

# **FACIO UT FACIAS: ASSOCIATIONAL CONTRACTS AND INNOVATION**

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## ***Abstract***

The paper takes a new look at the puzzle of what type of contracts are suitable for governing innovation, with particular attention to inter-firm networks. It employs a conceptual framework that integrates organizational theory of formal coordination with the prevailing economic perspectives on contracting, providing a new way of analyzing contracts according to the intensity at which they incorporate market-like mechanisms, hierarchical and bureaucratic mechanisms, and a usually neglected array of associational and democratic mechanisms, as related to the level of uncertainty. The framework is empirically applied to content-analyze the written agreements regulating inter-firm alliances for innovation in a comparative case study approach.

## **1. Introduction**

Although the production of innovation can be and has been to some extent routinized, at least in terms of search activities (Kilduff and Sawyer 2003), the generation of Schumpeterian innovation, that may make a significant difference in performance, typically rests on the discovery of new combinations of resources and activities, hence, of tasks and cooperation patterns that cannot be described ex-ante but need to be defined ad hoc (Burns and Stalker 1961; von Hippel 1988). This circumstance is seen as problematic, especially in economics, as it is supposed to generate ‘contract incompleteness’. In fact, the now prevailing economic view of contracting under uncertainty, is that in those conditions contracts are ‘incomplete’, for the cost of writing and enforcing ‘complete descriptions’ of tasks and actions, and for the impossibility of foreseeing all relevant contingencies (Williamson 1975; Hart 1988).

In the organizational economics tradition, we can single out basically three types of solution to this problem, which correspond to as many ways to understand the concept of ‘relational contract’. The first solution proposes that if the structure of the game is sufficiently cooperative, parties see net advantages in cooperating, agreements can be ‘self-enforcing’ and there is no need for formal, court-enforceable contractual protection (Klein 2000). That’s why many economists tend to see ‘relational contracting’ as typically informal (Baker, Gibbons and Murphy 2002). Others propose that when there is the possibility of a conflict of interests (or even the potential of opportunism) then the solution consists in the assignment of ‘residual’ (i.e. contractually unspecifiable) decision and reward rights to one party, so that the uncertainty about what should be decided is resolved by specifying who will decide rather than what will be done. Stated differently, the solution lies in the establishment of a hierarchical order, based on authority or on the power of one party (Williamson, 1975; Grossman and Hart 1986). The third solution proposes that the substantive, transactional part of the contract be complemented, or even be substituted, by a ‘relational contract’ in the sense of a contract centered on the relations among parties rather than on tasks: a ‘constitutional contract’ intended as a set of norms and rules, partly provided by the social context and enforced by social control

(reputation), partly set up by the interested parties themselves and incorporated into their formal contract, on how they will regulate their ongoing cooperation (Macneil 1978; Macauley 1963; Goldberg 1976; Ring and Van de Ven 1992).

We shall first point out some limitations of the three solutions just described, then expand on this line of thinking, integrating more organization theory into the argument, in a way that can overcome those limitations. These tasks will be carried out respectively in Sections 2 and 3, which, taken together, represent the theoretical part of this paper. The next two sections test the validity of our concepts in the context of a highly innovative industry. In particular Section 4 sets the stage by describing relevant features of the drug discovery process and of biotechnology alliances; Section 5 carries out an in depth comparative case study of contractual agreements in four alliances. Section 6 presents conclusions.

## **2. Limits of relational contracting under uncertainty**

In the economics of contracts, typical propositions have been that the higher the uncertainty, the lower the optimal degree of completeness, articulation and formalization of contracts (Bernheim and Whinston 1998) and that the lower the cooperativeness of the game (the higher the competitiveness) the higher the optimal level of formalization and of specification of contingent claim clauses (Klein 2000). These propositions go along with the theorem that, if uncertainty and conflict of interests are both simultaneously present at high levels, contracts fail altogether as a mode of regulation, because of their ‘incompleteness’, and need to be complemented by extra-contractual governance mechanisms, either internal and based on authority or power (Williamson 1975, 1979; Grossman and Hart 1986; Hart 1988), or external and based on norms (Macauley 1963; Al Najjar 1995)

A significant anomaly with respect to that framework is that in reality very uncertain, innovation oriented collaborations are often conducted across firms and are regulated by some contract. Even more puzzling, very simple and short contracts seem to be able to regulate very complex collaborations. This holds true even when the partners cannot be assumed to share the same culture and norms as they have little experience of previous collaboration with each other or they engage in very different fields of activity. More precisely, a few interesting empirical research conducted by economists on contract clauses in innovative alliances, have shown that, rather than entering into possibly relevant ‘myriads of details’ about future activities, contracts tend, rather, to focus on few core matters (Lerner and Merges 1998).

The organizational theory of coordination also highlights uncertainty and conflict of interests as (countervailing) predictors of the effective intensity of different coordination mechanisms. Organizational coordination theory, as applied to contracts and coordination among legally independent parties, on one side has maintained that the governance of innovative collaborations needs to be highly informal and relational, precisely for preserving adaptive capacity; on the other side, it has acknowledged that conflict, competition and the potential for opportunism all call for enforceable contracts and formalization (Ring and Van de Ven 1992; Ouchi and Bolton 1988; Grandori 1997; Gulati and Singh 1998).

If we were to accept those conclusions, we should model the problem of optimal contractual configuration as an optimal degree of formalization and completeness, resulting from the opposite pulls of

the two predictors. If both are high, we should expect an intermediate level of formalization and completeness; very low formalization/completeness if only uncertainty is high; very high formalization/completeness if only conflict is high; and possibly no contract at all where neither uncertainty nor conflict are present.

There is a problems with this view, though; and there are better solutions than just trading off the loss in enforceability with the loss in flexibility. If and where the relational and informal coordination 'solution' is intended just as 'leaving the contract incomplete' because contingencies cannot be foreseen, thereby gaining in flexibility (Loasby 1976), that sounds more as a renounce to solve the problem than as a solution. A second best, at best, in the lack of any good alternative. If and where the mechanisms that make these contracts work are specified, they are identified in either calculative 'incentive-based' cooperation, or in non-calculative 'norm-based' cooperation. The problem is that both such 'self-enforceable' and 'socially-enforceable' types of contracts require relatively low levels of uncertainty: either it should be known what relevant actions and payoffs are, or it should be known what behaviors are appropriate and, additionally, it should be observable whether they have been implemented (Grandori 2006). So, again, this is no satisfactory solution to the problem of regulating very innovative and uncertain collaborations.

There are some problems also with relational contracting as 'constitutional contracting' intended as a system of rules (Vanberg 1994; Goldberg 1976); even though we shall accept, emphasize and make use of some core insight provided in those political constitutional economics contributions. We shall accept and emphasize the point that a central difference between modes of contracting is between the regulation of tasks and transactions or the regulation of an ongoing relation; and that this difference is by no means coterminous with that between formal and informal regulation. However, to reduce these type of contracts capable of 'regulating the on going cooperation among partners' to a system of rules obscure two things. First, it obscures that the identity of parties matters in partnerships, and cannot be defined only by means of rules of access (no more than we could define a rule for selecting a marriage partner). Hence, the procedural contract should be complemented by a substantive associational contract on who the parties are and what resources they are committing to the relation (Grandori 2005). Second, not all kinds of rules perform nicely under uncertainty. At the opposite, organizational research has generally highlighted the 'rigidity' of this component of bureaucracy. A solution to this problem, i.e. a way to achieve 'flexible formalization' capable of coordinating action under uncertainty, is to use only high order, content free, framing rules of the game, specifying how to make decisions (Grandori 1999, 2006; Grandori et al. 1999), as contrasted with substantive rules, as 'programmes' or 'routines', specifying which actions to perform under what circumstances (Simon 1960, 1976; Cohen et al 1996).

