing is also diverse: 16 have negotiated out-licensing agreements exclusively, 44 have negotiated in-licensing agreements exclusively, and 34 have negotiated out- and in-licensing agreements. Moreover, 32 out of these 94 firms have a licensing or IP department.

Variable operationalization

The survey items were carefully developed on the basis of the related literature and discussions with industry experts. The first variable of interest in this paper is *resort to third-party' services*, which reflects the firm's decision to use third-party services at one or more contractual stages of the technology licensing agreement. To construct this dependent variable, each contractual stage (identification and selection of a licensing partner, negotiation of the licensing contract, and monitoring of the contractual relationship) was first considered separately. We asked whether the firm resorted to a third party (1) for the identification and selection of the licensing partner, (2) for legal and/or technical expertise during the negotiation of the licensing contract, and (3) for assistance in

[15] There are 5 firms with a missing value for this variable.

[16] We first identified the NACE rev1.1 codes for each firm. Then, we grouped the firms on the basis of the first two digits of the NACE rev1.1. Six categories were computed by using the NACE code and referring to the classification proposed by AGORIA, the Belgian Technology Trade Association. For 'new materials': 24. manufacture of chemicals and chemical products, 27. manufacture of basic metals, and 28. manufacture of fabricated metal products, except machinery and equipment. For 'mechatronic and electronic': 29. manufacture of machinery and equipment n.c., 31. manufacture of electrical machinery and apparatus n.e.c., and 33. manufacture of medical, precision and optical instruments, watches and clocks. For 'ICT': 32. manufacture of radio, television, and communication equipment and apparatus, 64. post and telecommunications, and 72. computer and related activities. For 'automobile': 34. manufacture of motor vehicles, trailers and semi-trailers, and 35. manufacture of other transport equipment. For 'construction': 40. electricity, gas, steam, and hot water supply, and 45. construction. For 'contracting': 50. Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel; 51. wholesale trade and commission trade, except of motor vehicles and motorcycles, and 74. other business activities.

monitoring the contractual relationship[17]. These three individual variables were aggregated into a single variable, *resort to third-party services*, which is equal to 1 if the firm used a third party at one or more contractual stages and to 0 otherwise.

Tacitness. The tacitness of the technology transferred is measured with a scale adapted from Simonin (1999, 2004) that consists of two questionnaire items: (i) the licensed technology is easily codifiable (in blueprint, instructions, formulas, etc.) and (ii) the licensed technology is more explicit (easy to explain and describe to others) than tacit. These two items were recorded on a 5-point Likert scale ranging from 1, 'Strongly disagree' to 5, 'Strongly agree' and reverse-coded. The coefficient of reliability (Cronbach's alpha) for this scale is 0.8339.

Relationship-specific investment. To create a measure of the level of investment in specific assets, we average the level of investment made by the licensor to develop the technology and the level of investment made by the licensee to implement it. For the specific investment made by the licensor, two questionnaire items were adapted from previous research (Simonin, 1999): (i) to develop this technology, the licensor had to invest significantly in specialized equipment and facilities and (ii) to develop this technology, the licensor had to invest significantly in skilled human resources. Responses were recorded on a 5-point Likert scale ranging from 1, 'Strongly disagree' to 5, 'Strongly agree'. The Cronbach's alpha is 0.6759 for this scale. One might argue that the two questionnaire items used for the licensor's investment reflect more the level of specialization than the level of specificity to a particular licensing agreement. We therefore multiply this scale by the regime of exclusivity characterizing the licensing agreement. Indeed, it makes sense to consider that the regime of exclusivity signals the extent to which the licensor's investment is specific to a particular licensing agreement. The regime of exclusivity ranges from 1 to 4: 1 if the license is a 'non exclusive license', 2 if it is a 'co-exclusive license' (with exclusivity granted to a small number of firms), 3 if it is a 'sole

[17] Systematically, in case the respondent mentioned his firm resorted to third parties' services, we asked to specify the exact name of the solicited third parties. This enables us to have information about the main third parties solicited at each contractual level in our sample.

license' (licensor keeps the right to exploit its patent and know-how) and 4 if it is an 'exclusive license' (licensor fully sells its right to exploit).

For the specific investment made by the licensee, we used four survey questions (Artz and Brush, 2000; Reuer and Arino, 2007): (i) the licensee's investment in tooling, equipment and/or plant dedicated to this licensing agreement is […]; (ii) the licensee's commitments of time and money involved in this licensing agreement are […]; if the licensing agreement were to terminate before its contractual end: (iii) the difficulty the licensee would have in redeploying its people and facilities presently serving the licensing agreement to other uses would be […]; and if the licensing agreement were to terminate before its contractual end : (iv) the licensee's non-recoverable investment in equipment, people, etc. would be […]. Again, a 5-point Likert scale was used from 1, 'Negligible' to 5, 'Substantial'. The Cronbach's alpha is 0.7871.

To obtain the final and single variable *relationship-specific investment,* we average the level of investment made by the licensor to develop the technology (adjusted to include the regime of exclusivity) and the level of investment made by the licensee to implement it. This requires us first to standardize both scales given that the scale for the licensee's investment goes from 1 to 5 and the scale for the licensor's investment goes from 1.5 to 20 after the multiplication by *exclusivity*. Finally, in order to avoid negative levels of investment after standardization, we add the value of 3 to each standardized scale and then average these scales to form the single measure, *relationship-specific investment*.

Institutional environment uncertainty. For our variable *institutional environment uncertainty*, we use the Worldwide Governance Indicators developed by Kaufmann, Kraay and Mastruzzi (World Bank, 2008). These scholars define governance as *"the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions*

among them". These indicators measure six dimensions of governance in 212 countries: voice and accountability[18]; political stability and absence of violence/terrorism[19]; government effectiveness[20]; regulatory quality[21]; rule of law[22]; and control of corruption[23]. Given that the respondent's firm is always Belgian in our database of licensing agreements, we use the value of these six dimensions of governance in the country of the other licensing partner. These licensing partners are also Belgian in 8 cases, European (and non-Belgian) in 52 cases, North-American (United States of America and Canada) in 30 cases, Japanese in 7 cases, Chinese in 4 cases and Thai, Russian, Pakistanis, Australian, or Algerian in the other cases. Moreover, as the Worldwide Governance Indicators are measured for 1996, 1998, 2000, and annually for 2002-2007 and our questionnaire asked the date of the signing of the contract ('When has this licensing agreement been signed? Less than 1 year ago, 1-2 years ago, 3-5 years ago, 6-10 years ago, more than 10 years ago'), we consider the value of these six dimensions for the year the contract was signed. We then form a unique scale based on these six dimensions that we reverse-code. The Cronbach's alpha is 0.9762.

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[18] *"Measuring perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media."* (Kaufman et al., 2008).

[19] *"Measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitution or violent means, including politically-motivated violence and terrorism."* (Kaufman et al., 2008).

[20] *"Measuring perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies."* (Kaufman et al., 2008).

[21] *"Measuring perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."* (Kaufman et al., 2008).

[22] *"Measuring perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well a the likelihood of crime and violence."* (Kaufman et al., 2008).

[23] *"Measuring perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests."* (Kaufman et al., 2008).

Scope and depth of joint activities. In order to assess the scope of joint activities, four variables - each dummy variable - are aggregated[24] as follows:

Scope of joint activities = (provision of goods or services to the licensor + joint efforts in R&D + joint efforts in manufacturing + joint efforts in marketing)

The variables *provision of goods or services to the licensor, joint efforts in R&D, joint efforts in manufacturing* and *joint efforts in marketing* are equal to 1, respectively, if the licensee must provide goods or services to the licensor; if the licensing agreement involves joint efforts in R&D; in manufacturing and supply; and in marketing; and to 0 otherwise. This sum enables us to assess the scope of joint activities. The variable *depth of joint activities* is equal to 1 if, in addition to the right to use a patent, the licensor provides the licensee with technical assistance, consultancy services and personnel delegation; and to 0 otherwise.

Inter-partner diversity. Different dimensions can be used to assess inter-partner diversity; for instance, the diversity in terms of strategic goals and objectives (Doz, 1988), in terms of formal and informal organizational processes (de Rond, 2003; de Rond and Bouchiki, 2004) or in terms of organizational and national culture (Mowery, Oxley and Silverman, 1996). Our database enables us to use as measure of *inter-partner diversity* the cultural distance existing between the national culture characterizing Belgium and the national culture characterizing the licensing partners' country. This variable has been measured in different ways in previous studies (Ronen and Shenkar, 1985; Anderson and Gatignon, 1986; Kogut and Singh, 1988; O'Grady and Lane, 1996; Shenkar, 2001). In this paper, we adopt Kogut's and Singh's (1988) measure of cultural distance, because it has most frequently been used in past studies. Based on Hofstede's 'dimensions of culture' (Hofstede, 1980), *inter-partner diversity* is measured as the deviation across each of the four dimensions of culture (power distance, uncertainty avoidance, individualism and masculinity), corrected for variance

[24] We have checked the level of correlation between these four variables and did not detect multicollinearity issue.

differences among the dimensions. Country scores were taken from Hofstede (2001) and, for the countries not included in the original Hofstede list, from the website of the consulting firm ITIM (www.itim.org), which is utilizing Hofstede's concepts and is supported by him.

To ensure the robustness of our results, four control variables are added to the equation. First, the variable *out-licensing agreement* is equal to 1 if the questionnaire was completed by a licensor (i.e., describing an out-licensing agreement) and to 0 if the questionnaire was completed by a licensee (i.e., describing an in-licensing agreement). In fact, some firms have exclusively participated in only one type of licensing agreements, out-licensing agreement vs. in-licensing agreement, while others have participated in both types. If the respondent's firm was exclusively a licensor or has negotiated more out-licensing than in-licensing agreements, we asked the respondent to describe one of its out-licensing agreements. Similarly, if the respondent's firm was exclusively a licensee or has negotiated more in-licensing than out-licensing agreements, we asked the respondent to describe one of the firm's in-licensing agreements. Finally, in case the respondent's firm has negotiated as many out-licensing agreements as in-licensing agreements, we asked the respondent to select and describe one of them (in- or out-licensing agreement). We include the variable *out-licensing agreement* as it is likely that licensors and licensees will not have the same propensity to resort to services proposed by third parties. One might think, for instance, that the process of identification and selection of a licensing partner is more often undertaken by the licensor than the licensee; hence, the resort to third-party services at this stage should be more frequent for licensors than for licensees. The variable *licensing department* is also introduced and equal to 1 if the firm has an IP or licensing department, and 0 otherwise. It makes sense to think that the presence of an IP or licensing department and its accumulated experience can decrease the need for assistance from third parties. The variable *European partners* is equal to 1 if both partners are Europeans and 0 otherwise. The resort to third parties depends directly on the existence of third parties themselves, which is contextual and varies with countries and regions. Introducing a variable for European partners enables us to partly control for these contextual aspects. Being both European, firms should have a more precise knowledge about the existence of third parties in Europe and about the services these third parties might provide and

their ability to deal with pan-European licensing relationships. Finally, the variable *size ratio* corresponds to the ratio between the sizes of the two licensing partners. To build this variable, the firms' size is first distributed according to employment in 5 categories: 1 less than or equal to 100 employees, 2 between 100 and 250 employees (250 included), 3 between 250 and 500 employees (500 included), 4 between 500 and 1.000 employees (1000 included) and 5 more than 1.000 employees. Then, we divide the size of the licensor by the size of the licensee.

RESULTS

The description of our sample presented in Table 1 provides a first indication of the contractual stages at which the firms in our sample resort to third-party services. In this table, each contractual stage is separately reported. In the full sample of 113 licensing agreements (row 1), we first see that third-party services have been used in 47 licensing agreements (41.59%). We can also see that use of third-party services is more frequent for negotiation of the contract than for identification and selection of a partner or for monitoring of the contractual relationship. Second, comparing rows 2 and 3, we see that, in general, licensors resort to third-party services more frequently than licensees. The exception is for monitoring of the contractual relationship, for which resort to third parties is almost similar for licensors and licensees (11.36% for the licensors and 10.14% for the licensees). This can be explained by the fact that the decision to use third parties for monitoring performance, unlike identification of partners and contract negotiation, is necessarily bilateral in nature. Finally, when the respondents answered that their firm used third-party services, our questionnaire asked the exact name of the third parties solicited. We know that firms composing our sample tend to rely on collective research centers, law firms, technology brokers and consulting firms for the first contractual stage; on patent attorneys, law firms, collective research centers, technology brokers, consulting firms and trade associations for the second contractual stage; and on trade associations, consulting firms, collective research centers and auditing firms for the third contractual stage (row 4).

	Number of licensing agreements with resort to third-party services			
	For identification and selection of a licensing partner	**For negotiation of the licensing contract**	**For monitoring of the contractual relationship**	**At one or more contractual stages (1 if at least one contractual stage, 0 otherwise)**
For licensors and licensees together	9 over 113 *7.96%*	40 over 113 *35.4%*	12 over 113 *10.61%*	47 over 113 *41.59%*
For licensors	5 over 44 11.36%	20 over 44 *45.45%*	5 over 44 *11.36%*	23 over 44 *52.27%*
For licensees	4 over 69 *5.80%*	20 over 69 *28.98%*	7 over 69 *10.14%*	24 over 69 *34.78%*
Third parties solicited	Collective research center; law firm; business consultant; technology broker	Law firm; collective research center; technology broker; business consultant; trade association; patent attorney	Trade association; business consultant; collective research center; auditing firm	

Table 1
Sample description

Table 2 reports the number of observations, mean and standard deviation for each study variable. Table 3 reports the correlation matrix. The maximum variance inflation factor (VIF) in the model is 1.47. This statistic is well below the guideline of 10, which Neter, Wasserman and Kutner (1985) suggest as indicative of a multicollinearity problem. Given that correlations between the independent variables reported are less than 0.50 and all the VIFs are equal or less than 1.47, multicollinearity should not impact the stability of the results.

