Role played by Intermediary Institutions in Academy-Industry Technology Alliances

The case of AGORIA, the Belgian Technology Industry Federation *

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Abstract. Due to the increasing complexity and pace of scientific and technological development, and the higher uncertainty and costs imposed by R&D projects, organizations have strong motives to collaborate through various modes of strategic alliances. In the case of technology alliances involving simultaneously academy and industry organizations, the collaboration can be significantly complicated by the specific rules prevailing in both environments – namely academic environment and industrial environment. Academy-industry collaboration difficulties may arise for reasons of divergences in terms of motives, incentives, constraints, and organizational culture. Therefore, academy-industry technology alliances are likely to experience significant hurdles, which may appear during the *ex ante* specification of the payoff-relevant activities, the *ex post* monitoring of the execution of prescribed activities, and the *ex post* enforcement of the alliance terms. Hence they need to be managed with specific organizational schemes.

In the present paper, we propose to shed light on the role that intermediary institutions may play in academy-industry technology alliances. Indeed, when allying, academy and industry organizations can have recourse to intermediary institutions, which may help them deal with their stringent and specific collaboration difficulties. We propose in this paper to focus on a specific type of intermediary institution; namely the industry federation. On the basis of an exploratory case study on the Belgian Technology Industry Federation, AGORIA, we expose the regulatory mechanisms implemented by this intermediary institution. This paper shows how intermediary institutions such as AGORIA may mitigate the collaboration difficulties and, therefore, ease the management of academy-industry technology alliances.

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INTRODUCTION

The worldwide increasing success for inter-organizational technology alliances is explained in big part by the today highly competitive landscape. Organizations have to deal with the current combination of *"rapid-fire technological change, shorter product life-cycles, continual entrance of new players, and constantly evolving customer needs"* (Santoro and Gopalakrishnan, 2001) and, therefore, need to collaborate more intensively. In such dynamic environments, the inter-organizational collaborations enable to *"share risks, to build on jointly shared capabilities, and to create synergies for better competitiveness (Cyr, 1999)"* (Santoro and Gopalakrishnan, 2001).

The inter-organizational collaborations may take multiple forms going from licensing to research joint ventures, and more and more commonly involve academy and industry organizations simultaneously[3]. Indeed, both academy and industry organizations have now strong motives to collaborate. While the current dynamic environment just described explains partly this new trend for academy-industry technology alliances, other motives are more specific to the academy-industry rapprochement. There is, on the one hand, an increasing dependency of basic research on private funding (due to budgetary constraints) and, on the other hand, an increasing dependency of industry organizations on basic research (the evolution to R&D-outsourcing). Numerous businesses notably in biotechnology, new materials, media or ICT indeed rely on scientific knowledge.

In response to this emerging interdependency between academy and industry organizations, academy organizations such as academic research centers, academic poles of excellence, and Superior Industrial Institutes (research report-ADE&MERIT, 2005[4]) tend to adopt new structures (Gibbons et al., 1994) more *"practically oriented, transdisciplinary, network-dominated, and flexible"* (Tijssen and Korevaar, 1997), and they commercialize their knowledge more intensively through *"patenting, licensing, research joint ventures, and startup companies"* (Link, Scott, and Siegel, 2003; Phan and Siegel, 2006). While we do not focus in the present paper on the informal academy-industry relationships, it is important to point out that the exchange of ideas can be achieved through informal methods as well such as mobility of scientists and engineers (Pouder and St. John, 1996), social meetings, and ad-hoc conversations (Pouder and St. John, 1996). As pointed out by Santoro and Gopalakrishnan (2001), whether through formal and informal methods, academy and industry assets can be viewed as complementary. At the industry point of view,

[3] For a literature review of technology transfer mechanisms between academy and industry, read Phan and Siegel (2006).
[4] "Fonctionnement du système d'intermédiation scientifique et technologique en région wallonne", study conducted by ADE (Louvain-la-Neuve) and MERIT (University of Maastricht).

academy-industry relationships allow an *"access to highly trained students and professors, access to new technologies, enhancement to the company's image and reputation, proximity to economic resources, access to university facilities, and access to new technologies (Phillips, 1991)"*. At the academy point of view, they allow to *"interact with industry in order to obtain additional research funding, gain access to industrial technical expertise, expose students and faculty to practical problems, obtain internships for students, and provide employment opportunities to university graduates (NSB , 1996; NSF, 1982)"*.

While academy organizations tend to initiate both short-term and long-term technology alliances with high tech companies, collaboration may present substantial specific difficulties. Indeed, academy and industry organizations are characterized by different *"modes of interpretation, decision rules, and objectives, and specific communicative standards"*, and have *"different motives and incentives and operate in different organizational cultures"* (Kaufmann and Tödtling, 2000). These divergent objectives and environments often result in conflicts between academy and industry organizations, and that at the three stages of contracting for technology (Pisano, 1989; Williamson, 1996; Oxley 1997, 1999; Hagedoorn, Cloodt and van Kranenburg, 2005; Sampson, 2005): the *ex ante* specification of property rights, the *ex post* monitoring of the actual collaboration, and the *ex post* enforcement of the contractual terms.

Kaufmann and Tödtling (2000) have explained that *"linking firms to non-business systems stimulates innovativeness more than remaining within the business system's set of routines … and improves the capability of firms to introduce more advanced innovations"*. Moreover, *"knowledge spillovers from universities to other organizations is especially rich since universities have less incentive to keep research secret than do industrial firms (Jaffe, 1989)"* (Santoro and Gopalakrishnan, 2001). Given the strong contribution of academy-industry technology alliances in innovation's stimulation (Kaufmann and Tödtling, 2000), academy-industry collaborations deserve a special attention as well as the existing mechanisms that manage them. In this vein, this paper is aimed at shedding light on the collaboration difficulties met between academy and industry organizations at the three stages of contracting for technology (specification/monitoring/enforcement) and at showing how mechanisms implemented by intermediary institutions such as industry federations help to deal with those difficulties.

ACADEMY-INDUSTRY TECHNOLOGY ALLIANCES AND THE RISK OF KNOWLEDGE LEAKAGE

Collaborations through technology alliance modes allow, among others, to share R&D costs and risks, to reduce uncertainty, to access complementary resources and skills, to achieve synergies leading to cost

saving or improvements in R&D productivity, to technologically learn, to keep up with major technological developments, to improve the speed to market, and/or to achieve a critical mass in R&D (Caloghirou, Tsakanikas, and Vonortas, 2001). However, the management of technology alliances should remain cautious since it can expose valuable knowledge at risk of appropriation by the alliance partners[5].

It has been pointed out by scholars that three dimensions are particularly relevant when transferring knowledge through strategic alliances: the adequate *ex ante* specification of property rights, the *ex post* monitoring of the actual collaboration, and the *ex post* enforcement of contractual terms (Pisano, 1989; Williamson, 1996; Oxley 1997, 1999; Hagedoorn et al., 2005; Sampson, 2005). The more problematic these dimensions, the more likely the knowledge leakage - or so-called appropriability hazards (Teece, 1986; Pisano, 1989) - and the risks of conflicts in the collaboration. We intend to show in this section that in the case of academy-industry technology alliances, divergences in terms of rules prevailing in academic and industrial environments contribute to magnifying the difficulties with which property rights can be specified and effective monitoring and enforcement of partners' actions can be achieved.

The issue of property rights specification

One of the key issues faced by the alliance partners is to define *ex ante* the future of collaborative outputs in a situation of high uncertainty. In contractual terms, it is often very difficult to set up *ex ante* the regime of property rights. Scholars have shown that, first, the nature of the knowledge transferred[6] (Mowery and Rosenberg, 1989; Polanyi, 1962; Oxley, 1997) - tacit know-how vs. codified technology - and, second, the scope of collaboration activities (Teece, 1986; Hennart, 1988; Pisano, 1988; Oxley, 1997) - going from simple exploitation of the knowledge transferred by one partner to joint development of new knowledge by both partners - substantially impact the level of contractual complexity. The level of tacitness associated with the knowledge transferred , on the one hand, and the anticipation of creation of new knowledge or significant modification of the knowledge transferred, on the other hand, make difficult the *ex ante* specification of property rights (Oxley, 1997; Foss and Foss, 2006) and, therefore, limit the possibility to draft up complete contracts.