Hence, relational contracting in all its usual meanings is not a fully satisfactory form of contracting for innovation.

### **3. Associational contracts for innovation**

The solution to the puzzle of contracting under uncertainty can be solved by disentangling the notion of contract from that of market-like coordination, and the notion of organization from that extra-contractual

governance. In principle, any coordination mechanism can be specified in a contract: from a price to the use of arbitration authority, from voting schemes to consultation and negotiation procedures, to rules to be followed in production and exchange. Contracts can be analyzed according to the extent they embody those qualitatively different mechanisms, rather than according to some linearly varying dimensions (such as completeness, articulation or formalization). In this perspective, the rightly posed question for understanding and designing contracts for innovation would be: which collection of clauses would compose a formal and enforceable, but flexible and open contract, capable of locking in resources without unduly constraining behaviors? which combination among coordination mechanisms can bring it about?

A first important requirement for such a contract seems to be that it *should not* define what contracts are typically supposed to define, namely, which actions are to be taken under what contingencies. If so, then the contract would in fact become rigid (in the lack of omniscience). Does this amount simply to saying that contracts *should be*, to some extent, incomplete, taking into account the cost of foresight, writing and enforcement (Loasby 1976; Bernheim and Whinston 1998)? We think that this is not the entire story; and that we should look at what *is* in the contract, rather than only to what is left out; as the former may explain the latter.

Organization theory indicates some control modes that are more compatible with uncertainty than the specification of actions and the control by monitoring deviations from promised actions. A first alternative is control by results, or outputs, rather than control on actions or inputs (Locke 1996). A contract on outputs to be reached or delivered is more flexible as it does not prescribe how to reach them (leaves flexibility at the level of actions). However, it is also known that control ‘by objectives’ and ‘goal setting’ is dangerous in very innovative activities, such as most research activities, as it generate a ‘tunnel effect’ and actually requires that what is to be discovered is already known (Locke 1996). Hence, the modes of control that may be expected to be effective where both inputs and outputs are unspecifiable should be abstract and content-free, general missions rather than precise goals, principles rather than routines, decision procedures rather than actions and results, rights on residual results rather than on substantively specified outputs. In fact, empirical research on what is there in the contracts that regulate innovative collaborations consistently shows that they focus on a few core matters, which are in fact different in kind with respect to actions, contingencies and specified outputs. Contracts for innovation are all focused on the terms of association between actors and the specification of their rights: who the participants are, which resources they will contribute, what the limits and liabilities of these commitments are, under what conditions and how the participants can withdraw those resources, who owns what, how the ‘surplus’ and output resulting from collaboration (independently of its specific content) will be distributed (Suchman 1994; Kaplan and Strömberg 2003; Grandori and Furlotti 2006).

These elements define what can be called an ‘*associational contract*’ (Grandori 1999, 2007) as their main purpose is to constitute an association of resources. It can be an association of financial capital (a joint-stock or incorporation contract), or of human capital (a partnership, or an association of people), with or without common ownership of technical assets, and with varying levels of other property right sharing

(Daems 1983; Grandori 1997; Brouwer 2005). As these authors all highlight, the presence and extent of property right sharing further qualifies and distinguishes the intensity and properties of those associational contracts: joint ventures and consortia are stricter associational contracts, and are more suitable to regulate collaborations for innovation, than, say, a commercial associational contract regulating the common use of a brand. Hence our conjecture is that the key feature that distinguishes associational contracts for innovations from other associational contracts, is rooted in the distinction between resources and the services that they might deliver (Penrose 1959): such contracts do not and should not stipulate specific common actions, but do and should stipulate the association of resources from which actions, unknown at the moment of contract, will derive. Let's then further qualify collaborative contracts for innovation as *resource-based* (as opposed to action-based) associational contracts (Grandori and Furlotti 2006).

Even in the case of tight, resource-based, proprietary associations, though, the agreement of associating resources needs to be complemented by an agreement on how decisions on their use will be taken, whatever these uses might be, and precisely because it is not known which they might be, that is, by a 'constitutional contract' on which coordination mechanisms will be used and how decisions will be taken. Basic coordination mechanisms include at least price-like and incentive-based coordination, hierarchical coordination (more or less delegated), joint decision making (team-like, negotiated or representation-based), and rules (varying in their degree of formality and generality) (Miller 1992; Fiske 1992; Grandori 1999). The effectiveness of such mechanisms is known to be extremely sensitive to the levels of uncertainty. In particular, it is known that the very high level of uncertainty connected to the production of innovation (uncertainty about what activities and transaction a collaboration is all about; what the best actions are, even after the relevant contingencies are observed; what the value of the output is going to be, or even what the value is once the output has been attained) leads both price-like and authority-based coordination to failure; as well as it leads to failure also action-specific, detailed rules (programmes and routines, task and job descriptions, contingent planning). Two among the basic coordination mechanisms emerge as more robust under uncertainty: high level, general, mission-like, constitutional rules of the game, as distinguished from detailed, action specific task descriptions; and joint decision making procedures, (especially representative multi-party decision making, if uncertainty also includes variability of conditions and decisions are to be made efficiently and the relevant knowledge for selecting actions is distributed) (Miller 1992; Grandori 1999).

On the basis of the above premises, our hypothesis is that the optimal contractual configuration for innovation, i.e. contracts capable of governing cooperation under radical uncertainty (activities and transactions to be discovered) and high conflict potential (future judgments on best actions may always differ), are formal (enforceable) but flexible (adaptive). The formal, enforceable core of these contracts is composed by a *'strictly associational' part - specifying the fundamental obligations and rights as to resource commitment and outcomes appropriation (rather than tasks) - and of a 'strictly constitutional' part specifying the fundamental decision rules and procedures (rather than substantive action plans).*

A second hypothesis is that the property rights intensity of contracts for innovation should not imply a high intensity hierarchical coordination, based on authority or on unilateral power. These contracts should exhibit 'high hierarchical intensity', as often assumed in research on contracts inspired by organizational economics. As organization and coordination theory ever since showed, where pooled resources (in particular knowledge resources) are distributed across different partners and problem solving is complex and innovative, coordination by hierarchy and plans is not effective, but team-like and horizontal coordination should prevail. Hence, *we expect that in contracts for innovation the property right sharing associational agreement, is complemented by a constitutional agreement to use multi-party negotiation and voting procedures (Grandori and Furlotti 2006), thereby instituting a 'democratic' order (Lammers 1993) rather than a hierarchical order.*

In sum, we expect effective contracts for innovation to be associational (rather than transactional), resource-based (rather than action-based), constitutional (rather than operational), democratic (rather than hierarchical) and, on those matters, to have the logic of a complete contract stating commitments to be honored 'no matter what' (rather than incomplete). More operationally, in analyzing the clauses and provisions contained in contracts for innovation, we expect to find that they approximate the following profile:

- a low incidence of both market-like and bureaucratic coordination;
- a high incidence of proprietary associational rights and obligations;
- a low degree of articulation and a small number of contingent clauses;
- a high degree of completeness, realized thanks to a contractual specification of decision making procedures (rather than decision content);
- a high incidence of strictly constitutional, procedural rules of decision making;
- decision procedures approximating a democratic order (joint direct or representative decision making, negotiation), rather than a hierarchical order (decision making rights assigned to one party).

