

# Formal or informal agreements: Revisiting relational contracting in public-private partnerships.

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*Preliminary version*

*This paper proposes to consider contracts to provide public services as possible relational contracts: if so, enforcement of contracts is observed through conventions derived from the social network in which they are embedded. Following Granovetter's works [1985, 1999, 2005], this paper demonstrates through a simple model that informal agreements are possible in a static framework, contrary to Baker et. alii. [2002, 2005]. Results show that technological parameters are no longer sufficient to determine (second) best organizational structures as in HSV [1997]. When both contractors are involved in a common social network, they are able to establish conventions that may outperform results obtained in spot governance. This helps to understand why different organizational choices are observed around the world with comparable efficiency: identities of parties matter in the contractual performance that cannot then be replicated only through the transfer of written contractual formula.*

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# 1 Introduction

The problem of organizational choice to provide public services has attracted much attention in the economic literature as in political debates. Controversies keep on raising about the role of private sector in such provisions, as about the optimal degree of private involvement in contracts of public-private partnerships.

Many contributions have then tried to clear-cut the debate by analyzing contractual efficiency to determine the best organizational structure. Recent developments in the framework of incomplete contract theory (Hart Shleifer Vishny (HSV [1997], Hart [2003], Shleifer [1998]), show for instance that the characteristics of services induce the appropriate choice. More precisely, the seminal work of HSV [1997] illustrates how the choice between in-house provision and privatization depends on the types and levels of anticipated uncontractible investments: Private provision is generally superior to public one, except when cost-reducing innovations are likely to entail strong adverse effects on quality. In spite of its rigorous approach, this study does not allow to understand why a great diversity of public-private partnerships is still observed for similar services between countries. If there exists one superior organizational form for a given service, why do public authorities not converge to such a choice?

To try to give some parts of the answer, this paper sheds a new light on the question of efficiency in the provision of public services by introducing a new vision of contracts, and more precisely of relational contracts. Up to now, works on provision of public services regard formal contracts as tools allowing parties to share rights and duties between them in order to coordinate. Yet, in various other fields, researchers think coordination does not reduce to formal contracts. In other words, parties can commit themselves beyond formal contractual written, through informal dealings for instance.

Recent works on theories of the firm have stressed the role of such informal agreements between contractors, described as self-enforcing contracts “that are too rooted in the parties’ particular circumstances to be enforced by a court, but that can be enforced by the parties’ concerns for their reputations” (Baker *et. alii.* [2004]). Since such relational contracts are mainly sustained by the value of future dealings, models of repeated games are used to determine the conditions of self-enforcement. Relational contracts then become sustainable when the time-path payoffs of informal cooperation yield a higher present value than those of defection. This means that informal dealings are sustained by inter-temporal self-interest.

However, this vision is not shared by many sociologists. To this subject, Granovetter’s works [1985, 2005] seem helpful to understand motivations for informal commitments. His “embeddedness” argument stresses the role of concrete personal relations and structures

(or “networks”) in generating trust and discouraging malfeasance. “Rational individuals are less interested in general reputations than in whether a particular other may be expected to deal honestly with them—mainly a function of whether they or their own contacts have had satisfactory past dealings with the other. It seems that social relations rather than institutional arrangements or generalized morality, are mainly responsible for the production of trust in economic life.”

Actors do not behave or decide as atoms outside a social context as the utilitarian tradition postulates, nor do they adhere slavishly to automatic behavior internalized through socialization. “Their attempts at purposive action are instead embedded in concrete, ongoing systems of social relations” (Granovetter [1985]). In other words, the reason for respect of informal agreements is less a calculated reputational interest, than the confidence that “the other will do the right thing despite a clear balance of incentives to the contrary”. Such a reason cannot then be deduced from repeated games where temptation to renege is measured to potential gains of respecting the informal agreement. The conditions for sustainable contracts, *i.e.* for trust in the ability of the co-contractor not to deviate, are rather to be searched in the information individuals have at disposal. “Much information is subtle, nuanced, and difficult to verify, so actors do not believe impersonal sources and instead rely on people they know” (Granovetter [2005]). As a consequence, social networks affect the flow and the quality of information, thus creating trust and so, relational contracts through shared “conventions”. These conventions are similar to common expectations or behaviors that are “customary, expected, and self-enforcing” (Young [1996]).

Such links between social networks and structure of information have been stressed in the economic literature for a long time. David Hume [1740] already made explicit reference to the role of mutual knowledge in coordination. In his account of convention in *A Treatise of Human Nature*, Hume argued that a necessary condition for coordinated activity was that agents all know what behavior to expect from one another. Without the requisite mutual knowledge, Hume maintained, mutually beneficial social conventions would disappear. Much later, Thomas Schelling<sup>1</sup> [1960] and John Harsanyi [1967] argued that something like “common knowledge” is needed to explain certain inferences people make about each other, as it implies that members of the network know that the other members know that they know... and so an *ad infinitum*. David Lewis [1969] was the first to give an explicit analysis of common knowledge in the monograph *Convention*<sup>2</sup>: Parties

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<sup>1</sup>The well-known experience of Schelling [1960] aims to ask two individuals unable to communicate with each other to choose some place in New York to which to go in the hope of meeting the other. Any location is as good as any other, provided both choose it. The coordination first seems very difficult, as many places can be given as answers. Yet, the majority of Schelling’s respondents chose the same place, Grand central Station. This place has some properties of salience and thus appears as a focal point: everyone expects that everyone chooses this place.

<sup>2</sup>To more precisions, see “Common knowledge” in Stanford Encyclopedia of Philosophy,

conform to the social norm of the group and expect everyone to conform, and everyone has good reason to conform because conforming is in each person's best interest when everyone else plans to conform.

However, no implication for firm behavior has followed such works, whereas the idea according to which firms as actors act in reference to the network in which they are embedded has been frequently explored in sociology.<sup>3</sup> This paper then tries to fill this gap by replacing “relational contracts” in the context of “embeddedness”. As the adoption of informal behavior does not depend on future dealings, such “relational contracts” can be sustainable even if parties meet only one time. This implication particularly fits to the study of contracts of public private partnerships, as they are most of the time concluded for a very long term (20 or even 30 years in some public services for example). It is then quite rare that the same actors, *i.e.* an elected representative and a private manager, contract repeatedly in similar conditions that would lead to the same anticipated gains, such as trigger strategy suggests.

To sum up, this paper proposes to show that the context in which contractors are embedded may make relational contracts sustainable even in a static framework. We then try to determine whether efficiency can be improved under such relational contracts in comparison to formal agreements. Results help to understand why different organizational choices are observed around the world with comparable efficiency, or why the same organizational structures will perform differently for services provided in similar conditions: identities of parties matter in the contractual performance that cannot then be replicated only through the transfer of written contractual formula. In other words, technological arguments are no longer sufficient to determine the (second) best organizational form as in HSV [1997], since structures of information inherited from the environment in which contractors are embedded interfere in this choice.

In the following section, a model based on the framework of HSV [1997] presents the various incentives that can be achieved through contracts, considered as formal agreements and then as relational contracts. Conditions for such contracts to be sustainable are then analyzed, as well as conditions under which they can outperform formal agreements. Section IV concludes.

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<http://plato.stanford.edu/entries/common-knowledge/>

<sup>3</sup> For instance, the study of Rooks *et. al.* [2000] showing “How inter-firm cooperation depends on social embeddedness”, or R. Gulati & M. Garigiulo [1999] that analyze the way partnerships depend on networks in which firms are embedded.

## 2 Striking facts about local public services

### 2.1 Organizational structures

In many states all around the world, local public authorities have to provide some public services but can choose to provide them directly in-house or to delegate them -totally or partly- to private companies. In spite of controversial effects established in the economic literature (Hart-Shleifer-Vishny [97], Lopez *et. al.* [97], Shleifer [98]), public provision still appears as the most observed organizational structure in many local public services, except in France, where many local public services are provided through contracts involving a private manager.