	Nbr of obs	Mean	Std	Min	Max
1. Resort to third-party services	113	.416	.495	0	1
2. Tacitness	113	2.549	1.124	1	5
3. Relationship-specificity	113	3	.7669	1.369	5.082
4. Uncertainty	106	2.049	.645	1.482	4.263
5. Scope of joint activities	113	.478	.757	0	3
6. Depth of joint activities	113	.575	.496	0	1
7. Inter-partner diversity	107	1.447	.946	0	4.451
8. Licensing department	113	.381	.488	0	1
9. Out-licensing agreement	113	.389	.49	0	1
10. European partners	108	.555	.499	0	1
11. Size ratio	105	1.58	1.504	.2	5

Table 2
Descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11
1. Use of third parties	1.00										
2. Tacitness	-.085	1.00									
3. Relationship-specificity	.124	.038	1.00								
4. Uncertainty	.077	.112	-.018	1.00							
5. Scope of joint activities	.132	.193**	.35	.165*	1.00						
6. Depth of joint activities	.071	.069	.182*	.147	.165*	1.00					
7. Inter-partner diversity	-.112	.115	.03	.103	-.088	.08	1.00				
8. Licensing department	-.107	-.067	.106	.003	.156*	-.064	-.037	1.00			
9. Out-licensing agreement	.173*	-.035	.022	.425***	.072	-.011	-.025	.159*	1.00		
10. European partners	.151	-.03	-.094	-.377***	-.02	-.189*	-.199**	-.03	-.124	1.00	
11. Size ratio	-.115	.016	-.101	-.088	.096	.208**	-.066	-.144	-.337***	-.171*	1.00

p*<0.1, p**<0.05, p***<0.01

Table 3
Correlation matrix

In the following, we first present four probit regression models where the dependent variable is the global dummy variable *resort to third-party services* (Table 5). Then, we investigate the impact of our explanatory variables on each contractual stage separately: identification and selection of a licensing partner; negotiation of the licensing contract; and monitoring of the contractual relationship (Table 6). Our unit of analysis is the licensing agreement. The size of most samples used in the regressions is somewhat smaller than 113 due to missing values. Before testing the hypotheses, it is important to ensure the absence of systematic differences between the questionnaires completed by licensors and questionnaires completed by licensees. To this end, we conduct "difference of means" tests (Table 4). Moreover, as some respondents described more than one licensing agreement, we must adjust the standard errors to consider the possible inter-dependence between licensing agreements negotiated by a same firm (White, 1980).

Resort to third-party services at one or more contractual stages

As mentioned before, it is important to ensure the absence of systematic differences between the questionnaires completed by licensors and questionnaires completed by licensees. Out of the 113 usable questionnaires, 44 were completed by licensors and 69 by licensees. In order to determine whether these two sets of questionnaires are statistically different from each other, we conduct "difference of means" tests (*t*-Test) on the eight questions recorded on a Likert scale. These questions, referring to the level of tacitness (2 questions) and the level of licensor's and licensee's investments (6 questions), may imply some degree of subjectivity. The results shown in Table 4 provide no evidence that the answers to these questions are systematically different when the respondent describes an in- vs. out-licensing agreement.

	Out-licensing agreement		In-licensing agreement		*t*-Test Statistics
	Nbr of obs	**Mean**	**Nbr of obs**	**Mean**	
the licensed technology is easily codifiable	44	2.5 (.188)	69	2.58 (.160)	.318
the licensed technology is more explicit than tacit	44	2.5 (.136)	69	2.58 (.151)	.365
to develop this technology, the licensor had to invest significantly in specialized equipment and facilities	44	3.43 (.182)	69	3.45 (.15)	.074
to develop this technology, the licensor had to invest significantly in skilled human resources	44	3.86 (.164)	69	3.78 (.127)	-.393
the licensee's investment in tooling, equipment and/or plant dedicated to this licensing agreement is	44	3.36 (.166)	69	3.16 (.162)	-.842
the licensee's commitments of time and money involved in this licensing agreement are	44	3.41 (.131)	69	3.42 (.144)	.054
if the licensing agreement were to terminate before its contractual end : the difficulty the licensee would have in redeploying its people and facilities presently serving the licensing agreement to other uses would be	44	2.70 (.177)	69	2.85 (.158)	.062
if the licensing agreement were to terminate before its contractual end : the licensee's non-recoverable investment in equipment, people, etc. would be	44	2.93 (.173)	69	3.10 (.152)	.721

p*<0.1, p**<0.05, p***<0.01 - standard errors in brackets

Table 4

"Difference of means" tests: out-licensing agreements vs. in-licensing agreements

In the **model 1**, we regress the variable *resort to third-party services* on the four control variables alone (Table 5). Our dependent variable is a global variable in the sense that it is equal to 1 if there is use of third-party services at one or more contractual stages. In order to ease the interpretation of the results, we report the marginal effects in the tables, i.e., how much a change in a variable changes the probability of the focal outcome (Hoetker, 2007). Showing the marginal effects conveys an

impression of the order of magnitude of the different effects. First, with respect to the variable *out-licensing agreement*, we find a positive and significant effect. In accordance with Table 1, this result shows that firms have a higher tendency to resort to third-party services when they are licensors than licensees. Second, the positive and significant effect for *European partners* suggests, as expected, that the resort to third-party services will be more likely when both partners are Europeans. This positive relationship can be explained by the more precise knowledge of European firms about the existence of European third parties, their specific services and their ability to ease and secure pan-European partner-relationships. As an indication of the magnitude of these two effects, we note that when the licensing agreement is an *out-licensing agreement* and when it involves *European partners*, there is respectively an increase of 18% and 20.8% in the probability of resorting to third-party services. The results show no significant effect of *licensing department* and *size ratio* on the use of third parties.

Turning to **model 2**, we test our first three hypotheses relative to the costs of control. These hypotheses address the impact of the transaction attributes, *tacitness*, *relationship-specificity* and *uncertainty,* on the likelihood of resorting to third-party services at one or another contractual stage. As expected, the impact of *relationship-specificity* is positive and significant. This suggests that firms tend to use services offered by third parties when they fear possible hostage situations caused by the level of their specific investments (hypothesis 2). However, hypothesis 1 and hypothesis 3 are not confirmed in model 2; meaning that *tacitness* and *uncertainty* do not significantly impact the resort to third-party services when we do not distinguish the contractual stages.

Our variable *relationship-specificity* has been adjusted to integrate the effect of the regime of exclusivity on the licensor's investment. However, we must address the potential for endogeneity between the variable *exclusivity*, which is a contractual variable and thus a choice variable, and the variable *resort to third-party services*. To test whether *exclusivity* is exogenous, in which case we do not need to correct for endogeneity, we perform a bivariate probit regression with *resort to third-party*

services and *exclusivity* as dependent variables[25] (Greene, 2003; Monfardini and Radice, 2008). The value of rho can be interpreted as a test of exogeneity; if rho is equal to 0, then *exclusivity* is exogenous. This requires us to first transform the variable *exclusivity* in a dummy variable equals to 0 if the original variable *exclusivity* is equal to 1, and to 0 otherwise. The test fails to reject the null hypothesis (prob>chi2 = .1092) and confirms that *exclusivity* is exogenous.

In **model 3**, we test our three hypotheses relative to the costs of coordination. As expected, the greater the scope and depth of the joint activities and efforts in the licensing agreement, the higher the likelihood that licensors and licensees will resort to third-party services at one or another contractual stage. Model 3 confirms our hypothesis 4 and hypothesis 5. However, we can see that the variable *inter-partner diversity* does not significantly affect the *resort to third-party services*. This means that when partners show strong cultural differences, they do not consider the resort to third parties as a means to temper their differences and ease the coordination. Hypothesis 6 is, therefore, not confirmed.

Finally, in the **model 4**, we test all of our hypotheses. The variables *scope of joint activities* and *depth of joint activities* influence positively and significantly the *resort to third-party services*. Therefore, when we regroup the three variables relative to the use of third-party services in one global dependent variable, our results show that the need to coordinate rather than the need to control drives the decision to use third-party services.

[25] We have included all of our explanatory variables in both equations and also included *exclusivity* in the *third parties* equation.

		Model1	Model2	Model3	Model4
Need to control	*Tacitness*		-.019		-.041
			(.043)		(.047)
	Relationship-specificity		.126*		.057
			(.065)		(.073)
	Uncertainty		.055		.017
			(.097)		(.098)
Need to coordinate	*Scope of joint activities*			.163**	.149*
				(.077)	(.085)
	Depth of joint activities			.169*	.165*
				(.073)	(.097)
	Inter-partner diversity			-.062	-.04
				(.053)	(.056)
Control	*Licensing department*	-.132	-.162	-.13	-.158
		(.103)	(.105)	(.106)	(.107)
	Out-licensing agreement	.182*	.134	.14	.128
		(.106)	(.12)	(.111)	(.121)
	European partners	.208**	.25**	.203*	.226*
		(.101)	(.106)	(.103)	(.116)
	Size ratio	-.021	-.033	-.051	-.053
		(.037)	(.038)	(.038)	(.037)
	Pseudo R2	.064	.0961	.1253	.1356
	Prob>chi2	.0815	.0952	.009	.003
	Nbr observations	103	102	102	101

p*<0.1, p**<0.05, p***<0.01 – marginal effects are reported - standard errors in brackets

Table 5

Use of third-party services - Probit regression models

Resort to third-party services at each contractual stage

We now consider separately the three contractual stages: identification and selection of a licensing partner; negotiation of the licensing contract; and monitoring of the contractual relationship. Our dependent variables are dummy variables, which are equal to 1 if third-party services were used, and

to 0 otherwise. Here, we regress our three dependent variables on the two sets of explanatory variables relative to the need to control and to need to coordinate using the probit regression. Marginal effects are reported in Table 6.

With respect to the first stage, identification and selection of a licensing partner, we find a positive and significant impact for *relationship-specificity* and for *depth of joint activities* (model 1 and model 2). Licensors and licensees tend to ask for assistance from third parties to identify a partner when the risk of hostage situations caused by specific investments is important and when the contract requires close interactions. Indeed, third parties can help firms find trustworthy partners that have the necessary skills, resources and capabilities to allow successful collaboration.

At the second stage, negotiation of the licensing contract, the variables *relationship-specificity* and *scope of joint activities* impact positively and significantly the dependent variable (model 3 and model 4). This suggests that the decision to resort to third-party services for negotiation of the licensing contract is driven by both the need to control and need to coordinate. In line with our hypotheses 2 and 4, third parties can help firms negotiate a contract that protects them against the risk of opportunism and simultaneously allows the flexibility necessary when the scope of joint activities is broad. Surprisingly, the variable *tacitness* affects significantly but negatively our dependent variable. Getting a negative effect is not what we expected (see our hypothesis 1). This result means that third parties cannot help partners negotiate a contract enabling them to be protected against risks associated with a transfer of tacit know-how (i.e., the licensee could opportunistically take advantage of the unprotected tacit know-how and the licensor could renege on its commitment in terms of quality and extent of tacit know-how's transfer).

Finally, at the third stage, monitoring of the contractual relationship, the variable *scope of joint activities* affects positively and significantly the variable *resort to third-party services* (model 5 and model 6). This means that licensors and licensees tend to use third parties for assistance in monitoring more 'relational' contracts, which may require further communication and adaptation. The variable

inter-partner diversity has also a significant but negative effect. Again, getting a negative sign is not what we expected (see our hypothesis 6). This result suggests that it is difficult for a third party to help partners overcome their inter-cultural differences, particularly when they are important.

		For identification and selection of a licensing partner		**For negotiation of the licensing contract**		**For monitoring of the contractual relationship**	
		Model1	**Model2**	**Model3**	**Model4**	**Model5**	**Model6**
Need to control	*Tacitness*	.012		-.082*		-.003	
		(.019)		(.045)		(.029)	
	Relationship-specificity	.059**		.165***		.026	
		(.028)		(.06)		(.034)	
	Uncertainty	.044		.123		-.06	
		(.036)		(.091)		(.046)	
Need to coordinate	*Scope of joint activities*		.021		.14*		.053*
			(.024)		(.079)		(.024)
	Depth of joint activities		.096***		.052		.056
			(.041)		(.088)		(.040)
	Inter-partner diversity		-.015		-.049		-.088**
			(.027)		(.049)		(.029)
Control	*Licensing department*	.015	.034	-.139	-.119	-.025	-.004
		(.049)	(.049)	(.096)	(.097)	(.057)	(.046)
	Out-licensing agreement	-.026	.017	.096	.119	.05	-.001
		(.045)	(.053)	(.112)	(.102)	(.074)	(.054)
	European partners	.004	-.017	.367***	.263**	.025	-.036
		(.049)	(.036)	(.086)	(.089)	(.065)	(.055)
	Size ratio	-.019	-.02	-.047	-.055	.02	.008
		(.016)	(.014)	(.04)	(.039)	(.018)	(.017)
	Pseudo R2	.1461	.133	.1843	.1457	.043	.1836
	Prob>chi2	.0705	.016	.000	.0385	.2278	.0166
	Nbr observations	102	102	102	102	102	102

p*<0.1, p**<0.05, p***<0.01 - marginal effects are reported - standard errors in brackets

Table 6

Use of third-party services at each contractual stage - Probit regression models

DISCUSSION

While previous research has mainly studied the choice of governance structure as a means to deal with the risk of opportunism and the coordination of inter-dependent tasks, little attention has been devoted to the role of third parties like technology brokers, consulting firms, collective research centers, patent attorneys, auditing firms, law firms and professional associations in this respect. In this essay, we have developed and tested a theoretical framework aimed at increasing our understanding of firms' motives for the use of third-party services in the licensing context and, in particular, at determining the extent to which these motives are driven by the costs of control and costs of coordination imposed by the management of licensing transactions.