[5] This is specially the case in the absence of shared equity since equity sharing allows to align the partners' motivation by creating mutual interests and so by reducing the possibility for opportunistic behavior by partners (Pisano, 1989).

[6] In order to understand why the nature of knowledge transferred may induce hazards, we need to recall the arguments of the literature on inter-firm knowledge transfers. Knowledge is considered as a complex mix of codified data and poorly defined tacit know-how (Mowery and Rosenberg, 1989). In the presence of tacit know-how, the transfer becomes difficult without intimate personal contact (Polanyi, 1962).

Difficulties met at this contractual level can significantly be magnified in the case of academy-industry technology alliances first due to the **different nature of the knowledge developed by academy and industry organizations**, and second due to the **different approach adopted by academic and corporate organizations to publicize the produced knowledge**.

First, while the academy organizations ask for clear and rigid specification of property rights, industry organizations favor flexible specification of property rights. This is in big part due to the differences regarding the nature of research undertaken respectively in academy organizations and industry organizations. While academy organizations tend to focus on basic research (Tijssen and Korevaar, 1997), which is rigid, less flexible (Meyer-Krahmer, 1997; Kaufmann and Tödtling, 2000), and often too theoretical to be of immediate use (Tijssen and Korevaar, 1997), industry organizations have a more pronounced interest in applied short-term research (Kaufmann and Tödtling, 2000). Conflicts may therefore arise at the *ex ante* specification of property rights level since an agreement on specification of property rights which involves knowledge at both extreme phases of the research process - fundamental knowledge for academy organizations vs. ready to use knowledge for industry organizations - is difficult to reach.

Second, the attitude towards the research, the disclosure of knowledge, and the reward systems differ significantly between the two types of organization. Academic researchers are recognized within the scientific community on the basis of their publications and their presentations at prestigious conferences (Dasgupta and David, 1992; Siegel, Waldmand, and Link, 1999; Kaufmann and Tödtling, 2000). Industry researchers will adhere to the profit-oriented business system and focus, therefore, on patents and commercially useful results (Dasgupta and David, 1992; Kaufmann and Tödtling, 2000). In other words, academic researchers communicate via publications and industry researchers communicate via the price mechanism (Tijssen and Korevaar, 1997). At the *ex ante* specification of property rights level, it can be very difficult to manage the conflicting interests of making certain part of the produced knowledge public vs. restricting the access through patents or secrecy (Kaufmann and Tödling, 2000).

The issue of collaboration monitoring

As pointed out in the existing literature, contractual activities are another factor affecting the ease with which property rights are specified and partner's actions are monitored. Contractual activities reflect the objectives pursued, which may vary from exploitation to creation of knowledge (Teece, 1986; Hennart,

1988; Pisano, 1988). As previously mentioned, if the parties anticipate that their contractual activities will lead to the creation or a significant modification of knowledge, the delineation of property rights becomes problematic due to the uncertainty surrounding the outcome of such activities (Teece, 1986; Hennart, 1988; Pisano, 1988). Beyond the *ex ante* specification of property rights (cfr *supra*), it makes the monitoring of partners' activities much more complicated as well (Oxley, 1997). Recent research has shown that the success or failure of technological collaborations strongly depends on how partners' actions are monitored (Brousseau and Coeurderoy, 2005).

In the case of academy-industry technology alliances, monitoring knowledge creation and evolution is made even more difficult due to **the distinct motives, ways of communication, and modes of decision rules prevailing in the academic and industrial environments** (Kaufmann and Tödtling, 2000).

First, the communication codes and the information channels present specificities whether organizations belong to the academic or industrial environments (Monteverde, 1995). These specificities may strongly impede the effectiveness of academy-industry technology alliances. This is highly critical in the case of contractual activities going beyond simple exploitation of the transferred knowledge. As mentioned by Santoro and Gopalakrishan (2001), "*first, effective communication helps articulate technology transfer objectives and expectations among partners (Lei, Slocum, and Pitts, 1997). Second, effective communication enables decision making in both organizations (the university research center and the industrial firm) to take place faster. If technology standards change, then the university research center and the industrial firm can refocus their efforts in order to respond to changes in the environment. Finally, effective communication reduces the manipulation of available information for political means (March and Simon, 1958). Effective communication allows collaborating parties to be more aware of expectations from the relationship thereby reducing uncertainty. Thus, there is greater confidence in each other's capabilities resulting in more time being spent on technology-related activities and less time on personality-related issues".*

Second, when there is a modification of the knowledge transferred or a creation of knowledge, it becomes particularly crucial to align the respective motives and to reach an agreement regarding the collaborative process implemented. Again, when the technology alliances involve simultaneously academy and industry organizations, conflicts may arise when trying to align the respective motives throughout the contractual duration. While both academy and industry organizations produce and protect IP, academy organizations value IP not only as a revenue-producing resource, but also as a tool in the advancement and

dissemination of knowledge (Link, Scott and Brainard, 1999). In the academy environment[7], rewards come from reputation and recognition, which require dissemination of findings, generate salary increases and teaching reduction, and favor mobility (Adams, Chiang, and Strakey, 2001). In the industry environment[8], in contrast, rewards come from corporate profits, which require confidentiality. Hence, once collaboration process involves simultaneously academy and industry organizations, the academic research has to move towards secrecy, in conflict with standard academic practice.

Finally, when decisions have to be made throughout the contractual duration, it is also argued that the high levels of bureaucracy and of inflexibility characterizing the way academy organizations (Siegel, Waldman, and Link, 2003) arrange collaborations may be harmful to the effectiveness of the technology alliances.

The issue of enforcement of contractual terms

Scholars have started exploring the institutional environments surrounding the transfer as another source of hazards (Henisz, 2000). Results of recent studies show that institutional hazards may cause difficulties at any of the three stages of contracting for technology (*ex ante* specification of property rights, *ex post* monitoring, or *ex post* enforcement) as well (Hagedoorn et al., 2005).

In the case of intellectual assets transfer, the "quality" of the institutional environment depends widely on the IP rights regime (Williamson, 1991; Oxley, 1999; La Porta, Lopez-de-Silanes, Schleifer and Vishny, 1999) whose "strength" and "completeness" vary across countries and industries (Anand and Khanna, 2000). The "quality" of the institutional environment in terms of IP rights protection has commonly been assessed on the basis of the levels of IP rights measurement and enforcement achieved by public institutions (e.g., Ginarte and Park, 1997; Ostergard, 2000). Beyond the "quality" of regulation per se, the knowledge of rules by organizations has to be taken into account as well. As pointed out by Coeurderoy and Murray (2005), *"a poor understanding of a different regulatory framework, even in an environment protective of individual rights, is likely to allow opportunistic moves by locally established agents who have a superior knowledge as incumbents"*.

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[7] Other possible motives in the academy environment include *"financial gain and a desire to secure additional funding for graduate assistants, post-doctoral fellows, and laboratory equipment/facilities. The norms, standards, and values of scientists reflect an organizational culture that values creativity, innovation, and especially, an individual's contribution to advances in knowledge (basic research)"* (Siegel, Waldman and Link, 2003).

[8] *"Firms and entrepreneurs seek to commercialize university-based technologies for financial gain. They also wish to maintain proprietary control over these technologies, which can potentially be achieve via an exclusive worldwide license. The entrepreneurial organizational culture of most firms (especially startups) rewards timeliness, speed, and flexibility."* (Siegel, Waldman and Link, 2003).

The enforcement of contractual terms becomes even more delicate when academy and industry organizations are simultaneously involved given that they are **ruled by institutions producing heterogeneous frameworks**. Such a gap will yield to discrepancies and potential conflicts on the objectives of both parts as well as their respective behaviors.