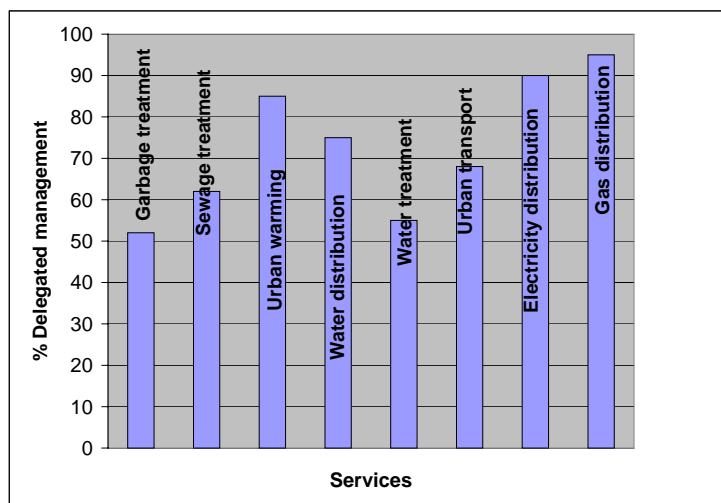


Figure 1: Proportion of delegated management in French local public services

Source: Institut de la Gestion Déléguée, inquiry (2000), <http://www.fondation-igd.org/>

In comparison, the following table provides a snapshot of how city services are managed in the United States. These data come from Levin & Tadelis (2005) and have been collected by the International City/County Management Association (ICMA). The 1068 cities in their sample provide a total of 42,069 services. Of these, 63% were delivered using only city employees. Just under 21% were provided using at least some private sector contracts. To quote more precise examples in parallel to the previous French data, proportions of public provision reach 52,9 % for residential waste collection services, 77,6% for water treatment and 68,2% for sewage collection, as illustrated in table 1.

Services	Make	Buy private	Buy public	Partial	Other
Residential Waste collection	52,9%	39,6%	0,6%	6,4%	0,4%
Snow plowing sanding	84,4%	1,1%	2,1 %	12,2 %	0,2 %
Street repair	52,5%	6%	1,2 %	40,3 %	0 %
Sewage collection and treatment	68,2%	4,6%	15,2%	11,9%	0 %
Water treatment	77,6%	3,7%	14,7%	4%	0%

**Table 1. Organizational structures of local public services in the U.S.**

More surprisingly, even in the other European states, local public authorities seem rather reluctant to involve private managers. A report by D. Hall [1997] about public utilities and privatization in Europe mentions the following proportions in the management systems of drinking water production and distribution services:

EU States	% of private management	EU States	% of private management
Belgium	5	Denmark	0
Germany	18	Spain	37
France	75	Greece	0
Ireland	0	Italy	4
Luxembourg	0	Netherlands	0
Austria	0	Portugal	1
Finland	10	Sweden	8
UK	88		

**Table 2. Management Systems of Drinking Water production and Distribution Services in the EU Member states.**

*Source: PSIRU Report n° 9707 WE-Eur-Emp "Restructuring and privatisation in the Public Utilities", D. Hall, University of Greenwich, 1997.*

Only in the UK and France are a majority of the population provided for by private operator. Yet, the report highlights important differences between the two countries:

- In the UK the main water companies were privatized in a single political act in 1989. In France, privatization has developed over the course of a century, although it has grown most rapidly in the last fifteen years.
- Water in France has been privatized by municipalities awarding concessions or contracts to private companies ("gestion deleguee"), whereas in the UK the water companies hold state-allocated regional concessions;

- Nearly all privatized water in France is in the hands of three major groups, which operate throughout the country via a number of local subsidiaries; in the UK, each company operates only in its own region.

As for the other European countries, the following comment can be read in the report:

*“About one-third of Spain is covered by privatized water concessions. Most of these are held by companies which are partly or wholly owned by the French water groups (...) A small number of Italians are covered by privatized water concessions - again, these are mainly held by companies partly or wholly owned by the French groups. Privatization has not however grown significantly in Italy in the last 5 years, despite expectations that new legislation would encourage this. Elsewhere in the EU privatized water (or sewerage) is exceptional. The figures in the table for Germany are slightly misleading: the percentages in the ‘private’ column refer almost exclusively to provision by companies which are, in effect, controlled by municipalities.”*

Such a situation<sup>4</sup> seems to question the economic literature on contracting and integration decisions, as many of these works connect optimal choices to the production function or technology parameters. The seminal work of Hart, Shleifer, Vishny [1997] shows that the choice of public vs. private ownership affects the incentives to deliver the non-contractible quality, and the cost of such delivery. As a consequence, the nature of potential innovations determine the preferable organizational form and there is some difficulties in understanding why similar countries choose different structures to provide one given service.

Some other works also mention the role of political arguments. Among them, Lopez *et al.* [1997] emphasize that state laws restricting political hiring or imposing budget constraints on local governments might affect contracting choices. Levin & Tadelis [2005] also empirically demonstrate a significant role for political forces in privatization decisions. Yet, if such arguments are quite persuasive, they fail to give a full explanation to the previous question: Why would such forces lead to more private involvements in France than in other countries?

The following subsection tries to review some other justifications.

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<sup>4</sup> Added to these facts, it is worth recalling that the two main worldwide companies delivering public services are French ones. A manager of one of these firms has recently declared that delegated management represents around 70% of organizational forms to provide public services in France, whereas it reaches about 7% to 8% in other countries, which may explain why it is often referred to “a French model of delegated management” (Interview in the special issue of *Le Nouvel Economiste*, n° 1351, 22-28 June 2006, p.3). Moreover, case studies or interviews show that such a private private involvement seems to fit to the needs of the population. In 2004, 83% of the people polled in France were very or rather satisfied with the provision of local public services. (Poll from BVA-IGD, “Baromètre sur les services publics locaux et la gestion déléguée”, with 984 people polled.)

## 2.2 Alternative explanations

### 2.2.1 The legal framework

Differences in the organizational choices to provide public services could first be explained by differences in the legal framework: legal procedures could influence organizational performance and then predict organizational outcomes. But, an explanation based on legal origin, such as works on corporate governance (La Porta *et al.* [2004, 2006]), is here misleading. In spite of what is generally thought about the legal frameworks of public-private partnerships, differences between common law and civil law countries are indeed not so important (Auby *et al.* [2004])<sup>5</sup>. In both types of countries, contracts with a public authority have indeed a special status with specific powers attributed to the public authority. Conditions for unilateral contractual modifications are codified through similar principles: French “*Fait du prince*” -when the public authority unilaterally impose contractual modifications that increase costs- or “*Imprévision*” that make the contract more specific about what to do when the concessionaire faces severe but temporary difficulties (Auby [1997]) are close from particular rules, mentioned in the *Federal Acquisition Regulation* (FAR).<sup>6</sup> Finally, differences in organizational choices are also observed between countries of the French civil law group: Belgium, Italy, or Spain have the same legal origin and yet operate different organizational choices, which prevents any explanation based on legal arguments.

### 2.2.2 Reputation and informal dealings

Recent literature on contracts has emphasized the role of informal dealings sustained by the value of future relationships beyond formal contractual agreements. Such an approach is quite persuasive as many researchers have long emphasized that business is riddled with such informal contracts (Macaulay [1963], Bull [1987], BGM [2002]). Informal agreements help difficulties in formal contracting enforced by a third party such as a court, as it can be based on outcomes that are observable by only the contracting parties *ex post*. It thus allows parties to utilize their detailed knowledge of their specific situation and to

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<sup>5</sup> The *Common law* constitutes the basis of the legal systems of many English-speaking countries, such as England, Wales, Ireland, the United States, Australia, Singapore, and other Commonwealth countries. The main alternative to the common law system is the *Civil law* system, which is used in Continental Europe.