It can be finally argued that those mechanisms, not only fit conditions of high uncertainty and high conflict potential, but are also complementary to each other. In particular, the foundation of an association between parties would be incomplete without the specification of how to make the ad hoc decisions on actions and vice versa; hence the associational and constitutional components of those contracts are strictly complementary. Additionally, the proper working of these mechanisms, that provide flexibility, is complementary with a low ex-ante description of tasks and contingencies, and of the substantive terms of exchange (good and service transfers and prices); that is, with limited intensity of the bureaucratic and market components of contracts. Finally, associational and constitutional governance is complementary with a multi-party, rather than a hierarchical, allocation of decision rights, in order to provide adequate incentives to invest resources for all parties, and to mobilize all relevant competencies for taking high quality decisions in ill-structured problems.

#### **4. Research design**

The particular empirical setting we have selected for an explorative assessment of whether actual contracts conform to the predicted model, is that of technology collaborations in pharmaceutical biotechnology. Below we provide a brief description of the basic characteristic of this industry. Our purpose is to make clear why this setting almost archetypically exhibits those conditions – high uncertainty, distributed knowledge, conflict of interests – which should be conducive to an intensive use of resource-based associational contracting.

Alliances are a common method of organizing pharmaceutical R&D. This trend has received a dramatic push from the biotechnology revolution (Gilsing and Nooteboom 2006). One of the consequences of this revolution has been the sprouting of small-sized research laboratories, based on one or two promising biotechnology projects, with a much higher scientific productivity than large incumbent firms. Thus, as a result of the biotechnology revolution, large established pharmaceutical companies found that certain promising knowledge resources were in scarce supply within their boundaries, and had to look for them among small and specialized firm (McKelvey and Orsenigo, 2004). This natural complementarity also concealed the seeds of attrition between potential partners. For example, these firms tended to specialize in specific technologies, which were particularly useful in the early stages of the discovery process. Yet some of them cultivated the ambition of gradually reaching out into biomanufacturing and global commercial distribution, and eventually a few succeeded.

Three features of the drug discovery process are salient in relation to alliancing. First the whole process is extremely long and costly.<sup>1</sup> Second, the attrition rate (the number molecules discarded during the process) is extremely high and is particularly severe during the very early stages (see Table 1 in the Appendix). In other words, the early stages of the process are fraught with uncertainty. Third, given the difficulty of generating new products, once a new drug hits the market it keeps being sold for 10-20 years and sometimes even longer, with cash flow profiles in the black from second year and growing for about a decade (Grabowski et al 2002: 20). These three characteristics favor partnering, in order to transfer risk from firms specializing in the early stages of the discovery process to pharmaceutical companies.

### ***Sampling***

The research design is a comparative case study, where cases are selected with purposes of analytic rather than statistical generalization (Yin 1984). All considered alliances are research-based, innovative projects<sup>2</sup>. However they differ in some respects: B and C were entered at earlier stages of the discovery process and involved relations between biotechnology research firms only; while the other two were entered in later, more applied stages and involved more vertical relations between biotech firms and downstream pharmaceutical firms. Alliances B and C can then be conceived as more uncertain and more characterized by resource pooling interdependence, while A and D as less uncertain and involving more transactional

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<sup>1</sup> It lasts on average about 14 years and it costs about 802 billion US\$ (DiMasi 2001).

<sup>2</sup> The contracts analyzed have been provided by Recombinant Capital (Recap), a San Francisco Bay Area-based consulting firm specializing in biotechnology alliances, whose help is gratefully acknowledged. The contracts were originally submitted to the US Securities and Exchange Commission as part of the firms' 8K, 10K, 10Q and S-1 filings.

interdependence. In addition, alliances B and A are characterized by very balanced resource contributions, while D and C were more asymmetric. Table 2 recaps the main characteristics of the alliances in the sample.

For the reasons exposed earlier, it is particularly difficult to establish, in general, whether a biotechnology alliance is successful. With regards to our sample we can say that we have evidence of progress of the collaboration through successive stages of the drug discovery.

#### *A - Kirin-Nuvelo*

Alliance A is established in March 2005 between Nuvelo Inc. a California-based biopharmaceutical company, and the pharmaceutical division of Kirin Brewery Company of Japan. The companies were parties to a prior collaboration. This alliance is designed to develop and commercialize products for the treatment of inflammatory diseases, based on a particular protein (referred to as 17206) that had been identified in the prior collaboration. Under the terms of the agreement Nuvelo will lead worldwide development, manufacturing and commercialization activities. All expenses and operating profits will be shared in a 60 (Nuvelo) /40 (Kirin) ratio while the parties are both actively collaborating under the agreement. Kirin is not expected to carry out any particular task, except if Nuvelo so requests and Kirin accepts. The contract is open ended, inasmuch as under a normal scenario the alliance would continue as long as either party develops or commercializes any product.

#### *B - Biosearch-Vicuron*

Alliance B is established in February 1998 between Biosearch Italia S.p.A. and Versicor, Inc. of California. The goal of the alliance is to exploit the complementary know how of the two firms. In practice, Biosearch contributes the natural product antibiotic leads and Versicor will contribute skills and efforts to optimize those leads. All primary care antibiotics derived from the collaboration will be partnered to large pharmaceutical companies with the revenues shared 50 - 50 between the two companies. Rights to the hospital antibiotics generated will be exclusive to Biosearch for Europe and exclusive to Versicor for North America. Hospital antibiotic rights for all countries outside Europe and North America will be jointly owned with the parties sharing the revenues 50 – 50. Initially, more than 15 novel antibacterial natural product leads will be contributed to the collaboration. The contract envisages a development program term of five years, extendable by mutual agreement. . The collaboration between Biosearch Italia S.p.A. and Vicuron Inc. went on for about five years, until the two companies merged on March 3, 2003. Later, the merged entity was acquired by Pfizer.

#### *C - Sunesis-Biogen IDEC*

The partners to alliance C, initiated in August 2004, are Sunesis Pharmaceuticals, Inc., a clinical-stage biopharmaceutical company of California, and Biogen Idec of Massachusetts, a biotechnology corporation. This collaboration is the second between the companies, after one initiated at the end of 2002. This alliance is designed to discover and develop small molecule cancer therapeutics targeting a family of cell signaling enzymes. The companies will apply Sunesis' proprietary fragment-based drug discovery technology. Under the terms of the agreement, Sunesis will receive upfront a \$7 million technology access fee and \$14 million equity investment, research funding, pre-commercialization milestone payments, and

royalty payments based on product sales. Biogen Idec acquires exclusive licenses to develop and commercialize the compounds resulting from the collaboration. Sunesis retains an option to participate in the co-development and co-promotion of several products that may emerge from this collaboration. A team of Biogen Idec and Sunesis scientists will work together on the identification, optimization, and development of kinase drugs. The contract establishes a period of four years for research activities (extendable for up to an additional two years), while ongoing activities of the alliance shall last until there are royalty payment obligations.

#### *D - Alexion-P&G*

Alliance D is established in January 1999 between Alexion Pharmaceutical Inc. a Connecticut-based, medium-size biotechnology firm, and a subsidiary of the health care division of Procter & Gamble Company. This alliance is designed to develop and commercialize Alexion's lead drug candidate pexelizumab and to assess it in a few acute cardiovascular indications. Procter and Gamble will receive worldwide development and marketing rights. In return, Alexion will receive up to \$95 millions in total payments (of which, 10 millions upfront), which may include up to \$39 million in pre-commercialization milestone payments. In addition, Alexion retains the right for commercial manufacturing as well as having co-promotion rights in the US.

### **5. Content analysis of contracts**

The analysis of contractual clauses will be organized around the theoretical core questions: to what extent do contracts specify ex-ante (plan) the actions to be taken, the goals to be reached, the resources to be committed and the apportioning of rewards? To what extent do they specify the decision rights and procedures through which all these contractual elements can be adapted, and of what kind are they?