As mentioned previously, licensing agreements do not form a homogeneous set of contracts; instead, there exists a wide variety of licensing agreements governing an as wide variety of transactions. We argue that the main motive for the use of third-party services is their ability to help partner firms face two main managerial imperatives: the need to control and the need to coordinate. In light of this, we have focused on various transaction attributes that are likely to increase the need to control, on the one hand, and the need to coordinate, on the other hand. Our results show that, according to the contractual stage - identification and selection of a licensing partner, negotiation of the licensing contract, or monitoring of the licensing relationship - , either the need to control or the need to coordinate or both will motivate the use of third-party services.

When we consider the three contractual stages together, the results suggest that the use of third-party services is driven by the need to coordinate rather than the need to control. In particular, the scope and depth of joint activities influence positively the resort to third-party services in the licensing context. When either scope or depth of joint activities increases, the coordination needs and, therefore, coordination costs increase. In this context, it is important to select a partner with the required pool of resources and competences and also to implement managerial mechanisms that promote the efficient sharing of information and communication, the establishment and maintenance of an inter-

organizational interface, and the realization of internal adjustment in response to partners' action. First, third parties can provide licensors and licensees with assistance regarding the identification and selection of partners that have the appropriate set of resources, skills and capabilities to provide the needed technology (for the licensee) or to implement the technology (for the licensor). Second, third parties can assist them in negotiating a contract that allows the flexibility imposed by the high inter-dependency. Third, third parties can provide licensors and licensees with assistance in monitoring the more 'relational' contract, which requires communication, continuity, and adaptation.

Turning to each contractual stage separately; at the first stage, licensors and licensees tend to ask for assistance from third parties to identify a partner when the risk of hostage situations caused by specific investments is important and when the contract requires close interactions. Need to control and need to coordinate come therefore into play at this first stage. This is also the case at the second stage since the decision to resort to third-party services for negotiation of the licensing contract is positively influenced by the level of specific investment and the scope of joint activities. Finally, at the third stage, monitoring of the contractual relationship, the scope of joint activities tends to increase licensors' and licensees' propensity to use third-party services. Need to coordinate is, therefore, the main motivation for solicitation of third parties at this last stage.

CONCLUSION

Our intent in this essay has been to investigate the factors motivating firms to resort to third parties for a range of services in the licensing context. While the mechanism under which more hierarchical governance structures mitigate opportunism and facilitate coordination has been extensively studied, knowledge about the influence of third-party services on these issues is extremely limited. Hence, our approach has been to 'position' these third parties in a theoretical framework that considers both the conflict and coordination aspects in inter-firm agreements.

While licensing agreements are essentially dyadic arrangements, our study shows that licensing partners frequently decide to resort to services proposed by such third parties as technology brokers, consulting firms, collective research centers, patent attorneys, auditing firms, law firms, or professional associations. These services may be supplied at one or more contractual stages: (1) the identification and selection of a licensing partner, (2) the negotiation of the licensing contract, and (3) the monitoring of the contractual relationship. We have argued that third parties help partners reduce the risk of opportunism and ease their coordination; hence, they help them reduce their costs of control and costs of coordination. When we consider the three contractual stages together, our findings provide partial support for our main argument: on the one hand, resorting to third-party services is more likely to occur when the licensing transaction is characterized with high costs of coordination (wide and deep joint activities) but, on the other hand, we do not find clear support for our argument relative to the costs of control. At the individual contractual stage, our results show that the use of third-party services is driven by both the need to control and the need to coordinate for identification of a licensing partner and negotiation of the licensing contract, and essentially driven by the need to coordinate for monitoring of the licensing relationship.

Clearly, there is a need for further theoretical and empirical investigations. First, the limited size of our sample did not enable us to investigate separately the behavior of licensors and licensees regarding the use of third parties. However, our descriptive table (Table 1) delivers some interesting insights in this respect. Second, our approach has been to study the use of services and not the types of third parties solicited for these services. One reason motivating this approach is that different third parties may similarly be labeled and still provide firms with distinct services; thus focusing on the third parties themselves would be misleading. For instance, European trade associations[26] provide a

[26] As defined by Tucker (2008) : *"Trade associations usually have voluntary membership, are not-for-profit organizations formed by policy entrepreneurs within firms located in the same industry to collect, share and disseminate industry-relevant information and provide a platform for collective representation and lobbying (Lorenzoni and Lipparini, 1999; Streech and Schmitter, 1985). Although competing firms are legally forbidden from forming cartels or colluding in the US and Europe, they have been historically encouraged to form associations to present their industry's interests (Aldrich and Staber, 1988). Trade Associations often serve a self-regulatory function, embody shared values and articulate shared norms for their members, cohering the*

very diverse set of services according to the sectors and the countries they cover. Another reason is that the third parties being solicited for a specific service can be very different according to the context. In our questionnaire, we asked respondents who indicated use of a third party the exact name of this third party. We know that firms composing our sample tend to rely on collective research centers, law firms, technology brokers and consulting firms for the first contractual stage; on patent attorneys, law firms, collective research centers, technology brokers, consulting firms and trade associations for the second contractual stage; and on trade associations, consulting firms, collective research centers and auditing firms for the third contractual stage. Finally, we have investigated the decision to resort to third parties in the licensing framework. Needless to say, this resort is also observed in other types of agreement and future research should compare the factors motivating firms to resort to third parties in distinct types of agreement.

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members of the industry by drawing them together around common interests like lighter regulation, easier access to markets, and more flattering media profile. Put more formally, trade associations operate as the centralized cooperative component of inter-organizational relationships".

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Arbitration Mechanism in Licensing Agreements*

ABSTRACT

The use of alternative dispute resolution (ADR) mechanisms - negotiation, mediation or arbitration - becomes increasingly frequent in technology industries, and particularly in inter-firm agreements involving development or commercialization of intellectual property (IP). Arbitration is the most prominent of the ADR mechanisms used for both domestic and international commercial transactions. Despite the rising popularity of arbitration, few studies have examined the factors motivating firms to use the arbitration mechanism in their technology agreements. In particular, empirical research on this issue is surprisingly rare in the strategic management and business economics literature. In this essay, we propose to palliate this important lack of empirical research by studying the trade-off between arbitration and litigation in technology licensing agreements. Given the expertise of the arbitrators, the confidentiality of the arbitral procedure, and the use of idiosyncratic rules, the arbitration mechanism offers numerous advantages when disputes involve technology and IP. However, licensing partners do not systematically decide to include an arbitration provision in their licensing contract. It is therefore important to understand the advantages offered by arbitration but also its drawbacks. To this end, we develop a theoretical framework addressing the trade-off between arbitration and litigation by using as our frame of reference Transaction Cost Economics. We argue that the likelihood that an arbitration provision will be included in a licensing contract increases when the transaction governed by this contract presents high risk of opportunism and great difficulty of writing a complete contract. To test our theoretical framework, we use a database of 118 licensing

* An earlier version of this third essay (with R. Coeurderoy and J. Hagedoorn) has been accepted for presentation at the ***2009 SMS conference***, *Strategic Management Society, in Washington.*

transactions collected through an online survey launched with the support from the Belgian technology trade association.

Keywords: arbitration mechanism; licensing agreement; transaction cost economics; alternative dispute resolution.

INTRODUCTION

In the current global economy increasingly based on conceptual products, converged technologies and international networks, many practitioners and scholars agree that intellectual property (IP) rights have become the primary locus of value for many businesses (Reitzig, 2004). Consequently, it has become critical for firms to be able to efficiently exploit, protect and enforce their IP rights, and we can observe an increasing trend towards international and intensive patent strategies and inter-firm technology partnerships like research contracts, licensing agreements, research joint ventures or research consortia. In parallel with this trend, we also observe a rising trend towards the use of Alternative Dispute Resolution (ADR) mechanisms such as arbitration in technology industries. These mechanisms are indeed increasingly used in inter-firm agreements involving development or commercialization of IP[1]. Including an ADR mechanism in technology agreements can be aimed at preventing and resolving 'IP disputes' caused by a breach of contract, infringement, misuse of confidential information and trade secrets, or industrial espionage.

Arbitration corresponds to one of the three main ADR mechanisms[2] with negotiation and mediation. Like each ADR mechanism, arbitration falls outside the public ordering. When opting for arbitration, the parties voluntarily agree to refer their dispute to an impartial third party - one or more contractually nominated arbitrators, or an arbitral institution such as the Court of Arbitration of the International Chamber of Commerce (ICC) - and agree, in advance, to be bound by the decision of this third party. Arbitration is the most prominent of the ADR mechanisms used for both domestic and international commercial transactions[3]. Given the

[1] www.unctad.org; United Nations Conference on Trade and Development

[2] Negotiation does not involve a third party to facilitate the dispute resolution process or to impose a resolution. In mediation, there is a third party – the mediator – who facilitates the dispute resolution process but does not impose a resolution on the parties. Unlike arbitration, negotiation and mediation do not result in a binding or enforceable award.

[3] www.unctad.org; United Nations Conference on Trade and Development.

expertise of the arbitrators, the confidentiality of the arbitral procedure, and the use of idiosyncratic rules, the arbitration mechanism offers numerous advantages when disputes involve technology and IP. However, firms do not systematically decide to rely on arbitration and prefer to opt for public litigation in many of their contracts. The question is: What factors impact this trade-off decision between arbitration and litigation?

While the popularity of arbitration has significantly grown during the recent years, few empirical studies have examined the factors motivating firms to include this mechanism in their inter-firm agreements. With the exception of Drahozal and Hylton (2003), Hagedoorn and Hesen (2007), Eisenberg and Miller (2007), Drahozal and Wittrock (2008), and Drahozal and Ware (2010), empirical research is surprisingly rare[4]. In this essay, we propose to address this dearth of empirical research by studying the trade-off between arbitration and litigation in technology licensing agreements. Licensing is a means by which technology can be transferred from one party (the 'licensor') to another (the 'licensee'); the licensee buys the right from a licensor to use its IP for a period of time and with a precise purpose. Licensing has become an increasingly important channel for diffusing technology (OECD, 2006; Zuniga and Guellec, 2009). According to the ICC Statistics, licensing agreements belong to the group of contracts[5] that are most often litigated in the ICC arbitral tribunal.

To develop a theoretical framework for addressing the trade-off between arbitration and litigation in the licensing context, we use as our theoretical frame of reference Transaction Cost Economics and, in particular, refer to Williamson's (1991) framework. According to Williamson (1991),

[4] There have however been studies of the incidence of arbitration clauses in employment contracts (Schwab and Thomas, 2006; Thomas, O' Hara and Martin, 2008), consumer contracts (Demaine and Hensler, 2004), healthcare contract (Rolph, Moller and Rolph, 1997), and software license agreement (Marotta-Wurgler, 2007).

[5] Licensing agreements are ranking as the third group of contracts which are most often litigated in the ICC arbitral tribunal, after sales contract and construction and just before distributorship agreements.

each generic mode of governance - market, hybrid, and hierarchy - is supported by a specific form of contract law regime. First, for simple market contracts[6], the contract law regime is classical contract law, where, ideally, "*disputes are costlessly settled through courts by the award of money damages*" (Williamson, 2002). Second, for the hybrid forms, the contract law regime is neoclassical contract law. The neoclassical contract law views the contract as a framework that *"never accurately indicates real working relations, but affords a rough indication around which such relations vary, an occasional guide in cases of doubt, and a norm of ultimate appeal when the relations cease in fact to work"* (Llewellyn, 1931). Third, in hierarchy, firms become their own court of ultimate appeal.

Williamson considers arbitration as a type of mechanism appropriate for the hybrid forms. In hybrid forms, parties maintain their autonomy but they are more bilaterally dependent than in pure market contracts. Continuity must, therefore, be favored and efficient adaptation promoted (Williamson, 1991). In general, hybrid forms correspond to long-term contracts, which lead by nature to a wider range of contractual disturbances than simple market contracts do. This renders hybrid forms' contracts unavoidably incomplete as there exists a large number of possible contingencies and *"it may be very costly to know and specify in advance responses to all of these possibilities"* (Klein, 1980). Because of this incompleteness, these contracts must be elastic. As we will develop further in this essay, arbitration is a type of mechanism that enables parties to make their contract more elastic and facilitate *ex post* adaptation. Williamson describes arbitration as an *"order-preserving mechanism for adapting to disturbances in the service of mutual gains"* (Williamson, 2005). In this essay, we focus on the use of arbitration in technology licensing agreements, which have first been associated with pure 'market contracts' but more recently with 'hybrid forms' between market and hierarchy (Borys and Jemison, 1989; Grandori and Soda, 1995; Bessy and Brousseau, 1999; Sattin, 2005). Recent works have, indeed, shed light

[6] By simple, we mean *"sharp in by clear agreement; sharp out by clear performance"* (Macneil, 1974).

on the great diversity of licensing agreements, which can be considered as market vs. hybrid forms according to characteristics like the regime of exclusivity, the extent of joint activities in R&D, marketing or manufacturing, or the inclusion of governance mechanisms like supervision or renegotiation.

The remainder of this essay proceeds as follows. In the first section, we introduce the mechanism of arbitration and its benefits compared to public courts. We also outline in this section our theoretical framework, which addresses the trade-off between arbitration and litigation and is built on the arguments of Transaction Cost Economics. In the second section, we develop hypotheses regarding the factors potentially influencing the likelihood that partners will include an arbitration provision in their licensing contract. In order to test our hypotheses, we use a database on licensing transactions that we collected through an online survey launched with the support from the Belgian technology trade association[7]; the third section describes our data and variable operationalization. Thanks to the 'survey' methodology, we gathered detailed information on 118 licensing contracts. We present our core empirical analysis in the fourth section and discuss it in the fifth section.