BENEFICIAL RECOURSE TO INTERMEDIARY INSTITUTIONS IN THE CASE OF ACADEMY-INDUSTRY TECHNOLOGY ALLIANCE

Considering the potential sources of discrepancy between academy and industry organizations at each contractual level (specification/monitoring/enforcement), it becomes clear that face to face relationships between academy and industry organizations are likely to experience significant transaction costs. Hence, exist intermediary institutions whose *raison d'être* is partly or fully to ease the management of collaborations between academic and industrial environments. While the intermediary role of those institutions is undeniable and determining in academy-industry relationships, it has remained rather unexplored in the existing literature; maybe because those institutions are not always at the forefront of the value creation process.

In this section of the paper, we intend to show how beneficial it can be for academy and industry organizations to have recourse to intermediary institution when allying. To this end, we will first articulate our arguments on the basis of the existing related literature and, afterwards, we will illustrate our arguments with a specific type of intermediary institutions, namely AGORIA, the Belgian Technology Industry Federation.

Mechanisms implemented by intermediary institutions

The essence of intermediary institutions is both collective and voluntary (De Clercq and Dakhli, 2003; Brousseau, Fares and Raynaud, 2004). One might consider them as forming an intermediary level between public institutions and inter-organizational alliances (Brousseau, Fares and Raynaud, 2004). Indeed, intermediary institutions are developed for two main reasons. The first is to respond to the high level of governance costs imposed by inter-organizational alliances. As organizations may share similar collaboration difficulties at any of the three stages of contracting for technology (specification of property rights, monitoring, and enforcement), intermediary institutions may enable them to achieve economies of

scale, scope and learning effects. The second reason is to respond to the high level of maladaptation costs resulting from the general and incomplete design of the public institutional framework[9] (Brousseau and Fares, 2000). Public institutions provide organizations with general solutions, which may not perfectly fit their specific coordination needs.

Academy and industry organizations can have recourse to intermediary institutions in order to benefit from the regulatory mechanisms they may implement, and that at any of the three stages of contracting for technology. The recourse to private institutions may provide organizations with one or more regulatory mechanism(s) simultaneously and may require the organizations' membership[10] of their network. We present in this section the mechanisms that can be implemented in relation to the *ex ante* specification, *ex post* monitoring, and *ex post* enforcement difficulties developed *supra*.

[9] Resulting from political processes and evolutionary phenomena (North, 1990).
[10] As it is the case for AGORIA and SIRRIS, a collective industrial research and technological services center founded by AGORIA in 1949.

DIFFICULTIES IN ACADEMY-INDUSTRY TECHNOLOGY ALLIANCES	REASONS FOR THESE DIFFICULTIES	ROLE POTENTIALLY PLAYED BY INTERMEDIARY INSTITUTIONS (I.I.)
Ex-ante specification		
1. costs of screening and selection of appropriate exchange partners *a priori* are increased	- different nature of the knowledge produced by academy and industry organizations - different approach adopted by academy and industry organizations to publicize the produced knowledge	I.I. may make the bridge between the academic and industrial environments via two channels: (1) "translation" of the intellectual assets produced in the two environments and (2) information about the activities previously and/or currently undertaken by potential future partners in the two environments = **information asymmetry reduction mechanisms**
2. costs of negotiating and writing the contractual agreement are increased		I.I. may enable organizations to benefit from its own experience regarding negotiation and writing of academy-industry technology alliances = **information asymmetry reduction mechanisms**
Ex-post monitoring (particularly if beyond simple exploitation of the transferred knowledge)		
1. costs of communicating new information, renegotiating contractual agreement, and coordinating activities are increased	- distinct motives (diffusion vs. protection), ways of communication, and modes of decision rules prevailing in the academic and industrial environments	I.I. may ease the coordination thanks to the roles, role relationships, conventions it specifies and dictates, and thanks to the events it organizes to help diffuse norms and values = **coordination mechanisms**
2. costs of controlling the partners' performance are increased		I.I. may inspect activities of partners (formal)/ other members of I.I. may detect those that do not conform the I.I. culture (informal) = **control mechanisms**
Ex-post enforcement		
1. costs of crafting necessary safeguards are increased	- heterogeneous framework produced by the institutions which rule respectively academy and industry organizations	I.I. may use **reputation mechanisms** I.I. may use **collective sanctions mechanisms** I.I. may implement **arbitration mechanisms**

Table 1

Intermediaries and the craftsmanship of academy-industry collaborations

Mechanisms minimizing the *ex ante* specification problems

As presented *supra*, due to the different nature of the knowledge produced by academy and industry organizations and the different approach they adopt to publicize the produced intellectual outputs, the *ex ante* specification of property rights is complicated.

The recourse to intermediary institutions may enable academy and industry organizations to benefit from **information asymmetry reduction mechanisms**, and so to reduce the costs of screening and selection of appropriate exchange partners *a priori* on the one hand, and the costs of negotiating and writing agreements on the other hand.

Information asymmetry reduction mechanisms. First, the *ex ante* information asymmetry about the parties' true characteristics is magnified if belonging to distinct environments - academic and industrial environments- and, therefore, gives rise to significant screening and selection costs designed to identify appropriate exchange partners *a priori*. Intermediary institutions can mitigate the *ex ante* information asymmetry and make the bridge between the academic and industrial environments thanks to two main channels: the "translation" of the intellectual assets produced in those two worlds and the information about the activities previously and/or currently undertaken by potential academy vs. industry partners. They enable academy and industry organizations to gather superior information on each other regarding identity, activities, resources and capabilities. One might, therefore, say that they allow a better match between partners belonging to academic and industrial environments respectively.

Second, another important form of information asymmetry is the asymmetry about negotiating and writing an agreement. Intermediary institutions may enable organizations to benefit from their own experience regarding those activities and, therefore, to reduce the possible gap between the ability of academy and industry organizations to manage design agreements.

Mechanisms minimizing the *ex post* monitoring problems

The recourse to intermediary institution may enable academy and industry organizations to benefit from **coordination mechanisms** and **control mechanisms** and, therefore, to reduce the costs of communicating new information, renegotiating agreements, coordinating activities, and controlling alliance partners' performance.

Coordination mechanisms. Intermediary institutions may ease the coordination thanks to the *"roles, role relationship, conventions"* (Jones, Hesterly and Borgatti., 1997) they specify and dictate. Moreover, the intermediary institution's events may help *"diffuse norms and values by providing role models, setting standards, and exchanging information among participants (Jones, 1996)"* (Jones et al., 1997)

In the case of intermediary institution with membership[11], the more frequent the exchanges within the network, the more structurally embedded the network's members, and so the more widely they share values, norms, assumptions, and role understandings (Abrahamson and Fombrun, 1992; Reddy and Rao, 1990; Jones et al., 1997). This network's culture enhances coordination among members and reduces its costs in three ways (Jones et al. [1997]):

"(1) by creating "convergence of expectations" through socialization so that members do not work at "cross purposes" (Williamson, 1991), (2) by allowing for idiosyncratic language to summarize complex routines and information (Williamson, 1975,1985) (3) by specifying "broad tacitly understood rules… for appropriate actions under unspecified contingencies" (Camerer and Vepsalainen , 1988)."(Jones et al. [1997]).

Control mechanisms. A formal or informal control can be allowed by intermediary institutions and may help cope with the *ex post* information asymmetry relative to the task performance of the alliance's partners. First, inspection of the activities of parties and their certification constitute a formal control mechanism that may be implemented by intermediary institutions. Second, in the case of intermediary institutions with membership, informal control is performed by the other members of the network. Indeed, when the private institution's culture (i.e. set of norms, values, and practices) is diffused through its network, minority that does not conform to the culture is visible (Oliver, 1991).

Mechanisms minimizing the *ex post* enforcement problems

Considering the incompleteness of public institutions, intermediary institutions may enable academy and industry organizations to benefit from **reputation mechanisms**, **collective sanction mechanisms**, and **arbitration mechanisms** and, therefore, to reduce the costs of crafting necessary safeguards.

[11] As this is the case with AGORIA and SIRRIS

Reputation mechanisms. Intermediary institutions may use the reputation mechanism to make the opportunism more costly (Gulati, Nohria and Zaheer, 2000). Indeed, reputation mechanisms rest on the fact that once opportunistic behaviors are discovered, the information about these behaviors is rapidly spread around, and has the ability to significantly damage the current and future activities of the organization having misbehaved (Hirschmann, 1970; Blumberg, 2001). As a result, the reputation mechanisms discourage opportunism and reinforce safeguards.