#### *Actions plans*

In general contracts are quite concise, considered the time span and activity scope of the ventures (ranging from 7.500 words in the B case to 30-40 thousands in the other cases). Information on the articulation of tasks may also come from the proportion of contract that is dedicated to the specification of research and commercialization plans. In both alliance A and D the research plan occupies about 10% of the contract, while in alliance B the ratio plunges to less than 2%. Thus we can safely state that in all the alliances the specification of the actions to be carried out by the parties takes up only a minor portion of the respective contracts.

The *research plans* in the four agreements differ not just by their length but also by their content. B's plan, the shortest of all (108 words), simply names ten steps that indicate the fundamental tasks of the parties, without any articulation. On the contrary, C's initial research plan is fairly detailed. It identifies 59 distinct activities to be performed, it determines the allocation of resources and provides a Gantt chart outlining the respective start and end date of each of them. The plan is further detailed through the specification of several criteria that will guide the assessment of whether to bring a certain molecule to the

next phase of development or not. D's initial R&D plan is also fairly long (8 pages). Yet it is entirely procedural. Essentially it recaps the projects in progress as of the effective date of the agreement and assigns the basic action duties with respect to sections of the program. Clearly, in all the alliances a lot of the actions to be accomplished in practice are left to extra-contractual specification.

Contrary to research, downstream activities (commercialization and manufacturing) are scarcely planned in all the four alliances. Such plans are lacking altogether in collaborations B and C. In alliance A the contract makes extensive reference to the planning of commercial activities, but the actual drafting of plans is postponed until a specified period before commercial launch. Finally, in alliance D commercialization and manufacturing are described sketchily (about one page for each of them): the contract essentially establishes who has the right/responsibility to perform them and under what conditions. Other conspicuous sections that deal with particular actions are those that assign responsibilities for the execution of regulatory filings and patent applications and for the defense against infringement of collaboration patents. Even less than observed in research and commercialization plans, the contract does not enter into the details of how these tasks are to be performed. The essence of these stipulations revolves around the specification of who has the responsibility (or the right) to carry out the assignment, under what circumstances the responsibility may shift to the other party, and who shall bear the costs and enjoy the benefits associated to it.

### ***Goal setting***

The goals to be reached are specified in very general terms. Under this respect the four alliances show very little variance. Alliance C may be taken as an example for all. We obtain a first understanding of what the output of the collaboration is expected to be from the opening section of the contract, which sets the Background of the collaboration:

- C. Sunesis and Biogen Idec wish to collaborate to discover and develop small molecules that modulate certain Targets, especially Kinase Targets, with the goal of delivering compounds with desired activity and selectivity.

Then for further information on the expected output, we are referred to the Research Plan. However, after restating the mission of identifying novel inhibitors of protein kinases, the plan simply adds that this serves the purpose of optimizing them to identify Development Candidate compounds. When moving to the part that should specify what optimized compounds look like, the contract switches to language that is very rich in terms of the description of process but extremely poor of substantive specifications. The story is quite similar in alliance D. In alliance B the outputs of each of the ten step of the development process are never designated more specifically than "analogue" (compounds) or "improved analogues".

### ***Codes of conduct***

While tasks and outputs are not specified substantively in any detail, often contracts do specify some *behaviors* that should be followed in delivering whatever will be delivered: the contract becomes a 'facio ut facias' rather than a 'do ut des' agreement. These are general principles and codes of conduct to which parties agree to conform in generating action.

A common principle is *'due diligence'*, frequently defined as “commercially reasonable effort” [D]. Sometimes it is defined by reference to “applicable standards” for industry practices [C]. Other alliances make reference to particular regulations, like FDA-issued cGMP (Current Good Manufacturing Practices) [A]. In some alliances, the prescription of diligence is complemented by the institution of procedures that if not strictly court-enforceable, should at least apply a modicum of organizational pressure on the parties. For instance, in alliance C the contract prescribes that the parties periodically submit to each other a “Diligence Summary” of prescribed content, detailing the activities they performed. Significantly, the contract evokes diligence commitments and the Diligence Summary with special emphasis with regards to unplanned activities (development and commercialization by Biogen). Unlike the other three alliances, agreement B does not contain any reference to diligence obligations. It appears as if appropriate performance should naturally follow from existence of the right incentives.

Another common principle is *'full cooperation'*. Most contracts seem to acknowledge that the success of the alliance cannot be guaranteed by the sheer fulfillment of promises, and the avoidance of clearly competitive behaviors, and explicitly mention a commitment to ‘full’ rather than perfunctory collaboration during the life of the agreement.<sup>3</sup> Paradoxically, where cooperation is the least invoked is in the alliance where the promises mutually exchanged are of minimally specified content [B]. Stated differently, it is not the ‘completeness’ of contracts that renders cooperation superfluous.

*Non facio ut non facias: behavioral vetoes*

Another way of constraining behaviors so as to achieve cooperation without specifying actions and outputs is to forbid, explicitly and directly, competitive and uncooperative behaviors. Proscribing behaviors (specifying what must not be done) certainly leaves much more freedom and flexibility than prescribing them (specifying what is to be done). In addition, these clauses typically regard relational behaviors rather than task-related behaviors or actions. Non competition and exclusivity clauses are common examples. All the contracts in our sample require that the parties do not engage in external activities that can be detrimental to the relation.<sup>4</sup>

In the same way, restrictions to the assignment to third parties of the rights under the alliance agreement are also common to all of the focal contracts.<sup>5</sup> In some cases the restrictions to the transfer of rights underscore the importance of the counterparty’s identity in quite strong terms. In alliance C, the contract establishes that upon a change of control some rights of the acquired party shall terminate. In

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<sup>3</sup> “10.2.4 Cooperation. Each Party will cooperate fully with the other Party and provide all information and data, and sign any documents, reasonably necessary and requested by the other Party for the purpose of preparing (...) patent applications pursuant to this Section 10.2” [C]

<sup>4</sup> One representative negative covenant is as follows: “3.7. Non-compete. Neither Alexion nor Procter & Gamble shall itself or in conjunction with a Third Party enter into the development or commercialization of a Competing Product during the Term of this Agreement ... Any actions by Alexion under these conditions is contingent on such actions being approved by the Research & Development Steering Committee and not being to the disadvantage of the collaborative efforts under the Research & Development Plan”. [D]

<sup>5</sup> The correspondent covenant of alliance A is representative of the typical obligations on this matter: “15.10 Assignment. Neither Party may assign or transfer this Agreement or any rights or obligations hereunder without the prior written consent of the other; but a Party may make such an assignment without the other Party’s consent to an Affiliate or in conjunction with a merger, acquisition, or sale of all or substantially all of the assets of such Party to which this Agreement...”

alliance D, if the R&D firm experiences a change in control, P&G can sell its interest in the alliance to the R&D firm itself or to third parties. Incidentally the fact that the converse is not true (the R&D firm is not allowed to leave in case P&G changes control) corroborates the idea of a 'resource-based' contracting: the identity of the financier is rather irrelevant. However, the empirical literature inspired by the property rights approach tends to explain the lopsidedness of the allocation of rights mainly in terms of conflict of interests (Lerner and Merges 1998, Kaplan and Strömberg 2003).

### *Resource commitments*

As opposed to obligations to perform particular activities, or to deliver specific outputs, the obligations and rights about resources, and outputs, whatever they might be, are definitely less hazy.