CONCEPTUAL FOUNDATIONS

Arbitration mechanism

Typically, the decision to use ADR mechanisms like arbitration is specified *ex ante* in the contract. However, even if not specified, the parties can still decide to adopt an ADR mechanism

[7] In line with the Belgian technology trade association, AGORIA, we consider the following sectors as forming the technology industry: aero spatial, industrial automation, automobile, contracting and maintenance, electro technique, mechanic and mechatronical engineering, metals and materials, assembling and crane, plastics, building products, security and defense, ICT, and metal transformation.

when a dispute arises. In the present essay, we focus on the jointly made *ex ante* decision to employ an arbitration mechanism; thus the decision is made before disputes arise. As explained by Richman (2004), the main differences between public courts and private ordering mechanisms such as arbitration are that public enforcement *"applies to all disputes, […] employs a common body of contract law, and since it enjoys the backing of state-sponsored coercion, it can require all losing parties to comply with its legal rulings";* private ordering, by contrast, *"requires voluntary cooperation […] and applies a body of specialized law and procedures to actors who voluntarily subject themselves to such rules, and it provides transactional security only because actors are committed to […] complying with private arbitrator's rulings"*.

The arbitration mechanism enjoys numerous sources of efficiency compared to public courts (Bonn, 1972; Dessemontet, 1996; Johnson, McMillan and Woodruff, 2002; Richman, 2004). First, arbitrators are market participants, more expert and specialized than judges in public courts, and are in most cases selected by the parties themselves on the basis of their expertise in the subject matter in dispute. This expertise is particularly critical in IP disputes as these disputes may require extensive knowledge in a particular area of science or technology and the issues involved may arise at the intersection between IP, regulation and competition laws. Arbitration may therefore result in better outcomes. Second, specialized rules are tailored to the idiosyncratic needs and transactional challenges of the firms concerned, and in general to their industry or technological domain. For instance, Richman (2004) explains that the National Grain and Feed Association (NGFA) have developed clear industry contract rules directly addressing problematic issues in grain sales contracts that enable arbitrators to deliver prompt and predictable rulings. As Richman (2004) puts it, *"the NGFA rules create contractual certainty where the applicable law would dictate less predictable results*". Arbitration may facilitate the use of privately developed

trade rules. Third, specialized procedures are used to act more swiftly[8], generally at lower cost[9], and with more nuance than public courts. Arbitrators typically require less background information and struggle with fewer administrative hurdles to deliver rulings (Richman, 2004). Fourth, the arbitral procedure is confidential. Confidentiality[10] is particularly important in IP disputes, certainly where proprietary or commercially sensitive information is involved or where the dispute is related to products or processes still in the development phase. Finally, arbitration also yields specific advantages in the case of global IP disputes - that is, disputes involving litigation proceedings in multiple jurisdictions due to the global exploitation of the IP rights - because it enables the parties to resolve multiple national disputes involving the same IP rights in a single proceeding.

A distinction must be made between 'ad hoc arbitration'[11] and 'institutional arbitration'[12]. As written by Mattli (2001): *"In ad hoc arbitration, the parties are 'on their own '; they are not bound by time limits set by arbitral institutions, and their proceedings are not monitored by any*

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[8] An ordinary arbitral proceeding may take anywhere from 6 to 30 months. Some arbitral procedures are especially quick, so-called 'fast-track' arbitration (Dessemontet; www.unil.ch). As pointed out by Hylton (2004), *"congestion provides an important reason why arbitration agreements may involve cheaper enforcement costs than the court regime. Congestion in ordinary courts makes it less likely that any court will have the time or resources to match the level of accuracy in adjudication that repeat-dealers are likely to desire"*.

[9] However, *"the cost factor is not very different from ordinary courts, at least in those countries where courts have fees proportional to the litigated amount"* (Dessemontet; www.unil.ch). Doubts have been raised as to whether arbitration is really faster and less expensive than litigation.

[10] *"Although the confidentiality of arbitral proceedings does not enjoy uniform treatment even in the leading arbitral jurisdictions, the parties can by contract create far-reaching obligations of confidentiality, including by incorporating institutional arbitral rules which specifically address this issue. The WIPO Arbitration Rules, for example, contain provisions dealing explicitly with the treatment of trade secrets and other confidential information and even provide for the appointment of a confidentiality advisor to determine, in lieu of the tribunal, whether the information is confidential and, if so, what special measures of protection are required with the proceedings to protect it" (www.twobirds.com).*

[11] An arbitration clause without specification of an administering authority.

[12] An arbitration procedure using the rules developed by one of the recognized arbitral international or regional institutions such as the Court of Arbitration of the International Chamber of Commerce (ICC), the London Court of International Arbitration, the Arbitration Institute of the Stockholm Chamber of Commerce, or the World Intellectual Property Organization (WIPO).

central body. The parties can leave the issuance of arbitration procedures to their own rules and design their own arbitral management either in the initial contract or after a dispute has arisen. Alternatively, the parties may simply adopt or adapt the rules of one of the major arbitration centers." In other words, while ad hoc and institutional arbitrations show more procedural flexibility than public ordering, institutional arbitration is characterized by a higher level of centralization - centralization of the procedural safeguards and information collection - than ad hoc arbitration (Mattli, 2001).

Trade-off decision between arbitration and litigation

In order to develop a theoretical framework predicting when firms will jointly decide to include an arbitration provision in their licensing contract, we first need to understand the strengths of the arbitration mechanism but also its drawbacks and constraints. Our approach is consistent with those of Williamson (1985), Yarbourgh and Yarbourgh (1987), Mattli (2001), Drahozal and Hylton (2003) and Drahozal and Wittrock (2008) in that public courts are not generally inefficient but are not very efficacious for certain types of transaction. In other words, we suggest that the nature of the underlying transaction will affect whether or not an arbitration provision is included in the contract. By using as our frame of reference Transaction Cost Economics, we hypothesize that an arbitration provision is more likely to be included in a contract when the transaction governed by the contract imposes a high risk of opportunistic behavior and severe difficulties of writing a complete contract.

The risk of opportunism. The complexity and uncertainty characterizing technology exchanges create a fertile environment for partner opportunism. According to Transaction Cost Economics, the risk of opportunism increases with the level of asset specificity and the level of uncertainty surrounding the transaction. In the presence of a high risk of opportunism, agreeing to include an

arbitration provision in the contract can represent a signal of 'credible commitment' for two main reasons.

The first reason is that agreeing to include an arbitration provision implies binding and enforceable outcomes. By agreeing in advance to be bound by the decision of the arbitrators with very limited possibility of legal appeal, parties credibly commit themselves to fulfill their obligations and to inflict predefined damage on each other in the event of a breach (Williamson, 1983; Richman, 2004).

Second, opting for an arbitration mechanism requires, in most cases, that the partners jointly choose the arbitrator(s)[13], the issues to be arbitrated, the place of arbitration, the procedural rules, the schedule, and the form of award (Dessemontet, 1996). Jointly spending time and collaborating in this often laborious process signal the willingness of both parties to put in the effort to promote continuity and efficient adaptation in the relationship (Galanter, 1981; Williamson, 1983). Moreover, when the contract specifies the set of rules governing the relationship in the cooperative phase, but also the set of rules governing the relationship in the defection phase (i.e., the arbitral procedure), the parties have realistic expectations about the likely outcome of arbitration and the sanctions to be imposed if they engage in opportunistic behaviors (Bernstein, 2001; Richman, 2004).

The difficulty of writing complete contracts. Drafting a contract that 'completely' establishes rights and duties can be seen as a means to address the opportunism issue. However, this option

[13] Drahozal and Wittrock (2008) write: *"The number of arbitrators (either one or three) obviously affects the cost of the process. The parties can hold down the cost of arbitration by specifying a sole arbitrator in the arbitration clause. Conversely, having a dispute resolved by a sole arbitrator may increase the risk of an aberrational award, so if the parties are willing to pay the extra cost of three arbitrators, they may be able to reduce that risk"*.

presupposes that the threat of legal enforcement will keep partners from behaving opportunistically; the great diversity of legal frameworks and IP rights regimes makes this presumption dubious, however[14]. Moreover, drafting complete contracts can be extremely costly and even impossible when the transaction they govern is complex. As many have noted, complexity amplifies the number of possible future situations and makes the consideration of all contingencies in a contract prohibitively costly and thus impossible (e.g., Al-Najjar, 1995). This is mainly due to the bounded rationality, which gives rise to gaps, errors and omissions in the original contract (Simon, 1957; Williamson, 2002). When transactions are complex and contracts incomplete, unanticipated disturbances are likely to arise, leading to demands for renegotiation and refusals of cooperation. In such settings, alternative mechanisms that go beyond purely legal documents may be used to curtail opportunism and encourage cooperative behavior.

Arbitration is one of those alternative mechanisms; namely, a machinery allowing to deal with unanticipated contingencies. Where stipulating in advance appropriate adaptations to each potential but unlikely contingency is impossible, arbitration allows the parties to deal *ex post* with these contingencies as they arise (Williamson, 1985). As written by Mattli (2001): *"[u]nlike judges in public courts, who follow fixed rules of procedure and apply the laws of the land, arbitrators can dispense with legal formalities and may apply whatever procedural rules and substantive law that best fit a case"*. Moreover, Williamson (1991) (citing Fuller, 1963) argues that *"there are open to the arbitrator […] quick methods of education not open to the courts. An arbitrator will frequently interrupt the examination of witnesses with a request that the parties educate him to the point where he can understand the testimony being received. […] The end*

[14] As Dari-Mattiacci (2007) puts it: "*the main reason for the parties' failure to settle is a divergence between their expectations about the outcome of the trial: each of them believes his chances to win are better than his counterpart's. This postulated divergence between the parties' expectations may be explained by the incomplete contracts and incomplete law theories: when the law is incomplete, it might be difficult for parties to predict ex ante in what way the judge will fill the gaps in their contract, especially with respect to unsettled, infrequent, or novel cases*".

result will usually be a clarification that will enable everyone to proceed more intelligently with the case".

If arbitration helps firms overcome the risk of opportunistic behavior and deal with the difficulty of writing complete contracts, then why would firms not include an arbitration provision in their contracts? The main reason is that arbitration induces strong binding situations that firms may prefer to avoid in two situations. First, when the risk of opportunism and the difficulty of writing complete contracts are not significant, the use of arbitration mechanism can be considered as not necessary. Second, when erroneous outcomes could jeopardize the continued existence of the firms, the use of arbitration mechanism can be considered as too risky because of the limited court review of arbitration awards. Indeed, if the loser at arbitration defies the arbitrators' decision and the winner petitions the public court to confirm the arbitration award, the court will almost systematically confirm the award, leaving parties with no recourse if dissatisfied with an arbitrator's ruling[15]. This is consistent with the underlying purpose of arbitration, which is to be a substitute for litigation and not a prelude to litigation (Ware, 1999). Given the great power given to arbitrators, one might understand why firms may prefer to keep their disputes out of arbitration (Ware, 1999) in situations where arbitration is not necessary or too risky. Another reason for avoiding arbitration is, as mentioned before, that including an arbitration mechanism may involve a complex contract drafting (Dari-Mattiaci, 2007). This drafting is a fastidious and costly *ex ante* process that firms may prefer to avoid if not necessary.

[15] *"Only in rare cases does a court vacate an arbitration award because of the arbitrator's legal error"* (Ware, 1999).

HYPOTHESES

We argue that the likelihood that an arbitration provision will be included in a licensing contract will increase when the transaction governed by this contract presents high risk of opportunistic behavior and a complete contract is difficult to write. By contrast, arbitration is less likely when firms' existence could be jeopardized by a possible aberrational arbitration award. Before developing the hypotheses, it is important to keep in mind that designing and implementing an arbitration clause can impose significant costs, which can sometimes overcome the costs resulting from public litigation. In this essay, we assume that partners will jointly decide to include an arbitration provision in their licensing contract when they expect that this inclusion will contribute to the reduction of the total costs of their relationship either through the prevention or the resolution of possible disputes.

Specific investment made by the licensee to implement the transferred technology. Investments (tooling, equipment, plant, personnel, etc.) characterized by high relationship-specificity represent sunk costs because they have little value for the licensee outside the particular licensing agreement (Williamson, 1975, 1985; Klein et al., 1978). The potential for hold-up is therefore magnified for the licensee. In the presence of important specific investment made by the licensee, arbitration is likely to be preferred to public court ordering for two main reasons. The first reason is, as mentioned before, that opting for arbitration is a signal of 'credible commitment'. Agreeing on the design of the arbitral procedure (which often is a laborious process) signals the willingness of both parties to facilitate continuity and adaptation. The second reason relates to the custom-designed rules driving the arbitral procedure. In fact, compared to a court of law, arbitrators take a closer look at the nature of sunk costs and rely on business custom rather than on law (Bonn, 1972). The arbitration awards and sanctions reflect more adequately the business constraints and imperatives.

Hypothesis1: The higher the level of specific investment made by the licensee, the higher the likelihood that licensing partners will agree ex ante to rely on arbitration mechanism instead of public litigation.