<sup>6</sup>Its part 30 codifies the conditions for contract unilateral modifications (*change orders*) as well as the rights and obligations for the private partner. Part 43 also mentions the rules to apply in case of unilateral *termination of contract*, whether it is due to the contractor’s fault or to the will of the public authority. It seems that many states inspire from these regulations for their own procurement contracts at the local level. For instance, the Californian Public Code mentions similarly a unilateral modification power for the public authority: <http://law.justia.us/california/codes/pcc.html>

adapt to new information as it becomes available. For the same reasons, such relational contracts cannot be enforced by courts, and have then to be self-enforcing: the value of future relationship must be sufficiently large so that neither party wants to renege (BGM [2002, 2004]). Repeated games then allow to determine the renegeing temptations making relational contracts sustainable.

Such an approach allows to understand why contractual efficiency can be improved under some conditions. If there is no doubt that informal dealings interfere in contractual agreements, the previous methodology based on trigger strategy in repeated games raises however more questions than it gives answers. First, repeated games do not perfectly suit to contractual commitments in local public services, as contracts are generally long-term, such as 20 or even 30 years. Second, they are rarely concluded by identical parties, with a same matrix of gains, as representatives of local public authorities are elected on shorter mandates. Third, there is still no explanation about why relational private contract would be more sustainable in France than in other countries, as concerns for reputation and future dealings should produce the same effects in other countries.

### **2.2.3 Historical facts**

A third explanation could lie in the historical facts. Delegated management is an old practice in France: X. Bezançon (88) notes that “ the first form of delegation arose out of the feudal system itself, through a long cascade of rights and powers from the King down to the nobility and communities, and culminating in the first local public services”. Delegation process and the creation of public contracts were already observed in the XVI-Ith century. At the same time, concessions for urban planning and bridges multiplied, and soon extended to public services, such as drainage of cesspits, water concessions, street lighting services. The first major water delegation contract for Paris in 1856 was a 50-year contract of “régie intéressée” type (public ownership with private management), signed with the Compagnie Générale des Eaux.

But an explanation of organizational choices based on historical facts and tradition remains only partly satisfying. First, the perspective of the problem is indeed changed but questions are still unsolved: why does History entail such cooperation between public and private sector in France and not in other countries? Second, can early experimentations of public-private partnerships explain today’s efficiency of such organizational forms? Finally, does it lead to explain organizational choices and performances only by historical contingencies, which appears as a poor explanation of such strategic choices?

#### 2.2.4 The embeddedness approach

to consider organizational choices as an economic action in the Weberian tradition, *i.e.* as a type of social action driven by various goals, not exclusively economic. The originality of this approach is

Historical facts gives probably relevant elements of French organizational specificities of local public services. Yet, they have to be integrated in a larger conception of public and private relationships to allow a full understanding of the observed choices. To this end, works proposed by sociologists, and especially by Granovetter can help to gather both informal and historical approaches.

As mentioned in the introduction, Granovetter suggests two reasons why personal relations in economic life generate trust and discourages malfeasance. One is the desire to safeguard future transactions, and the other the expectation of good behavior that inheres in a personal relationship. It seems that the first reason can be correctly treated through repeated games as in BGM [02, 04, 05]). The second seems however to be ignored with such a methodological approach. Commenting Gibbons'work, Granovetter [1999] adds that "the most common definition of trust is precisely the confidence that another will not take advantage of you despite clear incentives to do so, even in an "end-game"." Few actors pursue economic goals alone, most are driven in their economic activity by needs for social status, affiliation, sociability, identity and power. These motives will not be well understood without analysis of the larger setting in which economic action is embedded. Such a perspective is to be connected to the Weberian conception of economic action, *i.e.* as a type of social action driven by various goals, not exclusively economic.

In a word, the frequency and distribution of implicit contracts cannot be understood by reference to incentives alone but also requires an account of how different individuals'work histories intersect across economic and institutional sectors over time. Actions cannot be separate from networks, institutions, and history. But "this does not mean that formal models have no role to play. On the contrary, they can be quite illuminating when context stands still or is well decoupled from action (...) one must model how individual action articulates with the contexts and structures that embed such actions".

The following model is an attempt to model such an articulation, by proposing a new vision of relational contracting, where individuals'actions are replaced in the contexts and structures that embed them.

## 3 The model

### 3.1 The framework

As in HSV [1997], we consider a public authority, denoted G, in charge of the provision of a public service, noted F. The manager of the facility or the service is noted M, whether public or private. G and M are able to write a long term contract specifying some aspects of the good or service to be provided. Although G and M specify some of these aspects in advance, we suppose some others cannot be specified as all contingencies cannot be anticipated ex ante. Observable but unverifiable investments researching innovative approaches to perform tasks in excess of the basic standards specified in the initial contract can thus be made, as well as observable but unverifiable cost-reducing investments. We assume that an innovation, if implemented, has an effect both on social benefits generated by the public service, and on the profits.

The benefit to society is noted B and costs the manager C to produce. Both variables can be represented by a dollar amount. We suppose that a cost innovation leads to a reduction in costs C but is typically accompanied by a reduction in quality. Similarly, a quality innovation leads to an increase in quality, but is typically accompanied by an increase in costs.

Consequently, we write the benefit to society  $B = B0 - b(e) + \beta(i)$ , and the cost reducing innovation is  $C = C0 - c(e)$ , where e and i denote respectively effort devoted to the cost innovation and quality innovation;  $c(e) \geq 0$  is the reduction in cost corresponding to the cost innovation and  $b(e) \geq 0$  is the reduction in quality corresponding to the cost innovation.<sup>7</sup>  $\beta(i)$  represents the level of increase in social benefit due to investments of type “i”. B0 represents the initial level of benefit, independent from the investments, and C0 represents the amount of initial cost independently of the level invested.

Standard assumptions about the convexity, concavity, and monotonicity of b, c and  $\beta$  are made such as:  $b(0) = 0, b' \geq 0, b'' \geq 0, c(0) = 0, c'(0) = \infty, c' > 0, c'' < 0, c'(\infty) = 0, \beta(0) = 0, \beta'(0) = \infty, \beta' > 0, \beta'' < 0$  et  $\beta'(\infty) = 0, c' - b' > 0$ .

The assumptions  $c' - b' > 0$  and  $\beta' > 0$  say that the quality reduction from a cost innovation does not affect the cost reduction from a cost innovation, and the cost increase from a quality innovation does not offset the quality increase. This assumption implies that the net effect of cost reducing investment is always positive. We then focus on particular

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<sup>7</sup> The function b plays a key role in the model, as it measures how much noncontractible quality fails because of a noncontractible cost cut, and hence serves as the variable that critics of privatization focus on.

types of public services, for which cost-reducing investments may provoke damages on quality that are inferior or equal to the gains they entail. Similarly, we need to keep track of the separate cost and quality components of the cost innovation ( $c$  and  $b$ ), but not of the quality innovation, considered as a net effect. The investments considered are for the main part human capital investments. In accordance with Hart-Shleifer-Vishny [1997], we assume consequently that  $i$ ,  $e$ ,  $b$  and  $c$  are observable to both  $G$  and  $M$ , but are not verifiable to outsiders and hence cannot be part of an enforceable contract.

To focus on the problem of enforcement, we retain here only two types of contracts, namely private and public provision, as it is the case in HSV [1997], even if a great variety of contracts involving private partners at various degrees exist and may lead to different incentives to invest. Consequently we keep the framework of the property-rights literature: contracts are considered incomplete and residual control rights determine agents' incentives in unforeseen contingencies, allowing observable but unverifiable investments described above.

$G$  and  $M$  are supposed to be partially locked into each other once their relationship is under way. Specifically, there is no facility available other than  $F$  that can supply society, and there is no other potential customer for the service apart from  $G$ . However,  $M$ 's labor services may be partially substitutable. We also assume that  $G$  and  $M$  are risk-neutral, and that there are no wealth constraints.

During the execution of contracts, unforeseen events may appear, such as the possibilities of quality and cost-reducing innovations described previously. Actors can adopt two types of behaviors to deal with such opportunities:

- First, contractors act as self-interested individuals. They share no informal ties between them and renegotiations take place under Nash-equilibrium principles. In accordance with property-rights literature, the parties renegotiate the contract, once the potential nature of quality improvement or cost reduction is known.
- Second, parties do not renegotiate contracts when possibilities of innovations appear, but apply an informal rule - a convention- that creates incentives to invest. Actions are not driven by pure rationality, but by the structures and contexts that embed them, as described in the previous part. This implies trust among the parties that loyally manage the potential gains of innovations. The contract is considered as “relational” and then informally enforced.