### *Project costs*

One important input into all of the alliances considered, are the financial resources that are used to fund research and development activities. Project costs are generally specified accurately both as to their amount and to their incidence. In alliance A the financial budgets of the activities are a cornerstone of planning (the word 'budget' is mentioned 248 times). The centrality of budgets is also apparent in the regulation of budget overruns, which sets a tight cap on the amount of development costs in excess of budget that can be included in sharing calculations. In alliances C and D the financing party achieves budgetary control of the funds it commits to the reimbursement of the research effort of the counterparty through the specification of the number of personnel full-time equivalents (FTE's) it will fund and of the FTE rate to be used in the calculation. On the contrary, alliance B stands out (no budgets), as its basic arrangement (each carries out its own activities and bears their costs) requires no foresight of monetary input factors in the contract.

### *Background intellectual property*

A second input to the collaborations is the intellectual assets that the companies bring to them. Biotechnology alliance contracts never forget being specific about the incidence of intellectual property rights (IPRs) that are brought into the collaboration (background rights) or generated by the collaboration (foreground rights). In all the alliances the background rights licensed by the R&D firm are explicitly listed in an appendix to the contract. Further specifications concern the extent to which IPRs can be used in the collaboration. For instance, in alliance C, the granting to Biogen IDEC of the license to practice the Sunesis' licensed background technology comes with limitations concerning the rights to sublicense, the period of the license and the field in which the technology can be practiced.<sup>6</sup>

### *Outcomes*

#### *Monetary rewards and foreground intellectual property*

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<sup>6</sup> While the 'field' is kept confidential, it is clear that it is defined quite precisely, as the treatment of diseases in humans through the modulations of specified families of cell signaling enzymes, and, for the avoidance of doubt, through the exclusion that the protein, peptide or nucleic acid therapeutics employed have "a molecular weight greater than 1,000 daltons".

Formatiert: Nummerierung und Aufzählungszeichen

Formatiert: Nummerierung und Aufzählungszeichen

A high degree of specification can be observed also with regards to the apportioning of residual rewards deriving from the collaboration. The main valuable outcomes specified in technological collaboration contracts are flows of monetary revenues, newly developed intellectual property and, sometimes, also specific skills acquired through the participation to particular activities of the alliance.

In the contract in our sample the incidence of monetary revenues is always crystal clear and in all cases it entails some sharing of sorts, though the payment of royalties [C and D] or the equal sharing of profits [A] or revenues [B]. As to the arrangements concerning newly-developed intellectual property, it is useful to distinguish residual from non-residual rights. Usually alliances regulate separately these two classes of rights, since they assign ownership (residual rights) distinctly from the rights to use the intellectual property for the specific purposes of the collaboration. Different arrangements on residual rights can be observed in our sample. Contracts A and B are rather communitarian, as already seen with monetary rewards. Inventions are to be owned jointly [A] or are to be shared [B], regardless of inventorship. On the contrary, in contracts C and D the rule is specific incidence: each owns the inventions generated by its own employees.

Stipulations concerning the use of intellectual property are clearly one core aspect of technology contracts. Regardless of who obtains the ownership of newly-developed intellectual property, it appears that the parties may effectively assign to either of them, or to both, the right to put to use that property in specific applications. Such assignment is accomplished by the specification of several items. Among them the most important are: what set of background and foreground rights is licensed; whether the license is exclusive or not (i.e., whether it excludes the licensor from the possibility to exercise the licensed rights); the kind of activities for which the license is granted (e.g. research, manufacturing, sales, etc.); a field of use, usually defined in terms of the particular molecules licensed and the therapeutic indications they may be used for; the geographic territory and the period for which the license holds; whether the rights can be sublicensed and at what conditions; the royalties to be paid for the right of use; royalty accounting provisions detailing the criteria to calculate the amounts due<sup>7</sup>; and, finally, whether either party (generally the licensor) is granted any particular option, like, for instance that to participate together with the licensee in any downstream activity, like manufacturing or sales promotion.<sup>8</sup>

#### *Learning outcomes*

Apart from those outcomes that provide extrinsic motivations to the parties, the participation into research collaborations may be valuable per se, as it enables the parties to learn skills and gain experiences.

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<sup>7</sup> The specification of royalty accounting provisions and of financial definitions in general, may occupy a considerable portion of technology alliance contracts. For example, in the agreement of alliance A, these provisions take up about a dozen pages.

<sup>8</sup> A typical license clause starts as follows (our emphasis): “6.2.1 License under the Sunesis and Joint Collaboration Technology to Target Selective Compounds. Subject to the terms and conditions of this Agreement (including Section 6.1.2 above), Sunesis hereby grants to Biogen Idec a worldwide, exclusive license under the Sunesis Collaboration Technology and Sunesis' interest in the Joint Collaboration Technology, in each case with the right to grant and authorize sublicenses as provided in Section 6.5, *to research, develop, make, have made, use, import, offer for sale, sell* and otherwise exploit Target Selective Compounds for any purpose, without regard to the mechanism of action of such Target Selective Compound, alone or as incorporated into a Product”. Every capitalized term refers to an explicit definition, usually contained in a separate clause, which further adds precision to the scope of the licensed rights.

This is a typical problem acknowledged by the contracting literature on multi-tasking. While the acquisition of some of experiences may be part of hidden agendas, we often see the parties to an agreement acknowledging at least the most conspicuous of these spillovers and establishing ex-ante to what extent and how a party is entitled to appropriate them.

In biotechnology collaborations one particularly cherished outcome, about the parties are likely to have widely diverging views, is the possibility to publish the findings in scientific journals. The typical solution is an assignment of a right to publish, accompanied by a right for the other party to block, or at least to delay, the publication until patent protection is secured. Ancillary provisions regulate the speed with which the authorization process must be conducted, and establish general or specialized mechanisms to solve disputes in this decision domain.<sup>9</sup>

As to learning more generic skills, the R&D partner to a pharmaceutical biotechnology alliance may attach importance to the opportunity to acquire regulatory, manufacturing and commercialization capabilities through the collaboration. This is clearly the case in alliance D, which offers an interesting example of how the contract can resort to a mix of mechanisms, rather than crude assignments of decision rights, to tread the fine line between collaboration and competition in this area. Here the action domain in question is manufacturing and supply, where P&G (the client) certainly has an established network of experienced manufacturers. The contract deals with these conflicting interests by setting conditions (quality, production and regulatory approvals, price) that, if fulfilled, would render P&G rather indifferent as to the source of procurement. The problem is that at any time it will not be easy to assess unambiguously if such standards have been met or not. The contract seems unwilling to provide a clear-cut solution. On one side it grants Alexion the right to bid for the manufacturing of the product and to be awarded the right to manufacture if the conditions are met. On the other, by establishing that the award of all or a portion of manufacturing shall be determined by P&G, it grants P&G substantial discretion. Clearly, the final decision must be arrived at through negotiation. However, the fine points of the contract structure the negotiation in such a way that a totally non-collaborative negotiation stance would be risky and costly.<sup>10</sup> These provisions indicate contracts do not solve conflicts of interests only through restraints or unilateral decision rights but can leverage the parties' preferences and induce adaptations that steer the payoffs of the game toward structures more supportive of collaborative outcomes.

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<sup>9</sup> The following clause from the agreement of alliance D is a rather representative publication provision: "10.3. Research Manuscripts and Abstracts. It is understood that either Party may publish or otherwise disclose the results of the Research & Development Plan or of development studies of Collaboration Inhibitor in a reputable scientific forum (...). Such disclosures may be made to a Third Party with the approval of the Research & Development Steering Committee (...). No such disclosure shall be made to a Third Party until a patent application has been filed adequately describing and claiming any patentable technology embodied in such disclosure, pursuant to Article VII. A party wishing to make any such disclosure shall submit a complete written draft of the disclosure to the other Party at least thirty (30) days prior to submission for the disclosure to a Third Party. The Party shall consider any comments from the other Party. Any disputes regarding the appropriateness, content and authors of any such disclosure shall be resolved by the Research & Development Steering Committee".