Strategic importance of the technology transferred for the licensor. We know that firms prefer to avoid licensing their core technologies to other firms (Caves, Crookel and Killing, 1983) as they fear selling their 'corporate crown jewels' (Williamson and Winter, 1991; Rivette and Kline, 2000). However, this decision to sell core technologies can be in some cases the most beneficial one; especially when the licensor lacks the required assets and capabilities to succeed on the marketplace and is not willing or able to engage in more hierarchical agreements such as an equity joint venture. The cost of losing control over core technologies is, however, high and mechanisms protecting their unauthorized dissipation will, therefore, be valuable. It is likely that arbitration will be avoided when the technology transferred by the licensor is strategically important for him. As pointed out by Drahozal and Wittrock (2008), when an aberrational arbitration award can have a devastating effect on a firm and jeopardize its continued existence, it will prefer litigation over arbitration. Drahozal and Wittrock write: "*just as a trial court's decision may be erroneous, so might an arbitrator's award be. But it is far more likely that a trial court's erroneous ruling will be overturned on appeal than an arbitrator's erroneous ruling will be vacated by a court"*. Hence, arbitration may be perceived as too risky for vital corporate interests or "bet-the-company" cases because of the limited court review of arbitration awards.

Hypothesis2: The higher the strategic importance of the technology licensed for the licensor, the lower the likelihood that licensing partners will agree ex ante to rely on arbitration mechanism instead of public litigation.

Institutional environment quality. Legal systems and IP rights regimes are key dimensions to consider when entering technology agreements and, in particular, international technology agreements. Today more than 90 percent of all international trade contracts contain an arbitration clause (Casella, 1996; Volckart and Mangles, 1999; Leeson, 2006). The arbitration mechanism occupies a privileged position in international disputes[16] (Casella, 1992) mainly because it helps to overcome the imperfections of the institutions supporting public contract law such as corruption or slow, disorganized or overburdened courts, and overly complex or ambiguous contract rules (Hadfield, 2001). When public institutions are not available or unable to provide contractual assurance, private ordering like arbitration will be preferred (McMillan and Woodruff, 2000; Leeson, 2006). As pointed out by O'Connor and Woods (2007), *"arbitration mechanism can ensure that relevant disputes will be heard by neutral and experienced decision-makers, under internationally recognized procedural rules"*.

> *Hypothesis3: The lower the quality of the institutional environment in the licensee's country, the higher the likelihood that licensing partners will agree ex ante to rely on arbitration mechanism instead of public litigation.*

Joint efforts in the implementation of the technology. Licensing may go beyond just permission to use the technology covered by a patent. In some cases, licensing partners commit themselves to jointly implement or commercialize this technology. When joint efforts are expected, it is difficult to write full, unambiguous and easily enforceable contract. This incompleteness is mainly due to the difficulty to fully specify *ex ante* the required inputs, expected outputs and division of IP rights when parties plan to jointly undertake activities like

[16] The most notable arbitration organizations existing for resolving international trade disputes are the International Chamber of Commerce (ICC), the London Court of International Arbitration (LCIA), the Arbitraton Association of the Stockholm Chamber of Commerce, and the American Arbitration Association's International Center for Dispute Resolution (ICDR).

technology development and commercialization (Ryall and Sampson, 2008). Given the subsequent incompleteness of the contract, the contractual framework must remain highly adjustable (Llewellyn, 1931; Williamson, 1985; Oxley, 1997) and litigation becomes less efficient (Masten and Crocker, 1985; Crocker and Reynolds, 1993; Drahozal and Hylton, 2003; Ryall and Sampson, 2008). Indeed, compared to arbitration, public courts will encounter greater difficulty of inferring the intentions of the respective parties and may thus produce sub-optimal remedies (Ryall and Sampson, 2008). In this vein, Hagedoorn and Hesen (2007) write *"courts might pay less attention to the context of the relationships and will often take the written terms of the contract as an approximation of parties' intention*". As a result, when parties have to leave contract provisions vague due to the difficulty of specifying the level of joint effort required, there is a higher probability that public courts will misinterpret the contract; hence, arbitration mechanism is more likely to be chosen. Another advantage of arbitration when joint activities create uncertain and technically complex situations is that parties may be able to educate arbitrators in a way that may not be feasible for judges in a court of law (Williamson, 1991).

Hypothesis4: The higher the intensity of joint activities between the licensor and the licensee, the higher the likelihood that licensing partners will agree ex ante to rely on arbitration mechanism instead of public litigation.

Equity-licensing agreements. By equity-licensing agreement, we refer either to a licensing agreement with one firm owning a stake (majority, minority or cross equity) in the partner, or a licensing agreement embedded in a new entity created by partner firms and whose ownership is shared among them (i.e., joint venture). Partner firms may opt for equity-based agreements because this governance structure enables them to monitor and control the activities and behaviors of the other party more easily; hence, it provides safeguards against opportunistic appropriability and under-investment (Williamson, 1983; Pisano, 1989). We argue that arbitration

mechanisms will be more frequent in equity-licensing agreements than in non-equity licensing agreements for two main reasons. First, when equity is involved, partners become more bilaterally dependent and their incentives have to be aligned. Mechanisms facilitating continuity and promoting efficient adaptation will therefore be favored (Eisenberg, 2000; Speidel, 2000; Scott, 2003). Arbitration is one of these mechanisms as arbitrators are better equipped than public judges to render nuanced solutions required for effective adaptation. Second, when equity is involved, partners expect that their collaboration will last longer than in pure market contracts. This long-term aspect means that flexibility is necessary due to the unforeseen contingencies and that writing complete contracts is almost impossible. Vague terms such as 'best efforts' and 'reasonableness' will more frequently be incorporated in these contracts (Hagedoorn and Hesen, 2007). As mentioned before, arbitration is an appropriate mechanism when flexibility is needed as it enables partners to write more elastic contracts and to more easily deal *ex post* with unexpected contingencies.

Hypothesis5: When licensing partners are linked through equity relationship, the likelihood that they will agree ex ante to rely on arbitration mechanism instead of public litigation is increased.

RESEARCH DESIGN

The context for this study involves the decisions made by Belgian firms and their licensing partners to include an arbitration provision in their licensing contracts. An initial list of 1.946 firms composing the Belgian technology industry was obtained from AGORIA[17], the Belgian technology trade association. In line with AGORIA, we consider the following sectors as forming the technology industry: aerospace, industrial automation, automobile, contracting and

[17] Website: www.agoria.be

maintenance, electronics, mechanical and mechatronical engineering, metals and materials, assembling and crane, plastics, building products, security and defense, ICT, and metal fabrication.

The questionnaire design, implementation, and the conduct of the survey followed the Total Design Method (TDM) developed by Dillman (2007). Our online survey package included a prenotice letter written, signed and sent by AGORIA and customized cover letters. Follow-up messages were made by electronic mail and phone with between two and five contacts per firm. Distinct stages of pre-testing were conducted: on-site interviews with managers in technological firms, lawyers in IP rights, business consultants in IP, representatives of AGORIA and of the Brussels Enterprises Commerce and Industry association; evaluations by academic colleagues; and reviews by industry associations' executives.

A key informant respondent approach was used for the survey. The technical and specialized nature of licensing decisions required sending our questionnaire to top executives[18] whose understanding and field of action related to the overall firm. These executives were, moreover, the best qualified to redirect the questionnaire, if necessary, to other individuals in the organization who may have been more competent on the subject (Aulakh, Kotabe and Sahay, 1996).

The first part of the questionnaire prompted the respondents to complete questions on the global licensing strategy adopted by their firm. In a second part, respondents were invited to select and describe a current, or past but recent, technology licensing agreement in which the firm had participated (see dissertation appendix). In addition to data acquired through the questionnaires,

[18] Chief Executive Officer, Chief Financial Officer, Manager R&D department, Manager IP department, and Head of the legal department.

secondary data, mainly related to the characteristics of the respondents' firm (such as industry and size), were collected from the ORBIS-AMADEUS database.

After eliminating surveys with incomplete information, the sample consists of 289 responses (15% response rate). Because numerous firms having completed our questionnaire have not negotiated licensing agreements; we end with 118 usable questionnaires completed by 103 firms for the purpose of this paper. Indeed, we did not know in advance which firms in the list received from AGORIA had negotiated licensing agreements or not. In case the respondent answered that his firm had not negotiated licensing agreements, which is the case for 156 firms in our sample, we asked him to identify the main reasons for this absence of licensing agreements[19]. We cannot use these latter 156 questionnaires for this study that focuses on licensing transactions.

Since the sample is based upon AGORIA's listings that represent the overall firm populations, sample selection bias is unlikely (Tomaskovic-Devey, Leiter, and Thompson, 1994). Firms composing our sample are of various sizes[20]: 100 employees or less in 56 firms, between 100 and 500 employees in 21 firms, and more than 500 employees in 18 firms. They can be regrouped into 5 distinct sectors[21] on the basis of their NACE code: new materials (12 firms); mechatronic

[19] We developed and proposed a list of possible reasons: no intellectual assets can be licensed by your firm to a licensee; your firm is not familiar with licensing practices and prefers other modes of technology transfer; intellectual assets could be licensed but potential licensees were not identified; your firm does not need external technology; etc.

[20] There are 8 firms with a missing value for this variable.

[21] We first identified the NACE rev1.1 codes for each firm. Then, we grouped the firms on the basis of the first two digits of the NACE rev1.1. Six categories were computed by using the NACE code and referring to the classification proposed by AGORIA, the Belgian Technology Trade Association. For 'new materials': 24. manufacture of chemicals and chemical products, 27. manufacture of basic metals, and 28. manufacture of fabricated metal products, except machinery and equipment. For 'mechatronic and electronic': 29. manufacture of machinery and equipment n.c., 31. manufacture of electrical machinery and apparatus n.e.c., and 33. manufacture of medical, precision and optical instruments, watches and clocks. For 'ICT': 32. manufacture of radio, television, and communication equipment and apparatus, 64. post and telecommunications, and 72. computer and related activities. For 'automobile': 34. manufacture of motor vehicles, trailers and semi-trailers, and 35. manufacture of other transport equipment. For 'construction':

and electronic (29 firms); ICT (17 firms); automobile (3 firms); and construction (4 firms). Their experience in licensing is also diverse: 16 have negotiated out-licensing agreements exclusively, 48 have negotiated in-licensing agreements exclusively, and 39 have negotiated out- and in-licensing agreements. Moreover, 33 out of these 103 firms have a licensing or IP department.

Variable operationalization

The dependent variable, ***arbitration***, is equal to 1 if independent arbitrators were contractually nominated and/or if both parties contractually agreed to settle their conflict before a private entity (Chamber of Commerce, Industry Union, or Chamber of Arbitration); and to 0 otherwise.

Specific investment made by the licensee. We used five survey questions to measure the level of specificity characterizing the investment made by the licensee (Robertson and Gatignon, 1998; Artz and Brush, 2000; Reuer and Arino, 2007): (i) the licensee's investment in tooling, equipment and/or plant dedicated to this licensing agreement is […]; (ii) the licensee's commitments of time and money involved in this licensing agreement are […]; (iii) the licensee's investment in dedicated personnel specific to this licensing agreement is […]; (iv) if the licensing agreement were to terminate before its contractual end: the licensee's non-recoverable investment in equipment, people, etc. would be […]; and (v) if the licensing agreement were to terminate before its contractual end: the difficulty the licensee would have in redeploying its people and facilities presently serving the licensing agreement to other uses would be: […]. A 5-point Likert scale was used from 1, 'Negligible' to 5, 'Substantial'. (The Cronbach's alpha is 0.8352).

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40. electricity, gas, steam, and hot water supply, and 45. construction. For 'contracting': 50. Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel; 51. wholesale trade and commission trade, except of motor vehicles and motorcycles, and 74. other business activities.

Strategic importance of technology transferred for the licensor. In order to measure the level of strategic importance for the licensor, we first used two questionnaire items adapted from previous research (Simonin, 1999) that reflect the level of specialized equipment, facilities and human resources used by the licensor to develop the technology licensed: (i) to develop this technology, the licensor had to invest significantly in specialized equipment and facilities and (ii) to develop this technology, the licensor had to invest significantly in skilled human resources. Responses were recorded on a 5-point Likert scale ranging from 1, 'Strongly disagree' to 5, 'Strongly agree'. The Cronbach's alpha is 0.6657 for this scale. Then, we multiplied this scale by the regime of exclusivity characterizing the licensing agreement on the grounds that, for a given level of specialized investment made by the licensor to develop his technology, potential infringement by the licensee would be more harmful to the licensor's strategic positioning if there is one licensee than if there are numerous licensees. The regime of exclusivity ranges from 1 to 3: 1 if the license is a 'non exclusive license', 2 if it is a 'co-exclusive license' (with exclusivity granted to a small number of firms), and 3 if it is an 'exclusive license'.

Institutional environment quality. In line with previous research investigating the entry mode choices in a foreign country, we consider here the quality of the institutional environment in the country of the technology recipient (i.e., the licensee's country) (e.g., Anderson and Gatignon, 1986; Hennart, 1991; Agarwal and Ramaswamy, 1992; Aulakh, Jiang, and Pan, 2009). We use the Index of Patent Rights developed by Park (2008). This index is based on five dimensions of patent protection: (1) coverage (the subject matter that can be patented); (2) duration (the length of protection); (3) enforcement (the mechanisms for enforcing patent rights); (4) membership in international patent treaties; and (5) restrictions or limitations on the use of patent rights. Index values are proposed in 110 countries for the periods 1960 to 1975, 1975 to 1990, in 1995 and

2000, and in 122 countries in 2005. In this paper, we use the values in 2005 if the licensing contract has been signed in or after 2005, and values in 2000 otherwise[22].

Joint efforts in the implementation of the technology. This variable is computed on the basis of three dummy variables. *Joint efforts* is equal to 1 if, in addition to the right to use his patent, the licensor (1) provides the licensee with technical assistance and consultancy services, (2) trains the licensee's personnel and/or (3) sends personnel delegation to the licensee; and to 0 otherwise.

Equity-licensing agreement. For the purposes of this essay, equity-licensing agreement refers to either a licensing agreement with one firm owning a stake (majority, minority or cross-equity) in the other partner, or a licensing agreement embedded in a new entity created by the licensing partners and whose ownership is shared among them (i.e., joint venture). Therefore, the variable *equity-licensing agreement* is a dummy variable, which is equal to 1 if the licensing partners are linked through equity holding; and 0 otherwise.