The model presented here determines the optimal levels of investments, *i.e.* the first-best amount of investments maximizing the total surplus, and then determines the levels

of investments that can be hoped for under both types of enforcement.

### 3.2 The First Best

Consider a benchmark situation where  $e$  and  $i$  are contractible. Their levels are chosen to maximize the total net surplus from their trading relationship, and divide the surplus between them using lump-sum transfers. That is, in the first best,  $G$  and  $M$  solve:

$$\text{Max } B0 - b(e) + \beta(i) - C0 + c(e) - e - i$$

There is a unique solution  $(i^*, e^*)$  characterized by first-order conditions:

$$-b'(e^*) + c'(e^*) = 1 \text{ and } \beta'(i^*) = 1$$

At the social optimum, the marginal social benefit of spending extra effort to reduce costs, measured to take account of marginal quality deterioration, must equal the marginal cost of that extra effort, which equals one. Similarly, the marginal social benefit of spending extra effort to improve quality must equal the marginal cost of that extra effort, which again equals one.

Let's call  $S^*$  the first-best social surplus:

$$S^* = B0 - C0 - b(e^*) + c(e^*) + \beta(i^*) - e^* - i^*$$

### 3.3 Determination of the levels of investments in case of Nash bargaining renegotiations.

Relationships between parties are first assumed to be reduced to formal contracts. If innovations appear during the execution of these contracts, renegotiation occurs. Such a situation is presented in HSV [1997].

The sequences of the game are then as follows:

- First,  $M$  and  $G$  write contract and choose ownership structure, either private or public,
- $M$  chooses  $i$  and  $e$
- Renegotiations occur, once the parties learn the nature of the potential innovations.

$G$  and  $M$  divide the gains from renegotiation according to Nash bargaining, *i.e.* they split the surplus 50:50. This means that the parties' default payoffs influence final payoffs.

Any cost or quality innovation requires the agreement of the owner of the facility F, since implementing these innovations involves a change in the way F is used. Only the owner, the possessor of the residual control rights, has the right to approve such a change.

### 3.3.1 Equilibrium under private ownership

In the first case under study, we suppose that M owns F. The private constructor has the residual control rights over the asset, and hence does not need to get government approval for a cost reduction. At the same time, if he wants to improve quality and get a higher price, he needs to renegotiate with the government since the government is the buyer of the service. The gains from renegotiation are  $\beta(i)$  split 50:50 in a Nash bargaining.

The parties' payoffs are then:

- for the public authority:

$$UE_N = -P0 + B0 - b(e) + \frac{1}{2}\beta(i)$$

- and for the private manager:

$$UM_N = P0 - C0 + C(e) + \frac{1}{2}\beta(i) - e - i$$

Since the parties are assumed to have rational expectations, M chooses e and i to maximize  $UM_N$ , that is, to solve:

$$\text{Max } UM_N = P0 - C0 + C(e) + \frac{1}{2}\beta(i) - e - i$$

Consequently, there is a unique solution and the first-order conditions are:

$$c'(e_{1N}) = 1 \text{ and } \frac{1}{2}\beta'(i_{1N}) = 1$$

A first conclusion can be drawn. Indeed,  $\forall i, 1/2\beta'(i) < \beta'(i)$ , *i.e.*, the level of "i" is lower under private ownership than its level of first best. But M ignores the deterioration of quality resulting from a cost reduction, and hence, exaggerates the social benefit of cost reduction. We have:  $\forall e, c'(e) > c'(e) - b'(e)$ : the amount of investments in cost reduction is higher than in first best.

The total surplus  $S_{1N}$  under private ownership is then given by:

$$S_{1N} = B0 - C0 - b(e_{1N}) + c(e_{1N}) + \beta(i_{1N}) - e_{1N} - i_{1N}$$

Let us now turn to the case of public provision.

### 3.3.2 Equilibrium under public ownership

In this case, G owns F. As mentioned previously, M's efforts  $e$  and  $i$  are embodied in M's human capital. Suppose that if M has an idea about how to reduce costs or increase quality then a fraction of the benefit of this idea requires M's participation, but the remainder can be realized without M because some aspects of M's ideas become public knowledge (at least within the organization). This remainder that G can realize without the participation of M by hiring a different manager and paying him at cost, is a fraction  $0 \leq (1 - \lambda) \leq 1$  of the net social gains  $(-b(e) + c(e) + \beta(i))$ . Consequently, in the case  $\lambda=1$ , the public employee is irreplaceable, and hence can command the same share of the total rents in the negotiation with G as if he were a private manager.

The renegotiation then takes place over the fraction  $\lambda$  of both the cost and quality innovations that the public authority cannot reach without the public manager, i.e.  $\lambda(\beta(i) + c(e) - b(e))$ . The gains are split 50:50, and so the parties' payoffs are:

$$\begin{aligned} UE &= -P0 + B0 + (1 - \frac{1}{2}\lambda)(\beta(i) + c(e) - b(e)) \text{ and} \\ UM &= P0 + \frac{1}{2}\lambda(\beta(i) + c(e) - b(e)) - e - i - C0 \end{aligned}$$

M chooses  $e$  and  $i$  to maximize  $\frac{1}{2}\lambda(\beta(i) + c(e) - b(e)) - e - i$ . The unique solution given by the first-order conditions is given by  $(\frac{1}{2}\lambda)(-b'(e_{2N}) + c'(e_{2N})) = 1$  and  $(\frac{1}{2}\lambda)\beta'(i_{2N}) = 1$

As the public authority has the residual control rights, M needs to negotiate the cost reduction and takes into account the quality reductions that may result from cost-cutting innovations. However, there are new distortions in the case of public ownership. First, for both quality and cost innovation, the public manager needs the approval of the public authority and surrenders half the gains from trade. Second, if  $\lambda < 1$ , the public manager can be replaced, and hence has even weaker incentives to innovate.

The total surplus under public ownership is given by:

$$S_{2N} = B0 - C0 - b(e_{2N}) + c(e_{2N}) + \beta(i_{2N}) - e_{2N} - i_{2N}$$

It follows from the first order conditions and concavity of  $c(\cdot)$  and  $\beta(\cdot)$  that:  $i_{2N} \leq i_{1N} < i^*$  and  $e_{1N} > e^* > e_{2N}$ .<sup>8</sup> Private management leads to underoptimal but higher incentives to invest in quality innovations than public provision, and to overoptimal incentives in cost-reducing innovations.

As proved in HSV [1997], this means that government ownership is likely to be superior in a rather narrow set of circumstances, *i.e.* when opportunities for cost reductions that lead to non-contractible deterioration of quality are significant. Moreover, even in this case, private provision can perform better if competition is strong, consumer choice is effective or when reputational mechanisms play a significant role. For instance, the management of universities is expected to be more efficient under private provision, as competition between them limits the temptation to quality deterioration in case of cost reduction. On the opposite, conditions for effective competition or reputation are not verified for prisons with dangerous criminals, whose management is to be more efficient under public provision.

These results have however some difficulties in explaining why identical services are provided under different organizational structures with similar levels of efficiency, as technological parameters are proved to induce one better organizational form. To try to overcome these difficulties, we enrich the model with considerations of “relational contracting”, following Granovetter’s works. In other words, informal dealings are no longer sustained by rational inter-temporal self-interest driving actions, but are inherited from networks in which contractors are embedded.

### 3.4 Equilibriums under relational contracts

Suppose now that the contract is initially chosen by the public authority in accordance with the environment in which it is embedded. It is then postulated that the contract is “relational”, and there is no doubt about the willingness of the co-contractor to adopt an informal convention when innovations appear. Conditions for such an assumption will be exposed in subsection 3.6.