<sup>10</sup> In fact, in case the dispute persists that matter shall be decided by external arbitrators. Moreover, during such periods as Alexion shall not be manufacturing all of the requirements of Product, Alexion shall be entitled to recommend the other contract manufacturing source.

### *Procedures for adaptation*

This section describes the mechanisms and procedures, included in the contract, that allow the adaptation of substantive stipulations during the life of the alliance.

#### *Non bindingness of plans principles*

First of all, most contracts openly admit that plans are not strictly binding. They are to be intended as hypotheses to be revised, the more so the closer to the operational level are the matters dealt with. As a result contracts concede that plans will undergo modifications or will be agreed upon after the start of the alliance.<sup>11</sup> If plans are written in the sand, or are just outlined, it is necessary to set up mechanisms to select the proper course of actions as the future unfolds. In all the focal alliances joint decision making stands out prominently as a mechanism for adaptation.

#### *Decision making*

In all the agreements in our sample a Joint Steering Committee (JSC) plays some role in the process of revision and of further specification of existing plans, and of approval of entirely new plans. Alliance B offers the most egalitarian arrangement: the JSC is composed of an equal number of members from each party, decides by unanimous vote, alternates the Chairmanship between the parties on a yearly basis (with the Chairman holding no tie-breaking vote) and is vested with the full and undivided powers to make these changes. Except for minor differences, the functioning of the JSC in alliances C and D is similar to the one just described. Alliance A, is partially an exception, as it gives a final say to the R&D firm in case of disagreement over research matters. However, joint decision-making is again resorted to in the case of downstream activities, where no party unequivocally holds a superior know-how and the decisions involved are high in conflict potential.

With the exception of alliance B, which is unwaveringly egalitarian, also in the other alliances the powers of the JSC are complemented by assignments of unilateral decision rights in specific areas. However, when this is the case, the assignment of unilateral decision rights tends to be mitigated by the requirement that the exercise of authority follows a particular procedure.<sup>12</sup> Moreover, to some extent the assignment of assigned unilateral decision rights seems to follow a logic of efficiency as it usually concerns decision areas where the assignee holds superior knowledge.<sup>13</sup> The assignment of unilateral decision rights to one party exposes the other to risk. Contracts generally limit such exposure through various safeguards, above and beyond the prescription of a certain procedure. In alliance D, as we have just seen, these are in the form of

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<sup>11</sup> See, for example, the following clause in alliance A: "4.3 Launch Plan and Budget. (a) Initial Launch Budget. Because of the current preclinical research stage of 17206, the Parties are not able at this time to generate a reasonable initial launch budget at a level of detail similar to the Overall Plan for the Collaboration Product..."

<sup>12</sup> For instance, in alliance C the client has a final say on technical matters only in the case that the JSC is unable to reach consensus and after the possibilities to reach an agreement through negotiation between senior executive officers have been exhausted.

<sup>13</sup> For instance, in alliance D, P&G (the client) holds unfettered decision rights only with regards to the strategy and tactics of selling and commercializing marketed products, but not for development activities. Moreover, while P&G is allowed to unilaterally terminate the agreement, that option can be triggered only by an unambiguous failure of the products to meet Success Criteria that have been set by the Joint Steering Committee beforehand.

verifiable criteria, set ex-ante ‘under a veil of ignorance’, that must be met in order to exercise the decision right. In alliances A and C the safeguard is provided by the requirement of consistency with the contract.<sup>14</sup>

Although less frequent than those concerning tasks and actions, adjustments in the basic terms of the association are also possible and suitable procedures are provided for. In this respect, the fundamental questions that need to be regulated are adaptations concerning pooled resources, the procedures for dispute resolution, and that extreme form of adaptation that is the exit of one party from the relation. This section and the next two will deal with these points.

Some mechanisms for the adjustments concerning resources have already been mentioned. One of them is the stipulation in alliance A, that the amount of budget overruns which the client may be asked to underwrite, is limited to a pre-specified percentage of the original budget. Another is joint decision making, which was prescribed in the same alliance for the determination of commercialization budgets. As seen before, this solution contrasts with the right granted to Nuvelo to make a final determination on development plans. Thus in alliance A we observe the use of separate decision-making processes for issues impinging upon resources and issues that just relate to actions. This two-tiered decision-making procedure is reminiscent of the distinction between “allocative planning” and “enterprise planning”, which is found in Macneil (1978: 903).<sup>15</sup>

While resources are almost untouchable, except than by mutual consent, marginal adaptations are sometimes carried out in a non-calculative, formulaic way (e.g.: R&D funding subject to periodical adjustment for changes in the Consumer Price Index [C and D]). In other cases, they are dealt with through the explicit foresight of contingencies. One issue for which this solution is commonly adopted is the possibility that in the course of the alliance the parties discover that the products under development cannot be sold unless a license on third party patents is obtained. Alliances A, C and D deal with this possibility by spelling out unambiguously who, under what circumstances and in what proportion should contribute those additional resources.<sup>16</sup>

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<sup>14</sup> “3.4 (...) If the Lead Development Party determines that such a change may be necessary, it shall promptly inform the JSC. The Lead Development Party has the authority to make the final decision (...) on any change as it determines necessary that is consistent with the Overall Plan and (...) this Agreement” [A]. “5.1.4. ... Biogen Idec shall not have the right to exercise such deciding vote in a manner that is not consistent with the other terms and conditions of this Agreement or that imposes a material obligation on Sunesis” [C].

<sup>15</sup> A similar arrangement can be seen in alliance D, where conflict of interest about resources is defused by certain limitation of the powers of the JSC to amend the initial R&D plan. In particular the JSC is not allowed to amend matters affecting milestone payments and the minimum number of FTEs to be reimbursed to Alexion. In a similar vein, alliance C safeguards the R&D firm by setting a floor to the minimum number of FTEs to be reimbursed by the client, despite all the possibilities granted to him to cast a deciding vote on many controversial issues.

<sup>16</sup> A typical provision so recites: “9.7(a) Third Party Licenses. If (a) Procter & Gamble believes that a license to a Third Party patent is necessary for sale of Products (...) and (b) Alexion does not agree that such Third Party license is necessary, then the Parties will submit the issue to a mutually acceptable independent counsel (...) If such independent counsel determines that such Third Party license is necessary for sale of Products in such country, (...) the Parties will share license costs, with Alexion responsible for 10% of such costs and Procter & Gamble responsible for 90% of such costs (...)”. A similar use of contingency planning applied to the adaptation of resources is found in alliance B, where the contract establishes that in the event the JSC decides to conduct later stage animal studies, the parties shall share equally the costs associated with such activity.

As an adaptation mechanism, contingency clauses find application not only with resources but also with action rights and with rights on outcomes. One such case is the provision, in alliance D, that royalty payment be reduced if sales of non-infringing generic equivalent products exceed a certain market share. Other cases are the provisions that Alexion's right to co-manufacture [D] and Biosearch's right to manufacture [B] are subject to proven capacity to meet a number of criteria.

All in all, the foresight of contingencies is used rather sparingly, to provide flexibility with regards to issues that would be too contentious to be solved through negotiation or through unilateral decisions, yet too important to forego the value entailed by adaptation.<sup>17</sup> Another condition for the use of contingency planning seems to be the possibility to identify the triggering event in a rather unambiguous way.