Controls

Four control variables are included in the equation. First, the variable *out-licensing agreement* is equal to 1 if the questionnaire was completed by a licensor (i.e., describing an out-licensing agreement) and to 0 if the questionnaire was completed by a licensee (i.e., describing an in-licensing agreement). In practice, some firms have exclusively negotiated one type of licensing agreement (in- vs. out-licensing agreement), while others have negotiated both types. If the respondent's firm was exclusively a licensor or has negotiated more out-licensing than in-licensing agreements, we asked the respondent to describe one of its out-licensing agreements.

[22] In our sample, 15 licensing agreements were negotiated between 2006 and 2007, 25 between 2005 and 2006, 40 between 2002 and 2004, 21 between 1997 and 2001, and 17 before 1996.

Similarly, if the respondent's firm was exclusively a licensee or has negotiated more in-licensing than out-licensing agreements, we asked to describe one of its in-licensing agreements. Finally, in case the respondent's firm has negotiated as many out-licensing agreements as in-licensing agreements, we asked to select and describe one of them (in- or out-licensing agreement). We include the variable *out-licensing agreement* because it is important to control for a possible systematic difference between the way licensors and licensees answer similar questions; for instance, questions related to the 'licensee's commitments of time and money involved in the licensing agreement' or to the 'level of tacitness of knowledge transferred'. Inclusion of a variable indicating the type of respondent controls for differences in the way licensors and licensees perceive the transaction and complete the questionnaire. Additionally, we have conducted "difference of means" tests on seven questions recorded on a Likert scale that refer to licensor's and licensee's investment (Table A1 in appendix). We have limited the test to these seven questions as they are the most likely to allow some degree of subjectivity. These tests show no evidence of systematic differences between the questionnaires completed by licensors (43) and questionnaires completed by licensees (74). Second, previous research has shown that prior relationships between partners operate to mitigate moral hazard and opportunism thanks to mutual trust, respect and norms of cooperation (Granovetter, 1985; Heide and John, 1992; Gulati, 1995; Gulati and Singh, 1998; Dyer and Chu, 2003). It is commonly believed that partners with a prior history of cooperation are more willing and able to resolve disputes and to adapt to unanticipated changes. They rely more on social norms and self-enforcing dealings (Galanter, 1981; Ryall and Sampson, 2008). As a result, in the absence of prior relationships, the risk of opportunism is higher and it is more likely that partners will choose to include an arbitration provision in their contract to curtail opportunism. This variable is equal to 1 if there had been prior agreement(s) with this specific partner (we asked whether the firm concluded any other licensing agreements or other forms of collaborative agreements with this specific partner prior to the described licensing agreement), and to 0 otherwise. Besides the options 'yes' or 'no', a third

option was offered for this question: 'I don't know'. Given that we lose an important number of observations when dropping answers where this third option (I don't know) has been selected (19 observations), we create another variable *prior relationship total*, which is similar to *prior relationship* except that it takes the value 0 if the respondent answered 'I don't know'. We associate this third option with 'no' because even if the partners negotiated prior agreements, the respondent does not remember it and this shows that he does not consider it as impacting the described licensing agreement. Third, the variable *size ratio* corresponds to the ratio between the sizes of the two licensing partners. To build this variable, the firms' size is first distributed according to employment in 5 categories: 1 less than or equal to 100 employees, 2 between 100 and 250 employees (250 included), 3 between 250 and 500 employees (500 included), 4 between 500 and 1.000 employees (1000 included) and 5 more than 1.000 employees. Then, we divide the size of the licensor by the size of the licensee. Including *size ratio* in the equation is consistent with previous research on licensing that indicates that when licensing partners are of different size, larger firms dominate the agreement due to bargaining asymmetries (Caves et al., 1983; Bessy and Brousseau, 1998; Hagedoorn, Lorenz-Orlean and van Kranenburg, 2008). Given that our hypotheses affect differently the licensor's and licensee's desire to include an arbitration provision in the contract, it is important to control for the possible bargaining power that a partner could gain from its size. Finally, we check whether differences in national commercial legal traditions between the partners' countries impact the decision to rely on arbitration mechanism. There are five national commercial legal traditions: common law, French civil law, German civil law, Scandinavian law, and socialist law (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1999). Given that in our sample the respondent firm is always Belgian, we compute the variable *French law*, which is equal to 1 if the country of the licensing partner has a French law tradition as well; and to 0 otherwise. One might indeed think that when partners do not have the same commercial legal tradition, they will favor arbitration as a way of avoiding the uncertainty of little known foreign laws (Casella, 1996).

RESULTS

In our sample of 118 licensing agreements, 32 agreements (27%) include an arbitration provision. In this section, we test our theoretical framework addressing the trade-off between arbitration and litigation for licensing activities and, in particular, the decision to include an arbitration provision in the licensing contract.

Estimation results

Table 1 reports the number of observations, mean, and standard deviation for the measures used in our empirical analysis. Table 2 reports the correlation matrix.

	Nbr of obs	Mean	Std	Min	Max
1. Arbitration	118	.271	.446	0	1
2. Strategic importance for the licensor	117	6.859	4.82	1.5	20
3. Specific investment of the licensee	117	3.13	.916	1	5
4. Index of patent rights	114	4.517	.498	2.2	4.88
5. Joint efforts	118	.636	.483	0	1
6. Out-licensing agreement	118	.364	.483	0	1
7. Prior relationship total	118	.161	.369	0	1
8. Size ratio	108	1.573	1.506	.2	5
9. French law	109	.266	.444	0	1
10. Equity-licensing agreement	117	.162	.37	0	1

Table1
Descriptive statistics

	1	2	3	4	5	6	7	8	9	10
1. Arbitration	1.00									
2. Strategic importance for the licensor	-.159*	1.00								
3. Specific investment of the licensee	.169*	.233**	1.00							
4. Index of patent rights	-.029	.067	-.029	1.00						
5. Joint efforts	.264***	.126	.217**	-.188**	1.00					
6. Out-licensing agreement	.093	.028	-.015	-.426***	-.049	1.00				
7. Prior relationship total	-.215**	-.084	-.022	-.155	-.099	.195**	1.00			
8. Size ratio	-.079	.018	.205	.104	.143	-.365***	-.087	1.00		
9. French law	-.011	-.008	-.056	.158*	-.157	.119	.102	-.073	1.00	
10. Equity-licensing agreement	-.166*	.164*	.073	.11	-.009	.097	.057	.015	.197**	1.00

p*<0.1, p**<0.05, p***<0.01

Table2
Correlation matrix

The maximum variance inflation factor (VIF) in the model is 1.37, which is below the rule-of-thumb cutoff value of 10 (Neter, Wasserman and Kutner, 1985). Correlations between the independent variables reported in Table 2 are less than 0.50 and all the VIFs are equal or less than 1.37. Multicollinearity should not impact the stability of the results.

The central purpose of this essay is to examine the decision jointly made by licensing partners to include an arbitration provision in their licensing contract. Our unit of analysis is the licensing agreement. The size of most samples used in the regressions is somewhat smaller than 118 due to missing values. As some respondents described more than one licensing agreement, we must adjust the standard errors in order to consider the possible inter-dependence between licensing agreements negotiated by a same firm (White, 1980). We report in the tables the marginal effects;

i.e., how much a change in a variable changes the probability of the focal outcome. Showing the marginal effects conveys an impression of the order of magnitude of the different effects.

We now turn to the evaluation of our hypotheses. Regression results are reported in Table 3 and Table 4. Table 3 presents three probit regression models, where the dependent variable is the dummy variable *arbitration.* In **model 1**, the variable *arbitration* is regressed on our four control variables. We can see that, as expected, the relationship between *prior relationship total* and the likelihood of an inclusion of an arbitration provision is negative and statistically significant. Stated another way, this result suggests that the presence of prior relationship between the licensing partners tends to reduce their propensity to include an arbitration mechanism in their contract. As an indication of the magnitude of this effect, we note that the existence of prior relationships between licensing partners causes a decrease of 28.5% in the probability of including an arbitration provision in their contract. The other control variables do not impact the partners' propensity to rely on arbitration mechanisms. In **model 2**, we test our first three hypotheses relative to the impact of the risk of opportunism. Hypotheses 1 and 2 are confirmed as the relationship between *specific investment of the licensee* and *arbitration* is positive and significant, and the relationship between *strategic importance for the licensor* and *arbitration* is negative and significant. The results suggest that, at the licensee's level, the fear of hostage situation resulting from specific investment increases the propensity to use arbitration, and, at the licensor's level, arbitration is less likely to be chosen when the technology transferred is so strategically important for the licensor that an aberrational arbitral award could jeopardize his firm's existence. Our third hypothesis relative to the institutional environment quality is not confirmed. In **model 3**, we test our hypothesis 4 addressing the influence of the difficulties of writing a complete contract, *joint efforts*. There is a significant and positive relationship between *joint efforts* and the inclusion of an arbitration provision. Results confirm our fourth hypothesis according to which firms prefer arbitration to litigation when the expectation of joint efforts in

implementing or commercializing the technology makes the contract unavoidably incomplete and requires mechanisms enabling them to deal *ex post* with unanticipated contingencies. Regarding the magnitude of these effects, we can see that the variable *joint efforts* has the greatest effect on *arbitration* as an increase to one standard deviation above its mean is associated with an increase of 24.5% in the probability of using arbitration compared to 3.3% (decrease) and 13.7% (increase) for *strategic importance for the licensor* and *specific investment of the licensee* respectively.

		Model1	Model2	Model3
Risk of opportunism	*Strategic importance for the licensor*		-.027*	-.033**
			(.016)	(.016)
	Specific investment of the licensee		.159***	.137**
			(.06)	(.057)
	Index of patent rights		-.103	-.034
			(.126)	(.123)
Difficulty of writing complete contract	*Joint efforts*			.245***
				(.08)
Control	*Out-licensing agreement*	.172	.125	.131
		(.123)	(.134)	(.125)
	Prior relationship total	-.285**	-.283**	-.273**
		(.085)	(.076)	(.071)
	Size ratio	-.017	-.283	-.052
		(.038)	(.076)	(.037)
	French law	-.024	-.044	.039
		(.08)	(.038)	(.097)
	Pseudo R2	.0758	.17	.2261
	Prob>chi2	.0853	.0032	.0002
	Nbr observations	102	102	102

p*<0.1, p**<0.05, p***<0.01 – marginal effects are reported - standard errors in brackets

Table 3
Arbitration in the licensing contract - Probit regression model

In order to test our hypothesis 5 concerning the impact of an equity relationship between the licensing partners on the inclusion of an arbitration provision in their licensing contract, we first have to address the fact that this variable, *equity-licensing agreement,* may be endogenous as it is likely to be jointly determined along with the dispute resolution mechanism. This variable is a choice variable and some of the determinants of this choice may likewise affect the dependent variable *arbitration.* To endogenize *equity-licensing agreement*, we first need to find additional

variables influencing the willingness of the parties to be linked through equity holdings. These variables will be used as instruments for *equity-licensing agreement* in the *arbitration* equation. There are two main requirements for using instrumental variables: (1) the instruments must be correlated with the endogenous explanatory variable, condition on the other covariates, (2) the instruments cannot be correlated with the error term in the explanatory equation.

The first variable is *same sector*, which is equal to 1 if the partners belong to the same sector, and to 0 otherwise. Firms engaging in cross-sector agreements are likely to face unfamiliar technology but also different product markets and customers. Transferring knowledge from a sector to another and implementing this knowledge for new products and customers can easily become a long, complicated and hazardous enterprise. Therefore, cross-sector licensing agreements are more likely to require governance mechanisms provided by equity-based structures to successfully transfer and implement knowledge. The second variable is *enforcement of licensee's performance* that reflects the difficulty with which the licensor can impose a level of performance to the licensee. The variable is recorded on a 5-point Likert scale according to the level of difficulty. We expect that the higher the level of licensor's difficulty to impose performance standards, the higher the probability to have equity-based governance. Equity holdings enable partners to monitor and control the activities and behaviors of the other party more easily; hence opportunistic appropriability and under-investment are less likely.

With respect to the first requirement; table 4 shows, in the first stage, the results of the OLS regression with *equity-licensing agreement* as dependent variable. As expected, the influence of *same sector* on the likelihood of equity holdings is significant and negative, while the influence of *enforcement of licensee's performance* is significant and positive. The strength of the instruments can be directly assessed. A common rule of thumb for models with one endogenous regressor is that the F-statistic against the null that the excluded instruments are irrelevant in the first-stage

regression should be larger than 10 (Stock,Wright and Yogo, 2002). We obtain an F-statistic (joint significant test) of 6.21, which is below the usual cut-off of 10. While our two instruments have significant effects, we should therefore remain cautious as they still may be weak due to the low value of the F-statistic. With respect to the second requirement; we have checked whether these two variables have a significant effect on *resort to third parties*. Results show no significant effect meaning that our instruments are valid. In the second stage, we find the results of the IVPROBIT regression estimation. Our hypothesis 5 relative to *equity-licensing agreement* is confirmed as the instrumented variable has a significant and positive influence on *arbitration*.