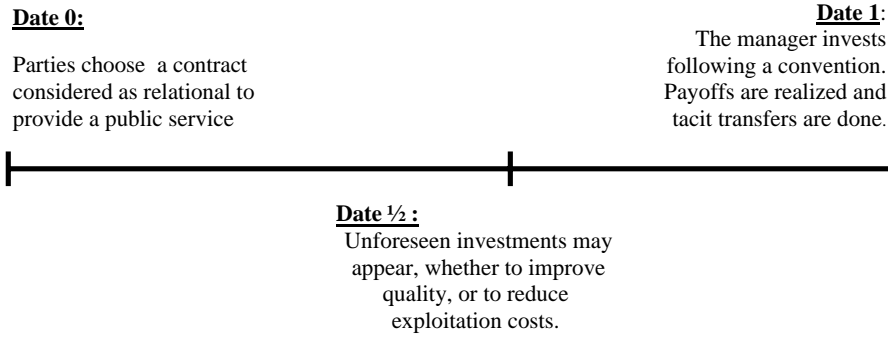
In case of unforeseen events, there is no longer formal renegotiation based on nash-bargaining principles to determine the levels of investments to implement. Instead, contractors apply a tacit shared convention, whereby a proportion  $0 \leq \alpha \leq 1$  of the impacts of new innovations on the public authority are taken into account by the manager when implementing them. In exchange, the public authority engages to transfer the correspond-

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<sup>8</sup>See HSV [1997] pp. 1139-1147 for the proof.

ing levels of gains<sup>9</sup> to the manager once payoffs are realized. The goal of this informal rule is to avoid previous formal renegotiations, hence the application of the convention on the same elements on which nash bargaining rules previously focused:  $\beta(i)$  and  $b(e)$  in case of private contracting, and  $\lambda(\beta(i)) + c(e) - b(e)$  in case of public management.

Timing of the game then becomes as follows:



### 3.4.1 Equilibrium under informal private provision

As in our first case under study, a private manager has to provide the public service. But, when unforeseen contingencies appear, the informal sharing rule described above is applied. The payoffs of the parties then become as follows:

- $UE_{1,\alpha} = -P0 + B0 + (1 - \alpha)(\beta(i_{1,\alpha}) - b(e_{1,\alpha}))$
- $UM_{1,\alpha} = P0 - C0 + c(e_{1,\alpha}) + \alpha(\beta(i_{1,\alpha}) - b(e_{1,\alpha})) - e_{1,\alpha} - i_{1,\alpha}$

The maximization of the utility function of the manager leads then to the following levels of investments:  $e_{1,\alpha}$  such as  $c'(e_{1,\alpha}) - \alpha b'(e_{1,\alpha}) = 1$  and  $i_{1,\alpha}$  such as  $\alpha \beta'(i_{1,\alpha}) = 1$ . The surplus that is thus achieved is:

$$S_{1,\alpha} = UE_{1,\alpha} + UM_{1,\alpha} = B0 + \beta(i_{1,\alpha}) + c(e_{1,\alpha}) - b(e_{1,\alpha}) - C0 - e_{1,\alpha} - i_{1,\alpha}.$$

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<sup>9</sup>This transfer can be realized through various forms such as subsidies, perks, new contracts. In a sense, future matters through new contracts but it only interfere here in the final stage through as the application of the convention and not in the decision to accept or refuse relational contracting as in repeated games. This point will be more detailed in subsection 3.6.

### 3.4.2 Equilibrium under informal public governance

Relationships between a public manager and the public authority can also be ruled by conventions for the share of innovations embodied in the human capital of the public manager. Consequently, the manager implements this fraction  $\lambda$  of innovations in a proportion  $\alpha$ , which leads to the following payoffs:

- $UE_{2,\alpha} = -P0 + B0 + (1 - \lambda) (\beta(i_{2,\alpha}) + c(e_{2,\alpha}) - b(e_{2,\alpha})) + \lambda(1 - \alpha) (\beta(i_{2,\alpha}) + c(e_{2,\alpha}) - b(e_{2,\alpha}))$
- $UM_{2,\alpha} = P0 + C0 + \lambda\alpha(\beta(i_{2,\alpha}) + c(e_{2,\alpha}) - b(e_{2,\alpha})) - e_{2,\alpha} - i_{2,\alpha}$

Incentives to invest are then:

$$\lambda\alpha(c'(e_{2,\alpha}) - b'(e_{2,\alpha})) = 1 \text{ and } \lambda\alpha\beta'(i_{2,\alpha}) = 1.$$

The surplus that is thus achieved is:

$$S_{2,\alpha} = UE_{2,\alpha} + UM_{2,\alpha} = B0 + \beta(i_{2,\alpha}) + c(e_{2,\alpha}) - b(e_{2,\alpha}) - C0.$$

The following subsection comments these results.

## 3.5 Analysis of the results

The following table sums up the results obtained in both formal and informal agreements.

Contracts	Formal agreements	Informal agreements
Private provision	$c'(e_{1N}) = 1$ $\frac{1}{2}\beta'(i_{1N}) = 1$	$c'(e_{1,\alpha}) - \alpha b'(e_{1,\alpha}) = 1$ $\alpha\beta'(i_{1,\alpha}) = 1$
Public provision	$\frac{1}{2} \lambda (c'(e_{2N}) - b'(e_{2N})) = 1$ $\frac{1}{2} \lambda (\beta'(i_{2N})) = 1$	$\lambda\alpha (c'(e_{2,\alpha}) - b'(e_{2,\alpha})) = 1$ $\lambda\alpha \beta'(i_{2,\alpha}) = 1$
First Best	$c'(e^*) - b'(e^*) = 1$ $\beta'(i^*) = 1$	

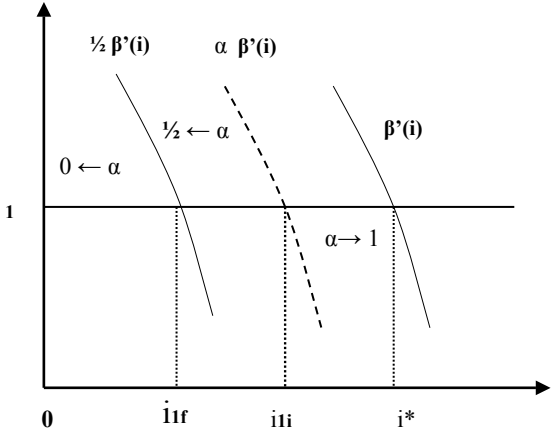
**Table 3. Results under formal and informal agreements**

If results obtained in Nash bargaining are precise, incentives derived from informal dealings mainly depend on the parameter  $\alpha$ . It is thus impossible to see at this stage whether informal enforcement of contracts allows to improve the total surplus.

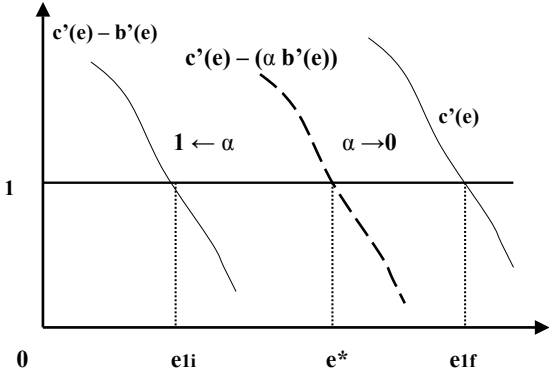
Indeed, in private provision of services, when  $\alpha \rightarrow 0$ , incentives to invest in cost-reducing investments under informal renegotiations tend to the levels obtained under Nash bargaining rules. To the contrary, when  $\alpha \rightarrow 1$ , first-best levels are achieved.

As for quality innovations, whenever  $\alpha > \frac{1}{2}$  incentives are closer to the first-best, which leads to the following ranking:  $i^* \geq i_{1,\alpha} > i_{1N}$ , but if  $\alpha < \frac{1}{2}$ , incentives are lower than in nash-bargaining solutions, which implies  $i^* > i_{1N} > i_{1,\alpha}$ .