#### *Dispute resolution*

The importance of the association is underscored also by the provision, common to all the alliances, of mechanisms to keep it afloat when disputes surface.<sup>18</sup> The typical set of mechanisms, which found also in alliances outside the focal sample, envisages the escalation of disputes to senior executives for settlement in an amicable way through negotiation. Failing that, the procedure provides for arbitration by a panel of legal experts [B]. Normally, arbitration is final, meaning that the dispute cannot be brought also to court.<sup>19</sup> Some of the alliances in our sample provide also for even leaner dispute resolution mechanisms, when the decisions are to be based on practices of the industry or scientific judgment, rather than the law. For instance, alliance D reserves the judgment on the collapse of the scientific rationale of the collaboration and on the inventorship of inventions to industry experts. Alliance C resorts to experts to determine whether disputed compounds are active with respect to a specified target protein. Alliance A, quite remarkably, provides abundantly for resolution by industry experts also when disputes relate to matters (Initial Launch Budget, Required Study, Sales Force Expense Mechanism), that are strongly influenced by the parties' respective interests. For each of them the contract establishes a particular procedure, assigns decision rights to an Industry Expert, and prescribes the standards that shall guide his/her determination of the dispute.<sup>20</sup>

Thus a wide array of soft dispute-resolution mechanisms is available. Nonetheless, there seem to be cases when disputes undermine the relation beyond repair to the point that the parties turn to uncompromising confrontation. This is the case in alliance C (for matters relating to intellectual property, and for breaches of warranties and representations) and D (default of payments, breaches of confidentiality,

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<sup>17</sup> Contingency clauses are also used occasionally as enforcement mechanisms. E.g.: in case of failure to exercise Diligent Effort to Commercialize in a country, all rights for the country revert to the other party [A].

<sup>18</sup> Alliance A expresses the parties' attitude underlying such mechanisms: "14.1 Disputes. The Parties recognize that disputes as to certain matters may from time to time arise during the term of this Agreement ... It is the objective of the Parties to establish procedures to facilitate the resolution of disputes arising under this Agreement in an expedient manner by mutual cooperation and without resort to litigation."

<sup>19</sup> Yet it is not uncommon that the contract allows to enter judgment for the award rendered by the arbitration, or to submit claims to a court for injunctions and other equitable relief.

<sup>20</sup> The relevant clause reads as follows: "14.3 (iii) ... the standards for a Sales Force Expense Dispute are that the Industry Expert shall select between the two mechanisms for determination of Sales Force Expenses proposed by the Parties based upon which is more within industry norms for products with similar commercialization requirements and more closely approximates, or calculates, such Party's actual costs reasonably chargeable to the Collaboration in this category".

indemnification and insurance). Interestingly, most of these triggers of litigation are closely related to resources.

### *Exit*

Contracts also acknowledge that relations alone cannot rescue an alliance that has completely lost its economic rationale, and they grant rights to terminate the relation ahead of time. The contracts in our sample differ considerably as to the latitude of the rights of not-for-cause termination granted to the parties.<sup>21</sup> Alliance D, that requires either mutual consent or the determination by an independent third party of the “collapse” of the scientific rationale, is the most restrictive. On the opposite end of the spectrum, alliance A grants termination rights to both parties on a country-by-country, product-by-product basis, in case the parties are experiencing net losses, in addition to the right to terminate the alliance in its entirety without cause.

Alliance C also grants unilateral termination rights for convenience quite generously, but only to the financing party. The only restriction is that such party serves a notice period and, in the case that termination occurs very early in the life of the alliance, that it pays a cancellation amount.

In alliance B unilateral termination is available to both parties, with limits. The party contributing the core intellectual property – Biosearch – is not allowed to withdraw from the alliance until the completion of pre-clinical studies. For later stages, individual withdrawal of Biosearch as well as of Versicor is allowed, but somewhat discouraged through a lower share of future revenues that the non-investing party shall be entitled to receive. Unlike Biosearch, Versicor can unilaterally leave at an earlier stage, but that would be quite contrary to its incentives, since all rights to collaboration compounds would revert to Biosearch and Versicor would receive neither monetary compensations for the work accomplished, nor any share of future revenues.

The reversion of IPR to the non-terminating party is common to all the other alliances. This covenant underscores once more the centrality of resources in the definition of what really a collaboration is all about. In a sense, once resources are contributed to the ‘association’ they are granted forever. In sum, relations are not sacred: extreme adaptation through early termination is possible in all the alliances of our sample. However, the right to disengage from the relation only relates to the actors, while resources remain to a large extent ‘locked in’. Finally, alliances B and C – both negotiated at the discovery stage – seem to indicate that the earlier in the development process termination is exercised, the more severe the ‘wound’ inflicted to the implicit association of resources underlying the alliance. Hence, early termination must be restricted [B] or made conditional to compensatory payments [C].

## **6. Conclusions**

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<sup>21</sup> Other causes of termination commonly provided for in alliance contracts are bankruptcy, breach of the contract, dissolution or winding up. These provisions, that are quite standardized across contracts, can be seen as pertaining to the ‘risk planning’ section of contracts (Macneil 1975) and will not be dealt with in this study that is designed rather to focus on the ‘performance planning’ aspects.

The preliminary results provided by the four case studies generally conform to our predictions, but also suggest some refinements. More specifically the more robust regularity regards the degree of specification of the core associational and constitutional contract: all contracts avoid entering into details about tasks and specific outputs, while completely specifying property rights on resources and residual rewards. These rights are shared, as expected, and more equally so at the extent to which the contributions are symmetric. In addition, in all alliances, that resource-based associational contract is complemented by a procedural contract, specifying precisely how decisions will be made. Pricing and detailed ruling figure less prominently in the documents analyzed.

The type of procedures for adaptation employed (the democratic versus hierarchical nature of the constitution), instead, are more varied and less straightforwardly linked to the considered features of the alliances. The alliance that more closely approximates a democratic order is B, which is also the only alliance that meets all the conditions of high uncertainty, high interdependence and symmetry of contributions simultaneously. However, alliance D, which is classified as relatively less uncertain in term of stage, as involving more transactional interdependence, and as more asymmetric is also governed less unilaterally than alliances A and C. In addition, the governance mechanisms embodied into contracts are varied within each single alliance. This finding suggests that the rights and obligations on procedural matters are sensitive to the fine-grained configuration of the antecedent variables in the various activities rather than to the overall characterization of an alliance. The organizational perspective that we are using to complement the economics of contracts would suggest that the varying complexity of different tasks, and the different concentration of knowledge on each of them, within any single alliance, can explain why and where unilateral, trilateral or joint decision making procedures are used in task selection. Classical organizational economic variables as team production and the criticality and complementarity of investments, instead, may especially contribute in explaining the observed configurations of control rights assignments and of the restrictions to exit.

## References

- Baker, G., R. Gibbons, K.J. Murphy. 2002. Relational contracts and the theory of the firm. *Q. J. Econ.* **117**(1) 39-84.
- Bernheim, B.D., M.D. Whinston. 1998. Incomplete contracts and strategic ambiguity. *Am. Econ. Rev.* **88**(4) 902.
- Brennan, G.H., J.M. Buchanan. 1985. *The Reasons of Rules*. Cambridge University Press, Cambridge.
- Brouwer, M. 2005. Managing uncertainty through profit sharing contracts from medieval Italy to Silicon Valley. *Journal of Management and Governance* **9**(3-4) 237-255.
- Burns, T., G.M. Stalker. 1961. *The Management of Innovation*. Tavistock Publications, London, 269.
- Crocker, K.J., K.J. Reynolds. 1993. The efficiency of incomplete contracts: An empirical analysis of air force engine procurement. *Rand J. Econ.* **24**(1) 126-146.
- DiMasi, J.A. 2001. New drug development in the United States from 1963 to 1999. *Clinical Pharmacology & Therapeutics* **69**(5) 286-296.
- Fiske, A.P. 1992. The four elementary forms of sociality: Framework for a unified theory of social relations. *Psychological Review* **99** 689-723.
- Gilsing, V., B. Nootboom. 2006. Exploration and exploitation in innovation systems: The case of pharmaceutical biotechnology. *Research Policy* **35**(1) 1-23.
- Goldberg, V.P. 1976. Regulation and administered contracts. *The Bell Journal of Economics* **7**(2) 426-448.
- Grabowski, H., J. Vernon, J.A. DiMasi. 2002. Returns on research and development for 1990s new drug introductions. *Pharmacoeconomics* **20**(Supp. 3) 11-29.
- Grandori, A. 2005. *Firm-Like Contracts: From Task Contingencies to Resource Commitments*. Milano: Bocconi University. Crora Working Paper n. 10.