These mechanisms are particularly efficient in the case of intermediary institution with membership. Indeed, intermediary institutions have a higher ability to collect and convey information to publicize defaults under the rules (Hadfield, 2000) among their network. They can serve as a repository of players' reputational information regarding, for instance, the debts unpaid or the low-quality goods delivered.

Collective sanctions mechanisms. As defined by Jones et al. (1997), *"collective sanctions involve group members punishing other members who violate group norms, values, or goals and range from gossip and rumors to ostracism (exclusion from the network for short periods or indefinitely) and sabotage"*. Again, these mechanisms are more efficient in the case of intermediary institutions with membership. Collective sanctions mechanisms reinforce safeguards and discourage the opportunism as well since *"they define and reinforce the parameters of acceptable behavior by demonstrating the consequence of violating norms and values"* (Jones et al., 2007)

Thanks to their collective sanctions mechanisms, intermediary institutions make the opportunistic behavior damage not only the specific alliance in which one behave opportunistically, but also the other current and potential alliances (Blumberg, 2001).

Arbitration mechanisms. Some intermediary institutions may provide organizations with arbitration mechanisms. Those mechanisms enjoy sources of efficiencies over the public courts (Richman, 2004; McMillan and Woodruff, 2000; Hadfield, 2000), and that is particularly true in the case of innovative activities which require a certain expertise to be judged. First, judges are market participants more expert and specialized than public courts. Second, specialized rules are tailored to the idiosyncratic needs and transactional challenges of a particular field of activities. Third, specialized procedures are used to act

more swiftly, at lower costs, and with more nuances than public courts. Fourth, arbitrator can consider information that could not be introduced in public court[12].

The arbitration mechanisms are structured under the public law of contract and arbitration (Hadfield, 2000). Indeed, the power of the intermediary institution to coerce organizations into respecting its legal regime and to enforce remedial orders arising from its private legal regime stems from contract law created and administered by the state[13] (Hadfield, 2000). As a result, arbitration mechanisms may ease the safeguard against vulnerabilities.

THE CASE OF AGORIA, THE BELGIAN TECHNOLOGY INDUSTRY FEDERATION

In this section, we propose to apply our arguments to a specific type of intermediary institution; namely the Belgian Technology Industry Federation, AGORIA. We intend to show on the basis of an exploratory case study which has been conducted on AGORIA how intermediary institutions may ease the management of academy-industry technology alliances, and that via the regulatory mechanisms they propose. The information regarding AGORIA, its structure, and its activities were mainly collected through a series of in-depth interviews with diverse representatives of AGORIA and SIRRIS - a De Groot Center-[14].

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[12] *"such as impressionistic evidence about business trends or judgments about the quality of items sold. They can base their decisions on a firm's behavior over time, on probabilistic patterns that would not be admissible evidence in court. "* (McMillan and Woodruff, 2000).

[13] *"The state's substantive involvement may be absolutely minimal, with no inquiry into the substantive or procedural attributes of an order. Alternatively, the state may take range of increasingly substantive roles: reviewing the extent to which the private legal entity has acted within a contractual or legislative grant of authority, adhered to its own procedural rules and/or reviewing the substantive approach taken in arriving at the order …. The range of possible legal mechanisms, therefore, allows for varying degrees of public law: from an absolute minimal public law component restricted to the registration of private legal judgments as publicly enforceable orders to a complete preemption of the field by public law. Within these extremes are regimes in which public law plays a role in structuring the private mechanism, such as by providing criminal penalties for fraud or perjury to promote the effectiveness of a private regime that relies on disclosures from self-interested parties, or by setting restrictions on the rules according to which contracting or disputing entities select a private regime, or establishing minimal conditions or broad principles which private legal rules must meet."* (Hadfield, 2000).

[14] We had the opportunity to explore our topic through multiple in-depth interviews: two interviews with Mr. PINTE (General Manager, Mechanical & Mechatronical Engineering Department, AGORIA), three interviews with Mr. WALSCHOT (Director of the legal department, AGORIA), one interview with Mr. CAMPIOLI (General Director of AGORIA Wallonia), one interview with Mr. BARALDI (Assistant Director of SIRRIS Wallonia, European Project), one interview with Mr. SALMON (Operational Director Wallonia, SIRRIS), and one interview with Mrs. WINDELS (information and technological watch – patent library, SIRRIS).

In order to briefly introduce the *raison d'être* of industry federations (trade associations) in general, we will refer to the view of Oliver (1990) regarding industry federations and more particularly regarding the determinants to the emergence of industry federations. According to Oliver, organizations decide to form industry federations for five main categories of reasons: first, to promote their interests in case of strong threats of government intervention; second, to facilitate the communication and information sharing through the publication of journals, magazines, newsletters, or through the organization of conventions and trade shows; third, to obtain selective (Olson, 1965) or economic advantages, such as information about less expensive sources of supplies, legal assistance, or statistical reports (Staber, 1987); fourth, to reduce the legislative uncertainty by disseminating information about political trends and requirements and to reduce the competitive uncertainty by providing members with standard definitions of products and product-quality guidelines or by disclosing the results of association-sponsored research (Pfeffer and Salancik, 1978); fifth, to assure legitimacy in the case of explicit institutional and public criticism.

AGORIA and its structure

AGORIA is the Belgian Technology Industry Federation that has been established in 1946 and corresponds to an association of Belgian firms. It represents organizations active in thirteen different technological sectors: 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. Among the 1.400 members of AGORIA, 900 are Small and Medium Sized Enterprises.

AGORIA is composed of sectoral entities which are each dedicated to a specific and proper technological sector. Those entities represent the heart of the AGORIA's activities. They directly provide members with information and/or concrete services specific to their technological sector. Moreover, AGORIA has developed central support departments - social department, economic department, legal department, and International Business Development department - that define the positions of the Industry Federation regarding the external world. Those latter departments offer their services and support to the sectoral entities of AGORIA but also directly to members[15]. Finally, whilst AGORIA treats federal issues, three regional departments - AGORIA Wallonia, AGORIA Brussels, and AGORIA Flanders - are responsible

[15] The amount of support services directly aimed at members is, however, much lower that the amount of services aimed at the sectoral entities of AGORIA.

for treating regional issues. The main purpose[16] of AGORIA is, therefore, to develop resources for its members in social, economic, political, and technological areas, and to put them at their disposal or at the disposal of activities whose primary beneficiaries are its members.

Furthermore, a collective industrial research center has been established by AGORIA in 1949 under the De Groot law; SIRRIS. SIRRIS is a research and technological services center specialized in several areas of competence, such as engineering of materials[17], mechatronical engineering[18], technology and innovation in business processes[19], processing technologies[20], smart manufacturing and processes[21], and rapid manufacturing[22] for the sectors of metalworking, plastics, mechanical, electrical and electronic engineering, information and communication technologies and automotive[23]. SIRRIS puts at its 2.000 members' disposal the know-how of 140 collaborators, mostly skilled engineers and operators. Among the main SIRRIS missions, we can mention providing members with information about the most recent technological evolutions and their applicability[24], proposing solutions to their daily technological problems, and accompanying them in introducing new technologies in products, services, and industrial

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[16] According to the statutes; the *raison d'être* of AGORIA is (1) to be fully in the service of its members and to use its influence to improve the economic, social, legal, and technological environment in which its members deploy their activities, to represent and defend the members and the sectors at the local, provincial, regional, comminatory, federal, European, and international levels; (2) to promote in permanent dialogue with the members their interests and to determine the collective stands; (3) to organize the collective actions and to offer individual services in response to the needs of members.
According to the interior regulation whose objective is to guide and inspire the spirit and the working methods within the collectivity of members; at the sectoral level, and at economic, social, technical, fiscal, legal, environmental, and training levels, the federation will work on: (1) deepening and developing the links of professional solidarity and collaboration between its members, (2) undertaking collective actions and stimulating collective initiatives, (3) defending its positions and the interests of its members at the public level and at the European, federal, and regional interprofessional federations levels, at the joint commission level, at the consultative council, committees, or commissions levels, or other entities of dialogue (4) documenting, informing, advising, and assisting members at collective or individual levels, (5) intervening towards administrations, private or public organisms in favor with members. In order to achieve this mission, members will regularly transmit necessary information.