Such a situation is represented in the graphs that follow:



Equilibrium levels of  $i$  under relational private provision

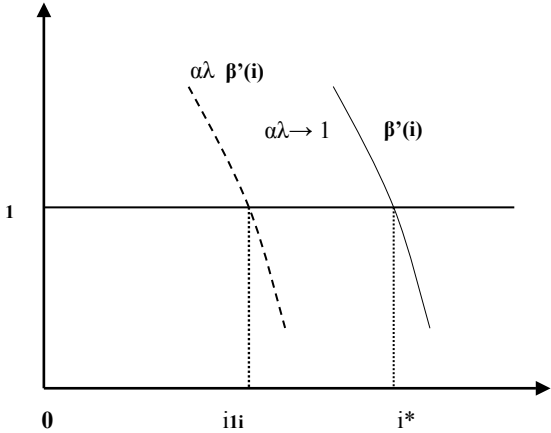


Equilibrium levels of  $e$  under relational private provision

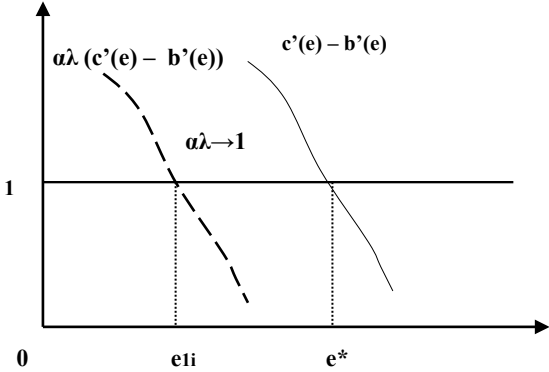
Figure 2: Equilibriums under relational private management

Similar ambiguous effects are noted in public provision. The levels of incentives become all the more undetermined, as they depend both on the proportion  $\lambda$  of innovations that cannot be implemented without the participation of the manager and on the share  $\alpha$  corresponding to the informal sharing rule agreed by the parties.

The incentives are illustrated in the graphes that follow:



Equilibrium levels of  $i$  under relational public provision



Equilibrium levels of  $e$  under relational public provision

Figure 3: Equilibriums under relational public management

At this stage, the introduction of relational contracting as applications of conventions defined by the environment in which contractors are embedded, appears as an undetermined issue, as it can ameliorate as well as deteriorate incentives. Two questions have then to be solved:

First, under which conditions are relational contracts sustainable?

Second, in which cases is this opportunity achieved, *i.e.* economic efficiency is improved?

The following subsections propose to clarify these points.

### 3.6 Conditions for sustainable relational contracts

As previously mentioned, informal agreements cannot be enforced by courts, and have to be self-enforcing. If self-interested trade-off between temptation to renege and future benefits is rejected, conditions for sustainable agreements have then to be redefined. Still believing that individuals are less “interested in general reputations than in whether a particular other may be expected to deal honestly with them- mainly a function of whether they or their own contacts have had satisfactory past dealings with the other” (Granovetter [1985]), the opinion of each agent about the co-contractor seems determinant to make contracts sustainable. This opinion is postulated to be based on information of people they know. Several structures of information between parties can then be observed: (1) each contractor can have no more information than is delivered in the formal contract, (2) they can have mutual knowledge on their ability to implement conventions, (3) finally, common knowledge as for informal commitments can be observed.

Let us now analyze in which cases both parties will agree on an informal contractual enforcement.

#### 3.6.1 Decisions without embeddedness of actors

When innovations appear, the manager has two possibilities: either he follows a convention that he supposes to be shared with the co-contractor and he directly implements investments, or he engages into renegotiation based on self-interest. If individuals share no more ties than the formal contract, relational contracts are not sustainable. Indeed, in a static environment, deviation of the co-contractor appears as the rational strategy: By cheating whereas the other engages into informal strategy, the agent can take advantage of the efforts done by its partner and turn the informal agreement to its own benefits. Such a strategy is unlikely to be punished by courts as the agreement is informal and temptation to renege thus appears as stronger than the respect of the informal dealing.

This situation can be formalized through a game similar to prisoner’s dilemma in a

static game:  $\forall j \in \{M; E\}$ ,  $U_j(N)$  represents the payoffs obtained in a nash bargaining process,  $U_{j\alpha}(+)$  represents the pareto-improving payoffs obtained if both parties agree and respect the convention,  $U_{j\alpha}(++)$  represents a higher payoff expected if actor j deviates from the informal contract to take advantage of it, and  $U_{j\alpha}(-)$  then represents the lower payoffs of his co-contractor in this case.

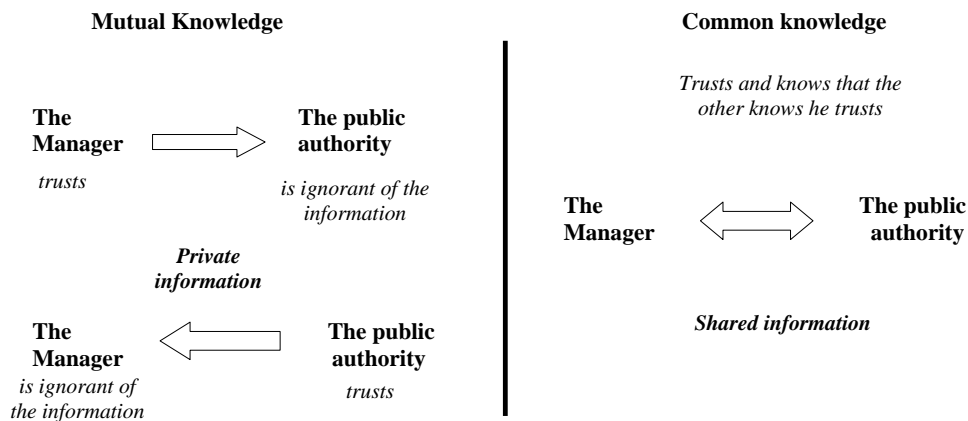
$r$  and  $nr$  represent the two strategies among which each contractor has to choose, *i.e.* to respect conventions or not. The following matrix is thus observed:

		The public authority	
		nr	r
The manager	nr	$UE(N); UM(N)$	$UE_{\alpha}(++) , UM_{\alpha}(-)$
	r	$UE_{\alpha}(-), UM_{\alpha}(++)$	$UE_{\alpha}(+); UM_{\alpha}(+)$

As is traditional from such forms of the game, equilibrium appears as the choice  $(nr, nr)$ , *i.e.* both contractors anticipate that the other will not respect the informal dealing. Consequently, both choose formal renegotiation when innovations appear. Let us now analyze the case when the structure of information is that of mutual knowledge of the respect of conventions.

### 3.6.2 Decisions with mutual knowledge about the co-contractors

Mutual knowledge is the structure of information in which each actor knows that the other can be trustworthy. In opposite to common knowledge, this information is not shared: the co-contractor does not know that he is considered as trustworthy as the following scheme represents.



Relational contracts are not sustainable in case of mutual knowledge. The co-contractor is unaware of the fact that he is *a priori* trusted. Consequently, he anticipates that the other doubts and acts rationally by refusing informal cooperation as in the previous case. With such an anticipated conclusion, he also decides *in fine* to apply formal renegotiations not to be cheated. As each contractor applies the same reasoning, mutual knowledge is then insufficient to make relational contracts sustainable.

### 3.6.3 Decisions with common knowledge between parties

Suppose now that the structure of information between parties is that of common knowledge: each contractor knows that the other is trustworthy and knows that the other is aware of such a knowledge. Both contractors then develop positive expectations and conventions can be applied since each contractor is convinced of the other's ability to respect its informal commitment. This corresponds to the justification of trust given by Granovetter and previously mentioned, namely "the expectation of good behavior that inheres in a personal relationship".<sup>10</sup> Relational contracts become then sustainable because of common knowledge inside the network.

There is now to determine the conditions under which common knowledge is observed among the parties. As previously written, Granovetter depicts one characteristic of the social networks as the sharing of information, and the trust in the quality of this information that relies on people actors know. Moreover, microeconomic literature traditionally associates common knowledge to social networks (Chwe [2000], Geanakopols [1992], Polak [1999]). It then seems that when contractors are embedded in the same social networks, actions are not independent from their environment and relational contracts become sustainable.