		Equity-licensing Agreement	Arbitration
		OLS	**IVPROBIT**
Equity			1.69*
			(.929)
Risk of opportunism	*Strategic importance for the*	.016*	-.096**
	licensor	(.009)	(.04)
	Specific investment of the	.03	.333*
	licensee	(.036)	(.189)
	Index of patent rights	.089	-.415
		(.102)	(.345)
Difficulty of writing complete contract	*Joint efforts*	.012	.732**
		(.069)	(.342)
Instruments	*Same sector*	-.201***	
		(.072)	
	Enforcement of licensee's	.062**	
	performance	(.028)	
Controls	*Out-licensing agreement*	.128*	.062
		(.076)	(.418)
	Prior relationship total	.065	-1.345**
		(.086)	(.589)
	Size ratio	.016	-.144
		(.023)	(.104)
	French law	.123*	-.164
		(.072)	(.306)
	Wald chi2		53.65
	R-squared	.2488	
	Prob>chi2		.000
	Prob> F	.0042	
	Nbr observations	97	97

p*<0.1, p**<0.05, p***<0.01 - standard errors in brackets

Table 4
Equity-licensing agreement endogeneity – Ivprobit regression model

DISCUSSION

As mentioned before, licensing agreements do not form a homogeneous set of contracts; instead, there exists a wide variety of licensing agreements governing an as wide variety of transactions. For the purposes of this essay, we have focused on four dimensions along which licensing transactions differ: the level of investment made by the licensee, the strategic importance of the technology transferred for the licensor, the uncertainty surrounding the transaction, and the extent of joint efforts devoted to the technology implementation and commercialization. Previous research, in particular rooted in Transaction Cost Economics, has stated that these characteristics impact the risk of opportunistic behavior and the difficulty of writing complete contracts. Our intent in this essay has been to study the decision made by licensing partners to use either litigation or arbitration and to determine the extent to which this decision is influenced by the risk of opportunism and the difficulty of writing complete contract.

At first, one might think that arbitration is always the best option as it enjoys numerous sources of efficiency compared to public courts: the expertise of the arbitrators, the rules tailored to the idiosyncratic needs, the more swiftly and often less costly procedures, and the confidentiality. Those aspects are highly valued by firms, especially when they engage in partnerships aimed at developing and commercializing technology and IP. Including an arbitration provision in licensing contracts can help partner firms prevent or resolve IP disputes caused by a breach of contract, infringement, misuse of confidential information and trade secrets, or industrial espionage. However, arbitration is not always preferred to litigation. It is, therefore, important to understand the advantages offered by arbitration but also its drawbacks. Our approach has been that arbitration is not generally efficient or inefficient, but it can be very efficacious for certain types of transaction. This approach is consistent with Transaction Cost Economics framework

and has been previously adopted by scholars who have investigated the use of arbitration in inter-firm agreements.

Our results show that, as hypothesized, the licensee's fear of hostage situation resulting from specific investment increases the propensity to use arbitration. Agreeing to include an arbitration provision in the contract signals a credible commitment as partners commit themselves to fulfill their obligations and to inflict predefined damage in the event of opportunistic behavior (Williamson, 1983; Richman, 2004). Description of the required specific investment can be explicit in the contract and the licensor can have realistic expectations about the likely outcome of arbitration and the sanctions imposed in case of opportunistic behavior (Bernstein, 2001; Richman, 2004). At the licensor's level, the results confirm our hypothesis 2 in a sense that situations where the existence of the firm can be jeopardized by a possible aberrational award reduce the propensity to use arbitration (Drahozal and Wittrock, 2008). This is mainly due to the limited court review of arbitration awards. In that case, litigation will be preferred to arbitration. Results also confirm our hypothesis 4 relative to the difficulty of writing complete contracts. Indeed, firms prefer arbitration to litigation for contracts governing complex transactions that can lead to an important number of possible future and unanticipated disturbances. This confirms Williamson (1991)'s argument according to which arbitration is a mechanism enabling to more easily deal *ex post* with unanticipated contingencies. Finally, an arbitration clause is more likely to appear in licensing contracts when partner firms are linked through equity holdings. In line with what we expected, these holdings increase the propensity to use arbitration as they imply that continuity and efficient adaptation must be facilitated and that flexibility is necessary due to unforeseen contingencies. Indeed, arbitrators are better equipped to render nuanced solutions required for effective adaptation and enable to more easily deal *ex post* with unforeseen contingencies.

We do not find confirmation, however, that the institutional environment quality in the licensee's country impacts this trade-off decision between arbitration and litigation. We expected that a low quality of institutional environment in the licensee's country would increase the propensity to use arbitration; our underlying argument being that arbitration mechanisms can ensure that relevant disputes will be heard by neutral and experienced decision-makers. This non-supportive result can partly be explained by a certain homogeneity characterizing the institutional environments in our sample. Out of our 118 licensing transactions, the licensee is Belgian for 80 transactions, European and non Belgian for 13 transactions, and North American for 5 transactions. More heterogeneity would be needed to provide more precise insights about the relationship between arbitration and the quality of institutional environment in the licensee's country.

CONCLUSION

One of the main purposes of this essay but also its main contribution has been to fill gaps in the litigation and contracts literature by examining the motives for adopting arbitration in licensing agreements. It has become highly important to study mechanisms like arbitration that enable firms to deal with the rising uncertainty caused by the internationalization of their business activities and the pace of technological development. Empirical research on arbitration mechanisms is extremely narrow in the strategic management and business economics literature. Another contribution of this essay is that our approach allows us to go beyond the discrete form analysis that has been the main tendency in previous research (e.g., Gulati, 1995; Oxley, 1997; Sampson, 2004). Indeed, we put emphasize on the great diversity among licensing agreements, which evolve along the 'transactional - relational contract' continuum. Finally, we also contribute to the relatively underdeveloped empirical research on licensing (Fosfuri, 2006; Zuniga and Guellec, 2009).

We argue that arbitration provisions are adopted as a means to facilitate adaption to unanticipated disturbances and to signal a 'credible commitment'. To test our theoretical framework, we have used a database on licensing transactions collected via an online questionnaire sent in the Belgian technology industry with the support from AGORIA (the Belgian technology trade association).

Our study has some limitations that suggest a number of directions for future research. First, our dependent variable is rather general in a sense that we do not distinguish ad hoc arbitration and institutional arbitration (Mattli, 2001). Moreover, our database does not enable us to assess the degree of detail characterizing the arbitration provision. Future research should investigate those aspects and differences more sharply. Second, the presence of an arbitration provision is not determinative of the effective dispute resolution mode. As pointed out by Mattli (2001), *"even if partners have contractually agreed to opt for arbitration, they may switch to another mechanism if they feel that the latter is more appropriate for a given dispute"*. It would therefore be interesting to conduct a research where information on both *ex ante* and *ex post* decisions to rely on arbitration is available. Third, our database does not allow us to test whether the presence of an arbitration clause effectively affects the parties' incentives to respect their contractual commitments and, thereby, the likelihood of future disputes. However, as Masten (1993 and 2002) has pointed out, the relationship between the transaction attributes and the governance structure reveals little about the implications of the organization structure for firm performance. In light of this, we should pursue our analysis one step further and study the effect of arbitration under various combinations of transaction attributes on the performance of the agreement. Finally, our sample is rather homogeneous regarding the institutional environment quality in the licensees' country. Given this homogeneity, it is difficult to properly assess how institutional characteristics like the Index of Patent Rights impact the decision to use third-party services.

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Appendix

	Out-licensing agreement		In-licensing agreement		*t*-Test Statistics
	Nbr of obs	Mean	Nbr of obs	Mean	
to develop this technology, the licensor had to invest significantly in specialized equipment and facilities	43	3.419 (.189)	74	3.392 (.144)	-.1126
to develop this technology, the licensor had to invest significantly in skilled human resources	43	3.884 (.167)	74	3.77 (.119)	-.5619
the licensee's investment in tooling, equipment and/or plant dedicated to this licensing agreement is	43	3.302 (.118)	74	3.122 (.155)	-.739
the licensee's commitments of time and money involved in this licensing agreement are	43	3.395 (.134)	74	3.378 (.139)	-.081
the licensee's investment in dedicated personnel specific to this licensing agreement is	43	3.372 (.16)	74	3.311 (.133)	-.2877
if the licensing agreement were to terminate before its contractual end : the difficulty the licensee would have in redeploying its people and facilities presently serving the licensing agreement to other uses would be	43	2.628 (.166)	74	2.824 (.151)	.8357
if the licensing agreement were to terminate before its contractual end : the licensee's non-recoverable investment in equipment, people, etc. would be	43	2.86 (.165)	74	3.067 (.144)	.9105

p*<0.1, p**<0.05, p***<0.01 - standard errors in brackets

Table A1
"Difference of means" tests: out-licensing agreements vs. in-licensing agreements

Conclusion

Numerous studies have attested that, within the current context of increasing pace of technological development, rising risks and costs imposed by R&D projects, and shortening product life cycles, it has become an imperative for firms in technology industries to collaborate and engage in partnerships going from licensing to research joint venture (e.g., Nohria and Garcia-Pont, 1991; Robertson and Gatignon, 1998; Dyer and Singh, 1998; Baum, Calabrese and Silverman, 2000; Stuart, 2000). Although managers recognize that being able to initiate, negotiate, and manage technology partnerships has become essential for their firm's success and growth, it does not mean that they consider that easy. Managers often struggle to find a right partner, to negotiate contracts, to monitor relationships, and to enforce contractual commitments. This dissertation has shown that many scholars have analyzed the various difficulties managers can encounter when engaging in technology partnerships, and have studied ways to deal with them.

Surprisingly, little research in the strategic management and business economics literature has been devoted to the possible assistance provided by third parties in technology agreements. However, managers frequently decide to use services offered by third parties to ease and secure their technology agreements. Key third parties can assist firms in identifying a partner, negotiating contracts, monitoring relationships and/or enforcing contractual commitments in technology industries: technology or knowledge brokers, knowledge-intensive business services firms (KIBS firms), patent attorneys, auditing firms, arbitrators, trade associations, regional development agencies, and collective research centers. Given the increasing levels of collaboration and outsourcing in technology industries and the heterogeneity between organizations involved (small firms, large firms, universities, or federal labs), these third parties have progressively emerged and developed skills that are highly valuable for firms wishing to engage in technology agreements. Research that ignores their existence and especially the assistance they provide can be misleading and does not enable to draw a complete

picture of the factors impacting the decisions made by managers regarding their technology agreements.

Given the dearth of theoretical and empirical research devoted to the study of third parties in technology industries, the principal aim of this dissertation has been to investigate the decisions made by firms to use third-party services at one or another contractual stage of their technology agreements through three essays: one theoretical essay and two empirical essays. We have used as our frame of reference Transaction Cost Economics and Social Network Theory. Both streams of research provide specific pieces of the puzzle as we argue that relying on third parties will be variously beneficial depending on (1) the characteristics of the transaction and (2) the firm's social embeddedness. In light of this, essay 1 is a theoretical essay that positions the third parties in the Social Network framework. Essay 2 and essay 3 are empirical essays focusing on the use of third-party services in a specific form of technology agreement: the technology licensing agreement. Essay 2 investigates firms' decision to resort to third-party services at the first three contractual stages (identification of a partner, negotiation of the contract, and monitoring of the relationship) and essay 3 examines the last contractual stage (enforcement of the contractual commitments) through firms' decision to include an arbitration provision in licensing contracts.

In the following, I summarize the theoretical and managerial contributions of the overall dissertation and propose avenues for future research.

CONTRIBUTION OF THE DISSERTATION

Theoretical contribution

Besides their individual contributions, these three essays contribute to the strategic management and business economics literature (1) by shedding light on the existence of third parties that have largely been ignored by scholars up to now, (2) by positioning these third parties within two important

theoretical frameworks - Transaction Cost Economics and Social Network Theory -, and (3) by increasing understanding of the reasons motivating firms to use third-party services in their technology agreements.

First, the three essays introduce and describe third parties that are partly or fully dedicated to favoring and supporting technology partnerships. Previous research on third parties in technology industries is theoretically fragmented (Howells, 2006) and few scholars have attempted to develop a typology of services that third parties may offer (Howells, 2006; Johnson, 2008). In each essay, we propose to remedy this. Essay 1 focuses on intermediary-governed networks where a separate entity is set up specifically to manage and coordinate the network and its activities. Government-sponsored R&D consortia like SEMATECH in the United States, EUREKA in Europe and the VLSI project in Japan are a common form of intermediary-governed network found in technology industries. Although these R&D consortia differ along several governance aspects, their broad mission is rather similar; i.e., to offer a framework that stimulates and eases collective research. Essay 2 and essay 3 introduce third parties whose services can be highly valuable in the licensing context. Essay 2 focuses on third parties that have the ability to help licensing partners at the first three contractual stages: technology or knowledge brokers, KIBS firms, patent attorneys, auditing firms, trade associations, regional development agencies, and collective research centers. Essay 3 explains how the arbitration mechanism takes place in the licensing context and, in particular, its advantages and drawbacks compared to public litigation.

Second, we contribute to Transaction Cost Economics and Social Network Theory by positioning third parties in their respective theoretical framework. In regard to Transaction Cost Economics, previous research has mainly studied the choice of governance structure (market, hybrid or hierarchy) as a means to deal with the risk of opportunistic behaviors and the coordination of inter-dependent tasks. Little attention has however been devoted to the role of third parties in this respect. The key argument in Transaction Cost Economics is that transactions are aligned with governance structures so as to reduce the costs of transacting (Williamson, 1991). This literature suggests that markets are a

more efficient governance structure due to economies of specialization and the administrative and incentive limits of hierarchy, unless the transaction is surrounded with uncertainty and requires to invest in specific assets (e.g., Williamson, 1975 1985; Klein, Crawford and Alchian, 1978; Teece, 1982). Under those conditions of uncertainty and specificity of the assets, more hierarchical governance structures are indeed preferred as they mitigate the *ex post* bargaining problems. In essay 2 and essay 3, we integrate the third parties in the broad picture by examining their ability to reduce the risk of opportunism and to ease the coordination of inter-dependent tasks.