[17] Optimal use of materials in specific applications

[18] Design and optimization of mechatronical engineering systems

[19] Optimization of product development and production organization

[20] Metal cutting, casting, surface treatments

[21] Intelligent processes development

[22] Rapid prototyping, tooling and manufacturing technologies development

[23] More than 80% of firms in those technological sectors are SMEs

[24] At this level, SIRRIS has been recognized since 2002 as a Center Patlib (Patent Library) on the European scene. *"PATLIB stands for PATent LIBrary. The PATLIB centers were created to provide users with local access to patent information and related issues. The centers have qualified and experienced staffs who offer practical assistance on a variety of IPR. As the number of PATLIB centers has grown, the range of services has been expanded to include, for example, trademarks, designs, and copyright. Many of the centers have diversified still further to provide an even greater breadth and depth of services. The PATLIB network is made up of patent information centers located throughout Europe, currently about 300 centers. It was set up with the aim of improving communication and co-operation between individual centers and promoting patent information awareness and the provision of services to the public."* (Website: www.epo.com).

processes. In order to achieve these missions, SIRRIS has built national and international networking activities and specific capabilities.

In line with the structure of AGORIA and the federalized nature of research activities in Belgium, SIRRIS has adopted a federalized structure; namely SIRRIS Wallonia, SIRRIS Brussels, and SIRRIS Flanders. SIRRIS collaborates with universities, research centers, companies, associations and institutions in Belgium and Europe. While SIRRIS is historically anchored in the academic environment[25], it tends to adopt a more industry-oriented than academy-oriented approach. SIRRIS plays a role of interface between academic and industrial environments.

AGORIA and its services for Academy-Industry Technology Alliances

Before describing the services proposed by AGORIA for academy-industry technology alliances and contributing to minimizing *ex ante* specification, *ex post* monitoring, and/or *ex post* enforcement problems, it is important to notice that the technological sub-sectors represented by AGORIA are very diverse in terms of innovation and inter-organizational collaborations. For instance, while the Belgian aero space sector initiates broad, pan-European, and highly intensive research projects, the Belgian ICT sector mostly develops research projects with Belgian universities through spin-offs. In this section, our intent is not to describe in an exhaustive way all services proposed by AGORIA in each technological sub-sector but rather to illustrate how AGORIA may ease the management of academy-industry technology alliances through some services it proposes.

Services proposed by AGORIA to minimize the *ex ante* specification problems. The recourse to AGORIA services may enable academy and industry organizations to benefit from **information asymmetry reduction mechanisms** and, therefore, to reduce the costs of screening and selection of appropriate exchange partners *a priori*, and the costs of negotiating and writing agreements. It is at this first stage of contracting for technology that AGORIA and SIRRIS play the most important and determining role.

First *[reduced costs of screening and selection of appropriate exchange partners a priori]*, AGORIA has developed a deep knowledge about the academic and industrial environments at the national and international levels, and more particularly about the identity, activities, resources and capabilities of

[25] Moreover, SIRRIS shows specificities: in Liege, materials and applications, plastics and light metal substance; in Heverlee, sheet metal manufacture, flow study, production optimization; in Brussels, informatics and automation; in Diepenbeek, machining and surface treatment; in Gent, foundry.

academy and industry organizations respectively[26]. It can play a bridge role between those two environments; in other words, a role of "go between".

There is an acknowledgment of the gap between what is produced by the academy organizations and what will be used by industry organizations and of the fact that industry organizations do not let the academy organizations sufficiently know their needs.

The main *ex ante* difficulties stem from the fact that, on the one hand, industrials think that academics are strong theorists and, on the other hand, the academics have a kind of complex *"I am a theorist, I know things but they are not directly useful in industry"*. AGORIA plays the role of interface, encourages them to meet one another, to learn about the intellectual outcomes produced in each environment - given the different nature of research undertaken, it may pose strong difficulties for industry organizations to understand the intellectual outputs produced by academy organizations, and vice versa -, and in the best case it will support them in the design of future collaboration.

To this end, AGORIA and SIRRIS organize meetings and seminars intended to assemble organizations, to bring them closer, to inform them about new technologies, and to foster technological developments and sectorial initiatives in collaboration with academy organizations. For instance, regarding the mechatronical engineering sub-sector, 5 seminars are organized each year in order to introduce the last developments achieved by academic organizations and their application for industry organizations. As another example, the membership of AGORIA in the Massachusetts Institute of Technology (MIT) allows its members to have access to the research results developed by the MIT, to offer a research position to some of their employees for a limited period at the MIT, and to invite American specialists as speakers on the occasion of seminars. We can also mention the "technological watch" information diffused among the members via a weekly electronic mail. The experts of AGORIA and SIRRIS assemble daily information about trends, evolutions, pilot applications, new developments and technologies and translate them in clear and concise articles. In addition to the AGORIA and SIRRIS experts, members themselves contribute to the "technological watch" by searching for new and interesting ideas potentially useful for themselves or for the other members and by publicizing them via TECHNILINE[27] (a technologic innovation gate developed by SIRRIS and equipped with electronic mail). Finally, a last example is the "ILLICO PRESTO" data base, which has been developed by AGORIA and allows any research center and company to post its own research themes and/or to find more easily potential Belgian partners.

One might, therefore, say that AGORIA plays an undeniable role in the "technological guidance". It even goes further beyond the technological guidance since the research and know-how developed by SIRRIS research center favor the "technological rupture" - essentially in three categories of technologies: rapid

[26] Moreover, the knowledge that AGORIA has developed essentially about Belgian organizations can easily be complemented - if required - by the knowledge of its sister organizations in foreign countries about their own national members.

[27] It assembles information relative to technologies applied to their members' products and processes: technological watch, costs/benefits analysis on technological innovation implemented in firms, main trends prefiguring the tomorrow society, deep analysis about specific thematic. Access to TECHNILINE is free for members of SIRRIS and AGORIA.

prototyping, thixo-molding of magnesium, nanopowders - , which is necessary for the long-term competitiveness of Belgian organizations. The main purpose of these "technological ruptures" is to favor and be at the root of formation of existing and/or new organizations clusters around those three key technological axes. Thanks to all those activities, AGORIA and SIRRIS are able to develop "road maps" intended to define what the different technological sub-sectors will need in the future, how they will develop and, therefore, what are the academic research needed.

Second *[reduced costs of negotiating and writing agreements]*, AGORIA benefits in a way from the experience of 1.400 companies in terms of negotiating and writing agreements. It provides its members with individual advices from lawyers and experts in case of specific legal problems, with information related to strong legislative modifications, and with templates of contract available in multiple languages (French, English and German) such as a template[28] of licensing contract with European licensing partners and another template with non-European licensing partners. On the basis of these templates of contract, AGORIA may offer its support and expertise for the parties' negotiations regarding for instance the royalty rates or indexes.

In the specific case of academy-industry relationships, AGORIA can play its role of "go between" by encouraging industry organizations to visit academic research laboratories and/or by helping parties determine the types of contract they could negotiate and their respective contributions to the common projects. Indeed, AGORIA works on designing solutions regarding precisely the protection of the know-how and the implementation of the future know-how developed throughout the collaboration, and that on the basis of typical basic clauses intended[29] to address the specific problems met with academy-industry collaboration. Those basic clauses will be elaborated and customized thereafter throughout the contractual negotiation. It is important to notice that contractual writing and negotiation functions differ widely with the research contexts, the facts, the reality of the project, the involved partners, and therefore this leads to very diverse contractual designs. The critical difficulty is often to distinguish the knowledge developed throughout the collaboration from the preliminary individual knowledge (individual background) which has been necessary to carry out the project.