As conditions for sustainable relational contracts have been highlighted, let us now see to what extent relational contracting leads to more efficient outcomes than spot governance.

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<sup>10</sup>This explanation does not mean that the confidence in the ability of the co-contractor to respect informal behavior is not linked to rewards and punishments that can be imposed in future. To the contrary, such sanction are often magnified in their impact by coming from others personally known. However, this threat does not lead to self-interested calculus integrating future businesses as depicted in BGM [02, 04], but rather acts as an institutional constraint that forces actors to respect informal commitments even in a one-shot transaction. The function of punishment coming from the social network is then similar to sanctions imposed by the law if actions were verifiable and that prevents deviation since the threat of sanctions even in a one-shot game is sufficiently strong to outweigh these gains.

## 3.7 Relational efficiency

When the previous conditions for relational contracts to be sustainable are observed, the achieved surplus is dependent on the convention shared by the parties. This subsection proposes to determine to what extent such surplus can outperform results obtained in spot governance<sup>11</sup> by analysing the consequences on incentives in case of relational contracting, and hence on surplus.

### 3.7.1 Incentives in quality innovations

As previously recalled, in case of Nash bargaining, incentives to invest in quality innovations are greater in private than in public management, as  $\frac{1}{2}\beta'(i_{1,N}) = 1$  and  $\frac{\lambda}{2}\beta'(i_{2,N}) = 1$ . As shown in figure 3, because of concavity of  $\beta(\cdot)$  and of  $0 \leq \lambda \leq 1$ , it follows that  $i^* > i_{1,N} \geq i_{2,N}$ . This means that private management leads to more quality innovations, even if they remain underoptimal.

For the same reasons, as  $(\alpha\beta'(i_{1,\alpha}) = 1)$  and  $(\lambda\alpha\beta'(i_{2,\alpha}) = 1)$  with  $0 \leq \alpha \leq 1$ , relational private contracting induces more incentives to invest in quality innovations than relational public provision.

Comparing private relational contracting ( $\alpha\beta'(i_{1,\alpha}) = 1$ ) and private spot management ( $\frac{1}{2}\beta'(i_{1,N}) = 1$ ), it appears that relational contracts entail more incentives to invest in quality innovations than formal renegotiation, whenever  $\alpha > \frac{1}{2}$ . Moreover, first best incentives are then reached when  $\alpha = 1$ .

The following graph indicates the governance structure that produces the highest (even if still underoptimal) quality incentives in each region of parameter space.

### 3.7.2 Incentives in cost-reducing innovations

#### *Extreme values of $\alpha$*

When no convention is shared among the parties, so that  $\alpha = 0$ , relational contracts are not feasible, so either spot private management or spot public organization is efficient. The first leads to the incentives  $c'(e_{1N}) = 1$  and the second to  $\frac{\lambda}{2}(c'(e_{2N}) - b'(e_{2N})) = 1$ . Consequently, spot privatization dominates public management when over-optimal incentives are preferable to under optimal ones<sup>12</sup>, as can be seen on the bottom of figure

<sup>11</sup>Governance designs here type of contracts (private vs. public) and the associated type of enforcement (spot or relational).

<sup>12</sup>See HSV [1997] for the proof.

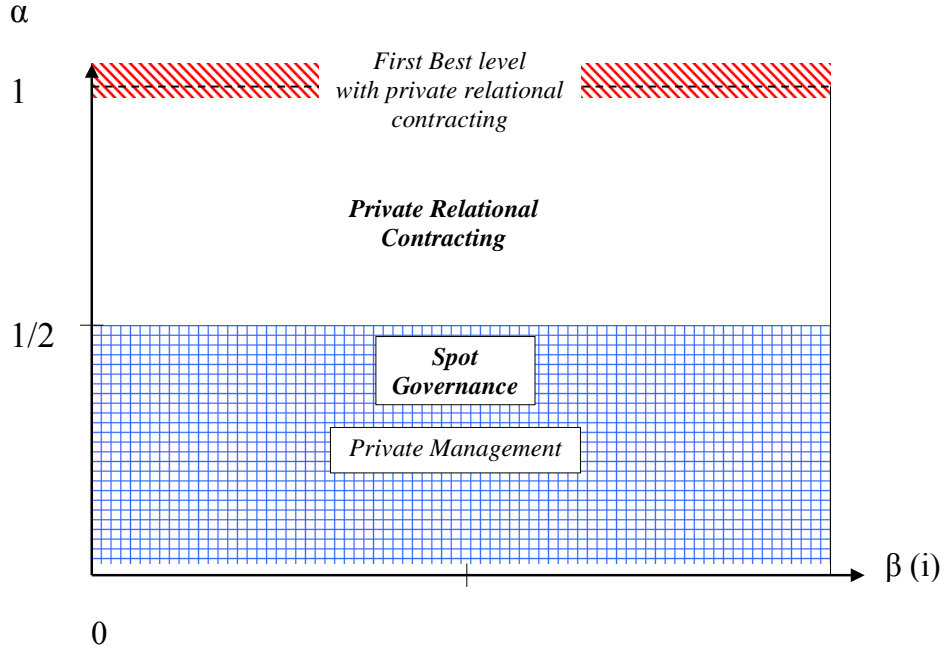


Figure 4: The preferable governance structure for quality innovations

5. In other words, when strong adverse effects due to cost-reducing investments are high, public structure is more efficient. As  $c(e) > b(e) > 0$ ,  $b(e)$  is considered as rather low when  $\frac{1}{2}c(e) > b(e) > 0$ , and rather high when  $b(e) > \frac{1}{2}c(e) > 0$ .

On the opposite side, when  $\alpha = 1$ , private relational contracting can achieve first-best as the incentives become  $c'(e_{1,\alpha}) - b'(e_{1,\alpha}) = 1$ . Relational public management does not allow to reach optimal levels of incentives in this case, except when  $\lambda = 1$ , *i.e.* when all innovations are embodied in the human capital of the manager. *See proof 1 in the Appendix.*

**Proposition 1.** **When the shared convention implies to integrate the full impact of innovations on the public authority, first best can be reached under private management. This is not the case under public provision, except when all innovations are embodied in the human capital of the public manager.**

This result obtained under private relational contract can be interpreted as the case when the manager attributes the same coefficient to his own payoffs as to those of the public authority since  $\alpha = 1$ . This explains why first best can thus be reached, as both utilities composing the total surplus are maximized.

*Intermediate values of  $\alpha$*

At intermediate levels of  $\alpha$ , relational contracting does not entail first-best incentives, but can perform better than formal contracts for some values of the parameters.

First, as soon as  $\alpha > 0$ , private relational leads to cost-reducing incentives nearer from their first-best levels than in spot private management.

Indeed, when  $\alpha \rightarrow 1$ ,  $[c'(e_{1,\alpha}) - \alpha b'(e_{1,\alpha}) = 1] \rightarrow [c'(e^*) - b'(e^*) = 1]$ .

- When  $0 < \alpha < \frac{1}{2}$ , as illustrated in graph 3 about public contracting, cost-reducing incentives in spot and relational contracting are respectively given by  $\frac{\lambda}{2}(c'(e) - b'(e)) = 1$  and  $\lambda\alpha(c'(e) - b'(e)) = 1$ , which implies that  $e^* > e_{2N} > e_{2,\alpha}$ .

It then remains to compare relational private governance and spot public management: public structure is to be chosen whenever the adverse effect due to cost reduction is strong. When  $\alpha$  tends to  $\frac{1}{2}$ , the impacts of the adverse effect is all the more integrated and public relational contracting tends to outperform public management. *See proof 2 in the Appendix.*

**Proposition 2.** When  $0 < \alpha < \frac{1}{2}$  and the adverse effect of cost reduction is low, relational private contracting allows to reach the appropriate incentives to invest. Spot public governance is preferable when this adverse effect increases, except when  $\alpha$  is high enough to sufficiently correct private relational contracting.