- Grandori, A. 2006. Innovation, uncertainty and relational governance. *Industry & Innovation* **13**(2) 127-133.
- Grandori, A. 1997. An organizational assessment of interfirm coordination modes. *Organization Studies* **18**(6) 897.
- Grandori, A. 1999. *Organizzazione e Comportamento Economico*. Il Mulino, Bologna. (*Organization and Economic Behavior* London Routledge, 2001)
- Grandori, A., M. Furlotti. 2006. The bearable lightness of inter-firm strategic alliances: Resource-based and procedural contracting. Ariño, Africa and Reuer, Jeff, ed. *Strategic Alliances: Governance and Contracts*. Palgrave, London.
- Grandori A., Soda G., Usai G. 1999 'Rules as a mode of economic governance' In L.Engwall, G.Morgan (Eds.) *Regulation and Organization*. London, Routledge,
- Grossman, S.J., O.D. Hart. 1986. The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy* **94**(4) 691.
- Gulati, R., H. Singh. 1998. The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Adm. Sci. Q.* **43**(4) 781.
- Hart, O.D. 1988. Incomplete contracts and the theory of the firm. *Journal of Law, Economics & Organization* **4**(1) 119.
- Hayek, F.A. 1945. The use of knowledge in society. *Am. Econ. Rev.* **35**(4) 519.
- Kaplan, S.N., P. Strömberg. 2003. Financial contracting theory meets the real world: An empirical analysis of venture capital contracts. *Rev. Econ. Stud.* **70**(245) 281-315.
- Kilduff, M., S. Sawyer. 2003. *Economizing on Bounded Rationality: Networking through the Machine in Extreme High Reliability Software Production*. EGOS Colloquium, Copenhagen.
- Klein, B. 2000. The role of incomplete contracts in self-enforcing relationships. *Revue d'Economie Industrielle* (92) 67-80.
- Lammers, C. 1993 "Interorganizational Democracy", in S. Lindenberg, H.Schreuder (edited by), *Interdisciplinary Perspectives on Organization Studies*, Pergamon Press, 323-337.
- Lerner, J., R.P. Merges. 1998. The control of technology alliances: An empirical analysis of the biotechnology industry. *Journal of Industrial Economics* **46**(2) 125-156.
- Loasby, B.J. 1976. *Choice, Complexity, and Ignorance*. Cambridge University Press, Cambridge.
- Locke, E.A. 1996. Motivation through conscious goal setting. *Applied and Preventive Psychology* **5**(2) 117-124.
- Macaulay, S. 1963. Non-contractual relations in business: A preliminary study. *Am. Sociol. Rev.* **28**(1) 55-67.
- Macneil, I.R. 1978. Contracts: Adjustment of long-term economic relations under classical, neoclassical, and relational contract law. *North. Univ. Law Rev.* **72** 854-905.
- Macneil, I.R. 1975. A primer on contract planning. *South. Cal. Law Rev.* **48** 627-704.
- McKelvey, M., L. Orsenigo. 2004. Pharmaceuticals as a sectoral innovation system. F. Malerba, ed. *Sectoral Systems of Innovation*. Cambridge University Press, Cambridge.
- Miller, G.J. 1992. *Managerial Dilemmas: The Political Economy of Hierarchy*. New York. Cambridge University Press
- Ouchi, W.G., M.K. Bolton. 1988. The logic of joint research and development. *Calif. Manage. Rev.* **30**(3) 9.
- Penrose, E. 1995. *The Theory of the Growth of the Firm*. Oxford, Oxford University Press.
- Ring, P.S., Van de Ven, A. H. 1992. Structuring cooperative relationships between organizations. *Strategic Manage. J.* **13**(7) 483-498.
- Simon, H.A. 1960. *The New Science of Management Decision*. Haper Row, New York.
- Simon, H.A. 1976. From substantive to procedural rationality. S.J. Latsis, ed. *Method and Appraisal in Economics*. Cambridge University Press, Cambridge.
- Stinchcombe, A.L. 1985. Contracts as hierarchical documents. A.L. Stinchcombe, C. Heimer, eds. *Organization Theory and Project Management*. Norwegian University Press, Oslo.
- Suchman, M.C. 1994. *On Advice of Counsel: Law Firms and Venture Capital Funds as Information Intermediaries in the Structuration of Silicon Valley*. Doctoral Dissertation. Stanford University.
- Vanberg, V.J. 1994. *Rules and Choice in Economics*. London: Routledge.
- von Hippel, E. 1988. *The Sources of Innovation*. New York; Oxford; Toronto and Melbourne.; Oxford University Press.
- Williamson, O.E. 1975. *Markets and Hierarchies: Analysis and Antitrust*. Free Press, New York.
- Williamson, O.E. 1979. Transaction-cost economics: The governance of contractual relations. *Journal of Law & Economics* **22**(2) 233-261.
- Yin, R.K. 1984. *Case Study Research: Design and Methods* (1<sup>st</sup> ed.). Sage Publishing, Beverly Hills, CA.

APPENDIX

Table 1 - The drug discovery process: stages, length, costs and attrition rates

Molecules entering the phase	Phase	PhRMA 2004 expenditures (bln USD)	Length (years)	Focus
5000-10000	Drug discovery	9.6	5.5	Modify compound to reduce side effects
250	Pre-Clinical		1	Lab and animal testing performed to test for potential adverse effects
5	Clinical	15.9	1.5	Find safe dose and side effect
			2.0	Find safe dose and side effect
			2.5	Check for adverse effects to long-term drug use and efficacy
	FDA Review	3.4	1.5	Strong evidence of safety needed
1	Large-scale manufacturing			

Adapted from PhRMA 2006, www.bio.org, and Fumero (2003)

Table 2 - Cases

Alli- ance	R&D firm	Client	Effective date	Parties*	Stage at signing	\$ Terms (mln USD)			
						Size	Upfront	R&D	Mile- stones
A	Nuvelo	Kirin Brewery	03/2005	B/D	Pre-clinical	N/A	2	N/A	0
						<i>Disease:</i> Inflammatory bowel disease		<i>Technology:</i> Peptides	
B	Biosearch Italia SpA	Vicuron	02/1998	B/B	Discovery	N/A	0	N/A	CON
						<i>Disease:</i> Infection - Antibiotics		<i>Technology:</i> Combinatorial, Screening	
C	Sunesis Pharm.	Biogen IDEC	08/2004	B/B	Discovery	81	7	19.2	60.5
						<i>Disease:</i> Cancer		<i>Technology:</i> Rational Drug Design	
D	Alexion Pharm.	Procter & Gamble	01/1999	B/D	Phase II	95	10	11.7	39
Humanized &						<i>Disease:</i> Anti-inflammatory		<i>Technology:</i> Monoclonals - Fully Human Abs	

Notes: \* B/D: Biotech/Drug; B/B: Biotech/Biotech; CON: Confidential information excised from the contract; N/A: Not applicable