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[28] Those templates - which apply to the transfer of technology for use outside and/or inside the European Union and can be used as a basis for drafting pure know-how or pure patent licensing agreements, as well as for mixed know-how and patent licensing agreements - have been developed by ORGALIME; the European Engineering Industries Association defending the interests of the Mechatronical engineering, Electrical, Electronic, Metalworking and Metal Articles Industries. The objective of ORGALIME is three-fold: *"(1) to be the prime voice of the EU engineering industry on selected issues affecting a broad range of its members; (2) to provide to its members information on the activities of the European Union and international bodies of direct relevance to the operations of reengineering companies operating in the EU, (3) to promote relations between member federations/associations."* (Website: www.orgalime.org).

[29] On the one hand, there are clauses relative to the use of know-how and protecting industry organizations in a way that they prevent academic scientists to publish anything in link with the project before industry organizations had the ability to protect the know-how via patents. Some clauses may also prevent academic scientists to use the reached results in a project dedicated to favoring research for competitors and/or in the same industry. On the other hand, there are clauses relative to the exploitation of know-how and guarantying that academic scientists can use what they have learned from the project for learning and training ends. Indeed, in some cases, scientists want to pursue research on the basis of the collaboration results.

Services proposed by AGORIA to minimize the *ex post* monitoring problems. The recourse to AGORIA services may enable academy and industry organizations to benefit from **coordination mechanisms** and **control mechanisms** and, therefore, to reduce the costs of communicating new information, renegotiating agreements, coordinating activities, and controlling alliance partners' performance.

First *[reduced costs of communicating new information, renegotiating agreements, and coordinating activities]*, AGORIA's events and activities make its members share values, norms, role understandings, and common culture which may enhance and ease the coordination between members. In other words, it contributes to creating a convergence of expectations via socialization. This is allowed by their encouragement to attend congress, seminars (such as Isis-Consult or Steel Business Briefing), training dedicated to managers of SMEs and continuous training in management, to receive publications and specialized magazines or the daily electronic information letter, to be involved in e-learning projects, etc.

In the case of conflict between academy and industry organizations throughout the contractual duration, AGORIA can again play its role of "go between" in order to avoid severe and irremediable disputes. These conflicts can stem from divergences in terms of motives: whilst industrial organization focuses on what is marketable, academic organization focuses on what is scientifically innovating even if not marketable. Given those fundamental divergences, the project has sometimes to be put back on the rails.

The role of "go between" is even more significant when AGORIA and/or SIRRIS are/is themselves/ itself involved as proper entity(ies) in the collective research projects that simultaneously involve academy and industry. In those cases, clusters of organizations are formed in which each organization will benefit from the common research development. This makes preliminary negotiation particularly difficult and mediation by intermediaries such as AGORIA or SIRRIS highly valued. As examples, we can mention the Plan Marshall or CRAFT European research projects[30]. In those cases, the partners may benefit from the experience of AGORIA and SIRRIS in terms of monitoring the ongoing collaboration. SIRRIS can accompany[31] the collaboration in all the process from the conceptual project and technical feasibility analysis to final and tested prototype. Moreover, given its experience and quantitative techniques such as computer simulation of production line, SIRRIS has a high ability to detect the real causes in case of problems, to unveil the links between the causes, and to set up appropriate remedies. Being a center of excellence, SIRRIS is familiarized with challenges and daily problems in the technological industry and can, therefore, support academy-industry collaborations thanks to its specific solutions and its research practically oriented.

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[30] As first example, the Plan Marshall is an association between industry organizations of all size and from all regions, and academy organizations. This is a typical case where a mobilization is favored by third parties among academy and industry organizations of all size around specific themes. As second example, the CRAFT European research project are characterized by an operating mode relatively codified and straightforward thanks to the preliminary signature of the "consortium agreement" required by the European Commission and relative to a series of aspects, such as the exploitation of the results or the attitudes towards breaches.

[31] More specifically for metal components in synthetic and composite materials, for metallic constructions, structures, machines, or complete products composed of mechanic and electro mechanic sub-systems.

Another particularly successful initiative of AGORIA dedicated to bridging the gap between academic know-how and the implementation thereof in industrial applications, is the founding of the FMTC (Flanders' Mechatronics Technology Center)[32]. The FMTC is a center of excellence in mechatronics supported partly by the Flemish government and by 17 leading mechatronic companies in Flanders. This technology center is characterized by a rather unique business model of joint research projects and performs three types of projects: strategic basic research projects[33], collective research projects[34], and contract research projects[35]. This research center has for main objective to efficiently monitor the academy-industry collaborations in the mechatronical engineering industry. To this end, the FMTC is simultaneously industry-oriented (being partly financed by the 17 companies themselves, the activities of the FMTC are essentially driven by the effective needs of those companies in terms of research) and academic-oriented (the research projects involve in most cases PhD students and academic departments). The FMTC is an initiative guarantying a permanent and direct bridge between academic and industrial environments and offering a strong framework for monitoring the ongoing collaboration.

Second *[reduced costs of controlling alliance partners' performance],* SIRRIS has developed a wide park of measuring and test equipment and is accredited[36] by BELAC[37] (Belgian Accreditation Structure)

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[32] At the end of 2006, FMTC employed 16 full time highly educated-engineers, and 4 Ph.D researchers at the department of mechanical engineering, Univesity of Leuven, and had a membership of 17 member companies: Atlas Copco, Barco, Bekaert, CNH, Daikin, Dana, EADS, Gilbos, Hansen Transmissions, Alliance International (IPSO), LVD, Packo, Pattyn Packing Lines, Picanol, Teleservice Systems, Televic and Van De Wiele. *"The major share of FMTC activities in 2006 consisted of 19 research projects classified in three industry-driven research programs; machine servitisation, modular machines and high productivity machine"*. (Website: www.fmtc.be).

[33] *"These aim at the realization of scientific and technological breakthroughs that will form the basis for new products for the mechatronic industry in Flanders. The projects ware followed up by at least three of FMTC's member companies. The information from these projects is directly available for all members of FMTC, while the dissemination of the information to the broader mechatronic sector in Flanders occurs with a time-delay".* (Website: www.fmtc.be)

[34] *"These target the clustering and translation of academic know-how into innovative applications that can be used by several of the participating companies. At least three member companies need to be interested in a particular topic before the project is initiated. Participation in collective research projects is open to non-member companies if they provide added value to the project. By sharing the cost of collective research projects, the investment of the individual companies can be greatly reduced. Information from these projects is immediately available to the participating partners, while the other members of FMTC can obtain the information at the end of the project. The dissemination of the information to the broader mechatronic sector in Flanders occurs with a time-delay."* (Website: www.fmtc.be)

[35] *"These are specific projects for individual companies. These projects comprise both industry-oriented research, where a specific problem is analyzed, and prototype research, where FMTC uses its general technological knowledge to generate a specific prototype. Contract research projects are only conducted in FMTC fields of expertise on topics that are non-competitive with members activities."* (Website: www.fmtc.be)

[36] *"Economic structures are subject to a dynamic evolution forced by internationalization of trade. Confidence in conformity of products and services to stated specifications is of primary importance to eliminate technical barriers, to allow for competition and to achieve harmonization in trade agreement. In such a framework, it is essential to boost confidence of both the economic actors as well as of the authorities in charge of market control with regard to documents issued by conformity assessment bodies (laboratories, inspection and certification bodies). These documents need to be regarded as reliable technical passports for a product or a service."* (Website:http://economie.fgov.be/orgnization_market/belac).

[37] The BELAC *"is established according to legal stipulations and placed under the responsibility of the Federal Public Service Economy, SMEs, Self Employed and Energy. The royal decree of the 31st of January 2006 creating the BELAC system for accreditation of conformity assessment bodies has come into force on the 1st of August 2006.*

for some tests and measures. This allows a control and certification for the outputs of its members. This control is crucial since given the current trend for harmonization, all products and services have to be approved nationally and/or internationally. Moreover, SIRRIS possesses the Q*For quality label[38] for all its services such as training and consulting.

Beyond the technical control of activities and outputs by an intermediary institution such as SIRRIS, the control can be relative to the respect of established and fixed budget by involved parties. This latter financial control usually implies regular reports showing whether expenses exceed the established budget. In some cases, this control is performed by third parties[39].

Services proposed by AGORIA to minimize the *ex post* enforcement problems. The recourse to AGORIA services may enable academy and industry organizations to benefit from **reputation mechanisms** and **collective sanctions mechanisms** and, therefore, to reduce the costs of crafting necessary safeguards.