In regard to Social Network Theory, the underlying argument is that understanding the formation and success of an inter-firm agreement requires to go beyond the agreement itself and to consider the whole network of agreements in which this agreement is embedded (e.g., Uzzi, 1997; Gulati, 1998; Gulati and Garguilo, 1999; Hagedoorn, 2006). In particular, this literature has studied the 'social embeddedness' of firms within their network and shown that each level of embeddedness (relational, structural and cognitive embeddednesses) can contribute to the reduction of the risk of opportunism and the success of inter-dependent tasks coordination. Essay 1 points out that, besides the spontaneous networks of inter-firm partnerships, there exists intermediary-governed networks. Firms entering an intermediary-governed network can benefit from the mechanisms developed and implemented by the intermediary entity to ease the collaboration and protect against possible opportunistic behaviors. As Provan and Kenis (2008) have recently stressed, *"although networks have been studied from a variety of perspectives, surprisingly little attention has been paid to the governance of whole organizational networks"*. It is important to consider the different network governance models and essay 1 is an attempt in this direction.

Third, our approach has been that using third-party services is not systematically appropriate but it can be very efficacious under certain conditions. Indeed, it is important to keep in mind that resorting to third-party services may induce some costs as well. Identifying the right third party, informing it about the details of the technology agreement and interacting with it ask time, resources, and money. Third-party services may, therefore, increase the global costs of the agreement while not having a

substantial positive impact on its success. We argue that relying on third parties will be variously beneficial depending on (1) the characteristics of the transaction and (2) the firm's social embeddedness.

On the one hand, essay 2 and essay 3 focus on transaction attributes that are likely to increase the 'costs of control' and 'costs of coordination' imposed by the management of this transaction. These costs vary indeed with transaction attributes like relationship-specific investment, uncertainty and tasks inter-dependency. Our results have confirmed our theoretical framework by showing that the likelihood to use third-party services increases with the 'costs of control' and 'costs of coordination'. We can, therefore, establish a relationship between the levels of 'costs of control' and 'costs of coordination' imposed by the transaction and firms' propensity to rely on third parties to ease and secure this transaction.

On the other hand, firms' social embeddedness provides additional insights regarding the motives for using third-party services. While previous research has shown that each level of embeddedness can contribute to the reduction of the risk of opportunism and the success of the coordination of inter-dependent tasks, essay 1 underlines that reaching an 'ideal' level of social embeddedness is far from simple. It is a long, hazardous and highly resource-consuming process. In this essay, our intent has been to show that alternatives exist for firms that cannot benefit from favorable levels of embeddedness (i.e., low relational embeddedness, unfavorable structural embeddedness, and limited cognitive embeddedness). In that case, they can try to enter an intermediary-governed network and, thereby, benefit from mechanisms implemented by an intermediary entity to secure and ease partnerships taking place within the network.

Fourth, our approach has allowed us to go beyond the discrete governance structure analysis that has been the main tendency in previous research (e.g., Buckley and Casson, 1976, 1998; Dunning, 1981; Rugman, 1981; Hennart, 1982, 1988; Teece, 1986). Essay 2 and essay 3 put emphasis on and study the great variety of licensing agreements, which can be associated either with pure market contracts

(also called 'transactional contracts' (Macneil, 1974)) or with hybrid forms (also called 'relational contracts' (Macneil, 1974)) according to their characteristics (Borys and Jemison, 1989; Grandori and Soda, 1995; Bessy and Brousseau, 1998; Sattin, 2005). The term hybrid is used to refer to arrangements where parties maintain their autonomy but are more bilaterally dependent than in pure market contracts. They retain some of the incentive characteristics of markets, while allowing enhanced monitoring and bilateral adaptation, and avoiding some of the bureaucratic and shirking costs associated with hierarchy (Williamson, 1991; Ménard, 2004). Licensing agreements can be associated with hybrid forms when governance mechanisms designed for coordinating activities, organizing transactions, and solving disputes are included in the contract (Ménard, 2004).

Fifth, we also contribute to the relatively under-developed empirical research on licensing (Sattin, 2005; Fosfuri, 2006; Zuniga and Guellec, 2009; Lichtenthaler and Ernst, 2009), which can mainly be explained by the high confidentiality surrounding the licensing deals. Thanks to the highly valuable support we received from AGORIA, the Belgian technology trade association, we built a detailed database on technology licensing transactions negotiated by Belgian firms. This database has been used to test our theoretical framework in essay 2 and essay 3 and its richness will enable us to conduct several other studies on licensing behaviors.

Managerial contribution

The era of 'Open Innovation' has imposed new strategic rules to managers. They know that their firm's survival and growth require them to leverage the discoveries of other firms instead of relying exclusively on their own R&D, and require them also to look for partners with business models that could be better suited to commercialize their own R&D. Our purpose throughout this dissertation has been to show that many forms of third parties, each with specific services, are able to help managers by easing and securing their technology partnerships. It is important that managers acknowledge that the technology industries do not only consist of firms but also of third parties such as technology brokers, patent attorneys, auditing firms, arbitrators or KIBS firms, and that they take advantage of

these third parties. On the other hand, it is also important to remain conscious of the costs that resorting to third-party services may induce. As a result, managers need answers to these three successive questions: (1) Under which conditions is third-party intervention necessary or appropriate?, (2) Which services are available?, and (3) Which kind of third parties to solicit?

Under which conditions is third-party intervention necessary or appropriate? According to our theoretical framework that combines arguments from Transaction Cost Economics and Social Network Theory, relying on third parties will be variously beneficial depending on (1) the characteristics of the transaction and (2) the firm's social embeddedness. Essay 2 and essay 3 have shown that the likelihood to use third-party services increases with the 'costs of control' and 'costs of coordination' engendered by the management of the transaction. These costs depend on transaction attributes like relationship-specific investments, uncertainty and task inter-dependency. However, as explained in essay 1, firm's social embeddedness also contributes to the reduction in costs of control (via the reduction of the risk of opportunism) and costs of coordination (via the reduction of the difficulty of coordinating the inter-dependent tasks). The three levels of embeddedness - relational, structural and cognitive - can indeed impact the risk of opportunism and the difficulty of coordinating inter-dependent tasks through mechanisms such as trust, mutual respect, familiarity, reputation, commonality of values, business rules and culture. Of course, the use of third-party services is only justified when the costs of using third-party services is lower than the reduction in costs of control and costs of coordination enabled by these services. As mentioned before, resorting to third-party services may increase the global costs of the agreement while not having a substantial positive impact on its success. To sum up, when (1) the transaction attributes generate high costs of control and costs of coordination, (2) the firm's social embeddedness cannot help to reduce these costs, and (3) the costs of third-party intervention are lower than the reduction in costs of control and costs of coordination enabled by this intervention; the use of third-party services should take place.

Which services are available? Which kind of third parties to solicit? On the basis of our three essays, Table 1 presents services offered by third parties (column 3) and the kind of third parties that can be solicited (column 4). For the sake of clarity of exposition, we distinguish in this table the four contractual stages: to identify and select a partner, to negotiate the contract, to monitor the relationship, and to enforce the contractual terms.

On the one hand, when costs of control are important, it is essential (1) to find a trustworthy partner, (2) to negotiate a contract incorporating the necessary safeguards, (3) to monitor the contractual commitments and (4), in case of conflict, to apply a binding and enforceable resolution mechanism. On the other hand, when costs of coordination are important, it is essential (1) to find a partner with the necessary set of resources, skills and capabilities, (2) to negotiate a contract allowing the necessary flexibility, (3) to ease communication, continuity and adaptation and (4), in case of conflict, to apply a flexible resolution mechanism favoring continuity. As shown in Table 1, diverse forms of third parties and diverse services can help firms reduce the costs of control and coordination induced by the management of their technology agreements.

Contractual stages	**Opportunism and coordination concerns**	**Which services are available?**	**Which kind of third parties to solicit?**
To identify and select a partner	*Opportunism:* To find a trustworthy partner *Coordination:* To find a partner with the necessary set of resources, skills, and capabilities	- access to databases on potential partners (e.g., Internet Website, specialized official guide) - network events such as meeting days, seminars, and exhibitions - individual advice and assistance in the identification and selection of potential partners - information about potential partners' reputation - an effective role of 'introducer' to the selected potential partner	technology broker, trade association, collective research center, regional development agency

To negotiate the contract	*Opportunism:* To negotiate a contract incorporating the necessary safeguards *Coordination:* To negotiate a contract allowing the necessary flexibility	For legal dimensions: - provision of contract templates - specialized training and seminars on legal aspects - legal advice and assistance from lawyers and experts For technical dimensions: - technical expertise to assess the value and price of the technology transferred and its obsolescence rate	law firm, KIBS firm, technology broker, thematic professional associations such as Licensing Executives Society, collective research center, patent attorney
To monitor the relationship	*Opportunism:* To monitor the contractual commitments	- control of partner's book - quality control of the products produced by the partner via the technology transferred - quality control of industrial installations and/or R&D projects of the partner - control of the partner's commitments in terms of IP rights (warranty of ownership, warranty of non- infringement, patent immunity, etc.)	auditing firm, accreditation agency, patent attorney
	Coordination: To ease communication, continuity and adaptation	- specialized seminars and training in technical areas - measuring, testing, prototyping and pilot testing activities - technical accompaniment of the implementation of the knowledge once transferred	KIBS, collective research center
To enforce the contractual terms	*Opportunism:* In case of conflict, to apply a binding and enforceable resolution mechanism *Coordination:* In case of conflict, to apply a flexible resolution mechanism favoring continuity	- to design arbitration provisions - to prevent possible disputes - to resolve possible disputes	mediator and arbitrator

Table1
Which services are available? Which kind of third parties to solicit?

We do believe that having the ability to solicit the right third parties and to use the appropriate services has become business critical. The current trend towards international technology exchanges

leads to a growth in the number and variety of third parties and of their services, it has become crucial for firms to be able to efficiently and adequately exploit them.

DIRECTIONS FOR FUTURE RESEARCH

As developed in detail in the conclusion of each essay, this dissertation has some limitations that suggest a number of directions for future research.

First, the main legitimate concern is our focus on the 'benefits' side of the third-party services and not on the 'costs' side. Although we stress in each essay the fact that relying on third-party services can engender significant costs, our propositions (essay 1) and hypotheses (essay 2 and essay 3) relate to the 'benefits' side and we assume that when partners decide to use third parties, they expect that this use will reduce the global cost of the transaction. In our questionnaire (see dissertation appendix), we did not include questions relative to the costs that respondents' firm had to support to use third-party services. Future research should investigate the 'benefits' and 'costs' sides in parallel as the absence of information about the costs imposed by third parties limits our ability to draw a complete picture of the factors motivating firms to use third-party services.

Second, another legitimate concern is the generalizability of our results. Each of our essays investigates third-party intervention in technology industries. Some could argue that the presence of third parties is higher in these industries. Indeed, technology partnerships have become essential in technology industries and numerous third parties have specifically emerged to favor and support these partnerships. Future research should investigate these issues in other industries in order to determine the extent to which industry specificities impact the decision to use third-party services. Moreover, essay 2 and essay 3 explore the use of third parties in the specific context of licensing. Again, it would be interesting to compare firms' propensity to use third-party services and factors motivating this propensity under different governance structures like research joint venture or research contract. Finally, while most of the described licensing agreements are international, firms having completed

the questionnaires are all Belgian; hence, answers are impacted by the institutional specificities found in Belgium. It would be interesting to conduct the same survey in other countries.

Third, in essay 1, we do not consider the interrelation between each level of social embeddedness, although previous studies have shown that these levels are interrelated in a complex way (Dacin, Ventresca and Beal, 1999; Hagedoorn, 2006; Hagedoorn and Frankort, 2008). In some cases, they will mutually reinforce each other, in other cases, they won't. This interrelation provides an interesting avenue for future research.

Fourth, several empirical limitations in essay 2 and essay 3 can be underlined. We followed the Total Design Method developed by Dillman (2007) to design, implement and conduct the survey. For the purposes of essay 2 and essay 3, we end with 113 and 118 usable questionnaires respectively. The rather limited response rate is mainly due to (1) the high confidentiality surrounding licensing deals, (2) the fact that numerous firms do not use licensing and, thus, did not feel concerned by the survey topic, and (3) the fact that our questionnaire was sent to top executives, who are extremely busy individuals.

The limited size of our samples has engendered several empirical limitations. In essay 2, we have not been able to investigate separately the behavior of licensors and licensees regarding the use of third parties. Moreover, we could not provide statistical analysis of the types of third parties solicited. Another empirical issue is that our sample is rather homogeneous in terms of institutional environment characteristics: licensing partners are European for half of the licensing transactions and North-American for one-quarter. Given this homogeneity, it is difficult to properly assess how institutional characteristics like the Index of Patent Rights or the government effectiveness impact the decision to use third-party services.

Finally, the last and probably most important aspect that has not been addressed in this dissertation is the impact of third-party assistance on the performance of technology agreements. While our essays

have been intended to investigate the reasons motivating the use of third-party services, it is clear that their existence and subsistence in the long run directly depend on their efficiency in leading to successful partnerships. Future research will be devoted to the relationship between the use of third-party services in technology agreements and the performance of these agreements. In this regard, our questionnaire includes multiple questions aimed at assessing the performance of the described licensing agreement: (1) this licensing agreement has satisfied your firm's expectations in terms of revenues; (2) this licensing agreement has satisfied your firm's expectations in terms of costs; (3) this licensing agreement has satisfied your firm's expectations in terms of profitability; (4) overall, this licensing agreement has been a success; and (5) this licensing agreement has met the objective that your firm sets out to achieve (responses were recorded on a 7-point Likert scale ranging from 1, 'Strongly disagree' to 7, 'Strongly agree'). We plan to study the relationship between the use of third parties and the performance of the licensing agreement in the near future.

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Appendix