First *[reduced costs of crafting necessary safeguards]*, even if AGORIA and SIRRIS may not force an organization to opt for one or another partner, reputation mechanisms play a crucial role in academy-industry collaboration and are present at any time. The damage of ruined reputation by previous opportunistic behavior is particularly critical when the organization is of small size since it relies *a priori* even more on the network of AGORIA to make business and find potential partners. Indeed, opportunistic behavior can be easily detected by the industry federation and/or its members and the information regarding this behavior will be informally diffused through the network as a damaging signal. In a way, AGORIA plays a role of witness and may on this basis recommend one or another partner.

Second *[reduced costs of crafting necessary safeguards]*, while formal collective sanctions are not really applied[40], informal sanctions can threaten the academy or industry organizations having misbehaved. Among the main informal collective sanctions, there are the avoidance by AGORIA and SIRRIS of recommending the organizations having misbehaved as potential reliable partners and the avoidance by members of involving them in future collaborations. However, in the case of collective research project

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Because of this, the former accreditation bodies BKO, BELTEST and BELCERT cease to exist and BELAC has become the sole accreditation system in Belgium." (Website: http://economie.fgov.be/organization.market/belac).

[38] SIRRIS benefits from the Q*For Training and Q*For Consulting labels (Website: www.qfor.net). "*The Q*For methodology has been developed under the framework of the Leonardo da Vinci Programme. The Q*For Network contains basic information about Training Organizations from Belgium, Spain, and Czech Republic that have been evaluated and meet the following conditions: more than 80% of their clients are satisfied or very satisfied with the company, have show an adequate level of consistency in management skills, and have shown a good level of professionalism."*

[39] This control is in general performed by an auditing company.

[40] We can, however, mention the existence of formal sanctions in the statutes which regulate the relationship between AGORIA and its members; namely the exclusion from the industry federation. Can be excluded from the industry union, any organization that is responsible for a serious breach of its duties as member of the industry federation or that fails in laws of honor and probity.

with coordinator or management committee such as European research project[41], formal sanctions may arise through the revocation of the academy or industry organizations having misbehaved (i.e., predefined obligations are not fulfilled by the organizations) from the ongoing research project and the replacement by another organization.

DIFFICULTIES IN ACADEMY-INDUSTRY TECHNOLOGY ALLIANCES	**ROLE POTENTIALLY PLAYED BY INTERMEDIARY INSTITUTIONS (I.I.)**	**IN PRACTICE: the case of AGORIA**
Ex-ante specification		
1. costs of screening and selection of appropriate exchange partners *a priori* are increased	I.I. may make the bridge between the academic and industrial environments via two channels: (1) "translation" of the intellectual assets produced in the two environments and (2) information about the activities previously and/or currently undertaken by potential future partners in the two environments = **information asymmetry reduction mechanisms**	(1) AGORIA plays the role of interface between the academy and industry organizations and encourages them to meet one another, to learn about the intellectual outcomes produced in each environment (e.g., membership of AGORIA in the MIT, technological watch of TECHNILINE, ILLICO PRESTO data base) (2) AGORIA has developed a deep knowledge about the academic and industrial environments at the national and international levels: identity, activity, resources and capabilities of academy and industry organizations
2. costs of negotiating and writing the contractual agreement are increased	I.I. may enable organizations to benefit from its own experience regarding negotiation and writing of academy-industry technology alliances = **information asymmetry reduction mechanisms**	AGORIA makes its members benefit from the experience of its lawyers and experts in terms of academy-industry contractual dimensions: individual advices, templates of contract, typical clauses regarding the protection of the know-how and the implementation of the future know-how developed throughout the collaboration
Ex-post monitoring (particularly if beyond simple exploitation of the transferred knowledge)		
1. costs of communicating new information, renegotiating contractual agreement, and coordinating activities are increased	I.I. may ease the coordination thanks to the roles, role relationships, conventions it specifies and dictates, and thanks to the events it organizes to help diffuse norms and values = **coordination mechanisms**	AGORIA creates a convergence of expectations, norms, values, role understandings and culture via socialization (e.g., congress, seminars, training, publications) AGORIA plays a critical role of "go between" if involved in the monitoring of ongoing collective research project such as CRAFT projects, FMTC

[41] The sanction is even heavier in the case of European research project since the organizations having misbehaved must reimburse the money that they received in advance and sometimes complements.

2. costs of controlling the partners' performance are increased	I.I. may inspect activities of partners (formal)/ other members of I.I. may detect those that do not conform the I.I. culture (informal) = **control mechanisms**	SIRRIS inspects the activities via a wide park of measuring and test equipment (it is accredited by BELAC and it possesses the Q*For quality Label)
Ex-post enforcement		
1. costs of crafting necessary safeguards are increased	I.I. may use **reputation mechanisms**	AGORIA and its members can easily detect opportunistic behaviors adopted by one or another member and diffuse rapidly the information about these behaviors through the network as a damaging signal
	I.I. may use **collective sanctions mechanisms**	AGORIA can avoid recommending an academy or industry organization having adopted an opportunistic behavior (informal sanctions) AGORIA can exclude members from the industry federation and/or from the collective research project (formal sanctions)
	I.I. may implement **arbitration mechanisms**	Not applicable in the case of AGORIA

CONCLUSION

In the present paper, our purpose was to shed light on the role of facilitator that intermediary institutions such as AGORIA - the Belgian Technology Industry Federation- may play in academy-industry technology alliances. We have shown that academy-industry collaborations have to deal with stringent difficulties arising from their divergences in terms of motives, incentives, constraints, and organizational culture. Those difficulties can appear at each stage of contracting for technology - *ex ante* specification of property rights, *ex post* monitoring of the actual collaboration, and *ex post* enforcement of the contractual terms- and significantly magnify the risks of conflicts in the academy-industry collaboration. It becomes clear that face to face relationships between academy and industry organizations are likely to experience significant transaction costs.

At each contractual stage, we exposed the regulatory mechanisms potentially proposed by institutional intermediaries that can help to deal with the stringent difficulties met throughout the academy-industry collaborations. To this end, we proposed, first, a theoretical typology of regulatory mechanisms potentially provided by intermediary institutions - information asymmetry reduction mechanisms, coordination

mechanisms, control mechanisms, reputation mechanisms, collective sanctions mechanisms, arbitration mechanisms - and, second, we developed the way those mechanisms contribute to mitigating the collaboration difficulties of academy-industry technology alliance. Finally, we illustrated our arguments via an exploratory case study on a specific type of intermediary institutions, namely the industry federation AGORIA.

References

Abrahamson E., Fombrun C.J. [1992]. "Forging the iron cage: Interoganizational networks and the production of macro-culture", *Journal of Management Studies,*29, pp. 175-194.

Adams J.D., Chiang E.P., Starkey K. [2001]. "Industry-University Cooperative Research Centers", the Journal of Technology Transfer, 26(1-2), pp. 73-86.

Anand B.N., Khanna T. [2000]. "The Structure of Licensing Contracts", *Journal of Industrial Economics*, 48, pp.103- 135.

Blumberg B.F. [2001]. "Cooperation Contracts between Embedded Firms", *Organization Studies*, 22(5), pp. 825-852.

Brousseau E., Fares M., Raynaud E. [2004]. " The Economics of Private Institutions", 8th Annual Conference of the New Institutional Economics, Institutions and Economic and Political Behaviour, Tueson Arizona, USA.

Brousseau E., Coeurderoy R. [2005]. "Combining institutional and contractual mechanisms to control transactional hazards related to transfers of technology: an empirical analysis of supervision provisions in technology licensing agreements"*, International Journal of the Economics of Business*, 11(3): 425-446.

Brousseau R., Fares M. [2000]. « »The incomplete Contract Theory and the New-Institutional Economics Approaches to Contracts : Substitutes or Complements ?", in Ménard C., eds., *Institutional, Contracts, Organizations, Perspectives form New-Institutional Economics, Edward Elgar Pub.*

Caloghirou Y., Tsakanikas A., Vonortas N.S. [2001]. "University-Industry Cooperation in the Context of the European Framework Programmes", *Journal of Technology Transfer*, 26(1-2), pp. 153-161.

Camerer C., Vepsalainen A. [1988]. "The Economic Efficiency of Corporate Culture", *Strategic Management Journal,* 9, pp. 115-126.

Coeurderoy R. and Murray G. [2005]. "Legal Environments and First International Market Entries: evidence on the internationalisation of new technology-based firms in three European Countries", in Spithoven A. and Teirlinck P. (eds.), *Beyond Borders: Internationalisation of R&D*, Chapter 6, Elsevier.

Cyr D. [1999]. "High Tech, High Impact: Creating Canada's Competitive Advantage through Technology Alliances", *Academy of Management Executives*, 13(2), pp. 17-28.

Dasgupta P., David P. [1992]. Toward a new economics of science, Stanford, CA: Stanford University, Center for Economic Policy Research.

De Clercq D., Dakhli M. [2003]. "A Cross-Country Comparison of Innovation: the Role of Human Capital and Social Capital", in Sptihoven A. and Teirlinck P. (eds.), *Beyond Borders: Internationalisation of R&D*, Chapter 7, Elsevier.

Foss K., Foss N. [2006]. "Entrepreneurship, transaction costs, and resource attributes", *Entrepreneurship, transaction costs, and resource attributes,* 1(1-2), pp. 53-60.

Gibbons M., Limoges C., Nowotny H., Scwartzman S., Scott P., Trow M. [1994]. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Society,* Sage, London.

Ginarte J.C., Park W.G. [1997]. "Determinants of Patent Rights: a cross-national study", *Research Policy*, 26(3), pp. 283-301.

Gulati R., Nohria N., Zaheer A. [2000]. "Strategic Networks", *Strategic Management Journal*, 21 (3), pp. 203-215.

Hadfield G.K. [2000]. "Privatizing Commercial Law: lessons from the middle and the digital ages", *Social Science Research Network,* Working Paper, 195.

Hagedoorn J., Cloodt D., van Kranenburg H. [2005]. "Intellectual property rights and the governance of international R&D partnerships", *Journal of International Business Studies*, 36, pp. 175-186.

Hennart J.F. [1988]. "A Transaction Costs Theory of the Equity Joint Ventures", *Strategic Management Journal,* July and August, pp. 361-374.

Henisz W.J. [2000]. "The Institutional Environment for Multinational Investment", Journal of Law, Economics, and Organization, 16(2), pp. 334-364.

Hirschman A.O. [1970]. *Exit, voice, and loyalty. Responses to decline in firms,organizations and states,* Cambridge, MA: Harvard University Press.

Jaffe A.B. [1989]. "Real Effects of Academic Research", *The American Economic Review,* pp. 957-970.

Jones C. [1996]. "Careers in project networks: the case of the firm industry", in M.Arthur and D. Rousseau (eds.), *The boundaryless career*, pp. 58-75, New York: Oxford University Press.

Jones C., Hesterly W.S., Borgatti S.P. [1997]. "A General Theory of Network Governance: Exchange Conditions and Social Mechanisms", *the Academy of Management Review,* 22(4), pp. 911-945.

Kaufmann A., Tödtling F. [2000]. "Science-Industry Interaction in the Process of Innovation: the importance of boundary-crossing between systems", Paper presented at the 40th Congress of the European Regional Science Association, Barcelona 2000.

La Porta R., Lopez-de-Silanes F., Schleifer A., Vishny R. [1999]. "The Quality of Government", *Journal of Law, Economics and Organization*, 15, pp. 222-282.

Lei D., Slocum J.W., Pitts R.A. [1997]. "Building cooperative advantage: managing strategic alliances to promote organizational learning", Journal of World Business, 32(3), pp. 203-223.

Link A.N., Scott J.T., Siegel D.S. [2003]. "The economics of intellectual property at universities: an overview of the special issue", *International Journal of Industry Organization,* 21, pp. 1217-1225. ()

McMillan J., Woodruff C. [2000]. "Private Order under Dysfunctional Public Order", *Social Science Research Network,* Working Paper, 189.

March J.G., Simon H. [1958]. *Organizations*, John-Wiley, New York.

Meyer-Krahmer F. [1992]. "The effects of new technologies on employment", Economics of Innovation and New Technology, 2(2), pp. 131-149.

Monteverde K. [1995]. "Technical Dialog as an Incentive for Vertical Integration in the Semiconduction Industry", *Management Science,* 41(10), pp. 1624-1638.

Mowery D.C., Rosenberg N. [1989]. *Technology and the Pursuit of Economic Growth*, Cambridge: Cambridge University Press.

National Science Foundation [1982]. "University-Industry Research Relationships: Selected Studies, Washington D.C.: US Government Printing Office.

National Science Board [1996]. "Science and Engineering Indicators", Washington D.C.: US Govt. Printing Office.

North D. [1990]. *Institutions, Institutional Change and Economic Performance*, Cambridge, Cambridge University Press.

Oliver C. [1991]. "Strategic Responses to Institutional Processes", *Academy of Management Review*, 16(1), pp. 145-179.

Ostergard R.L. [2000]. "The Measurement of Intellectual Property Rights Protection", *Journal of International Business Studies*, 31(2), pp. 349-360.

Oxley J.E. [1997]. "Appropriability Hazards and Governance in Strategic alliances : a Transaction Cost Approach". *Journal of Law, Economics and Organization*, 13(2), pp. 387-409.

Oxley J.E. [1999]. "Institutional Environment and the Mechanisms of Governance : the Impact of Intellectual Property Protection on the Structure of Inter-Firm Alliances", *Journal of Economic Behaviour and Organization*, 38(3), pp. 283-309.

Phan P.H., Siegel D.S. [2006]. "The Effectiveness of University Technology Transfer: Lessons Learned, Managerial and Policy Implications, and the Road Forward", Journal of

Phillips D. [1991]. "New Alliances for Policy and the Conduct of Research and Education", International Journal of Technology Management, 6, pp. 478-487.

Pisano G.P. [1988]. *Innovation through markets, hierarchies and joint ventures: technology strategy and collaborative arrangements in the biotechnology industry*, unpublished PhD dissertation, University of California, Berkeley, CA.

Pisano G.P. [1989]. "Using Equity Participation to support Exchange: evidence from the biotechnology industry", *Journal of Law, Economics, and Organization*, 5(1), pp. 109-126.

Polanyi M. [1962]. *Personal Knowledge: Towards a Post-Critical Philosophy*, New York: Harper and Row.

Pouder R. and St John C. [1996]. "Hot spots and blind spots: geographical clusters of firms and innovation", Academy of Management Review, 21(4), pp. 1192-1225.

Reddy N.M., Roa M.V.H. [1990]. "The Industrial Market as an interfirm organization*", Journal of Management Studies*, 27, pp. 43-59.

Richman B.D. [2004]. "Firms, Courts, and Reputation Mechanisms: towards a positive theory of private ordering", *Columbia Law Review*, 104, pp. 2328- 2368.

Sampson R. [2005]. "Experience Effects and Collaborative Returns in R&D Alliances", *Strategic Management Journal*, 26, pp. 1009-1032.

Santoro M.D., Gopalakrishnan S. [2001]. "Relationship Dynamics between University Research Centers and Industrial Firms: Their Impact on Technology Transfer Activities", *Journal of Technology Transfer*, 26 (1-2), pp. 163-171.

Siegel D.S., Waldman D., Link A. [2003]. "Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study", *Research Policy*, 32, pp. 27-48.

Teece D. [1986]. "Profiting from Technological Innovation : Implications for Integration, Collaboration, Licensing, and Public Policy"*, Research Policy*, 15, pp. 285-305.

Tijssen R.J.W., Korevaar J.C. [1997]. "Unravelling the cognitive and interorganisational structure of public/private R&D networks: a case study of catalysis research in the Netherlands", *Research Policy*, 25, pp. 1277-1293.

Williamson O.E. [1991]. "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives", *Administrative Science Quarterly*, 36, pp. 269-96.

Williamson O.E. [1996]. *The Mechanisms of Governance*, Oxford University Press.