- Let us now analyze the case when  $\frac{1}{2} \leq \alpha < 1$ . Cost-reducing incentives in relational contracting still outperform those in spot private management. However, relational public management outperform now spot public management, as  $e^* \geq e_{2,\alpha} > e_{2N}$ . For high levels of adverse effects of cost reductions, relational public management proves to be more efficient than relational private provision, but this trend decreases with the value of  $\alpha$ . *See Proof 3 in the Appendix.*

**Proposition 3.** When  $\alpha > \frac{1}{2}$ , relational public contracts entail more cost-reducing incentives than spot public provision, but the more  $\alpha$  converges to 1, the more incentives under relational private contracting outperform those of public management.

Figure 5 illustrates the four regions indicating the governance structure that produces the highest cost-reducing incentives in each region of parameter space.

The final stage of the analysis is then to determine the governance structure that produces the highest total surplus. Combining figures 4 and 5, the relative importance

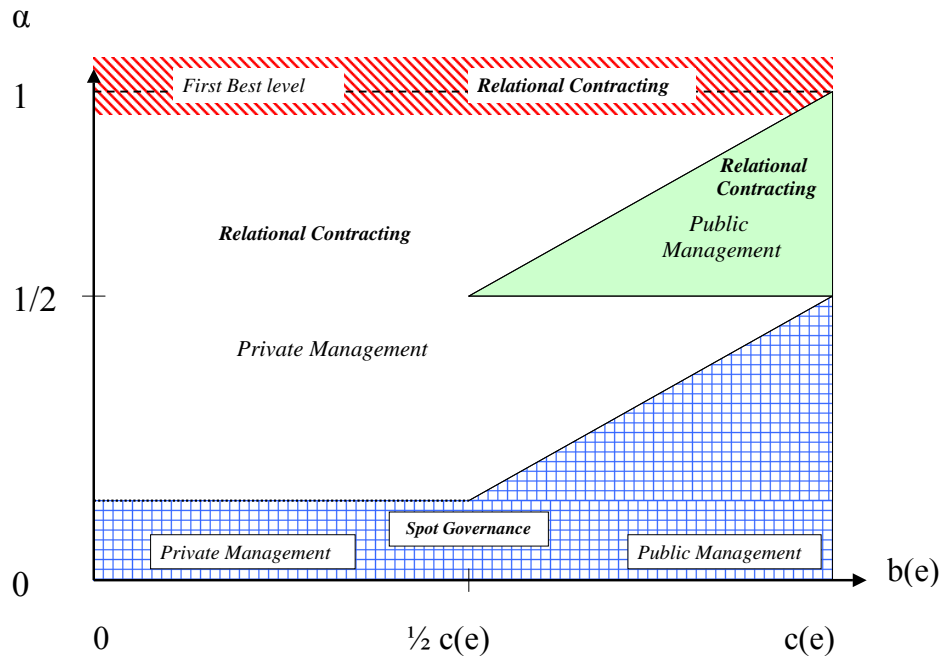


Figure 5: The preferable governance structure for cost-reducing innovations.

of quality and cost-reducing incentives in the total surplus determines the (second) best organizational structure. When  $\alpha > \frac{1}{2}$  and the adverse effect of cost reduction is low, private relational contracting leads to the more appropriate incentives in both types of innovations. In other areas of parameter space, the characteristics of the service, *i.e.* the anticipated innovations of type “i” and “e” determine the organizational outcomes: for instance, if quality innovations are unlikely to appear, cost reduction innovations mainly determine the best organizational structure. If strong adverse effects are expected, relational public governance is preferable as shown in Figure 5.

This approach both completes and diverges from results obtained in HSV [1997], essentially because technological parameters appear as no longer sufficient to determine the (second) best organizational outcome. In other words, for a same service, it is rational to observe different organizational forms as their performances are determined by the characteristics of the service as well as the information structure of the contractors, *i.e.* the social context in which actions are embedded and materialized here by the parameter  $\alpha$ .

## 4 Conclusion

This model explores “relational contracts” as informal agreements embedded in the social structure of individuals. The methodological approach of such dealings is not based on repeated games as usual, since this approach amalgamates concerns for self-interested reputation and trust in the ability of the co-contractor to respect informal dealings. In contrast, parties are considered here as willing to informally enforce contracts or not, after evaluating information at disposal, that is for the main part related to the social network in which they are embedded. Relational contracts then become sustainable when social networks are able to develop common knowledge about a convention, *i.e.* a tacit rule observed among the parties. The nature of the convention shared by the parties combined to technological parameters then determines the (second) best organizational choice to perform. Such an analysis can help to understand why various contracts are implemented to manage similar services with no significant difference of performance: the social structure is not neutral to determine the appropriate organizational choice. To this end, sociometric analyzes would probably proved to be helpful to try to measure the density of social networks, and then their ability to enforce conventions.

Such an approach gives some elements to understand why private contracting is far more observed in France than in other countries: because of social ties between public and private spheres, relational contracts are likely to be sustainable and lead to different surplus than in other institutional frameworks.

Such an analysis has many implications. It suggest that policy decision makers cannot recommend a type of provision in the name of its success in another institutional framework. Transfers of contractual formula have then to be cautiously done which may contradict the actual trend to promote such or such models of public-private partnerships. European harmonization of procedures of public procurement has also to be questioned through this analysis.

There is however to admit that the model proposed in this contribution postulates benevolent government that represents public interest. By changing this hypothesis, tacit knowledge between individuals could ameliorate as well as damage the total surplus, as corrup-

tion practices can certainly be supported by similar relational agreements. There is then a need to pursue this work to determine in which cases social networking can improve the total surplus or can be deviated towards corruption, as it seems to be the case in some developing countries, for instance in Africa.

## Annexes

### Proof 1.

When  $\alpha = 1$ , private relational contracting can achieve first-best as the incentives become  $c'(e_{1,\alpha}) - b'(e_{1,\alpha}) = 1$  and  $\beta'(i_{1,\alpha}) = 1$ .

In case of public provision, incentives become  $\lambda(c'(e_{2,\alpha}) - b'(e_{2,\alpha})) = 1$  and  $\lambda\beta'(i_{2,\alpha}) = 1$ . If  $\lambda = 1$ , then incentives are optimal, but in the other cases, relational public contracts never allow to reach first best, to the extent that optimal incentives are obtained for  $\alpha = \frac{1}{\lambda}$ . But  $\frac{1}{\lambda} > 1$  as  $0 < \lambda < 1$  which implies that  $0 < \alpha < 1 < \frac{1}{\lambda}$ , so the previous equality is never reached.

### Proof 2:

Suppose that the function  $b(e)$  is replaced by  $\theta$ , where  $\theta > 0$ . Suppose now that  $\theta \rightarrow 0$ , then  $c'(e) - b'(e) \approx c'(e)$ . Moreover:

- $c'(e) - \alpha b'(e) \rightarrow c'(e)$
- $\frac{\lambda}{2}(c'(e) - b'(e)) \rightarrow \frac{\lambda}{2}(c'(e))$

Suppose now that  $\theta \rightarrow c(e)$ , then  $c'(e) - b'(e) \approx 0$ . Moreover:

- $c'(e) - \alpha b'(e) \rightarrow c'(e)(1 - \alpha)$   
As  $0 < \alpha < \frac{1}{2}$ , the convergence to  $c'(e)$  is all the more important as  $\alpha \rightarrow 0$ . If  $\alpha \rightarrow \frac{1}{2}$ ,  $c'(e)(1 - \alpha) \rightarrow \frac{1}{2}c'(e)$
- $\frac{\lambda}{2}(c'(e) - b'(e)) \rightarrow 0$

Consequently, when  $0 < \alpha < \frac{1}{2}$ , relational private contracting leads to better incentives to invest in cost reduction when its adverse effect is low. In the other case, spot public governance is all the more efficient as this effect increases.

Proof 3:

Suppose that the function  $b(e)$  is replaced by  $\theta$ , where  $\theta > 0$ . When  $\theta \rightarrow 0$ ,  $[c'(e) - b'(e) = 1] \rightarrow [c'(e) = 1]$ .  $[c'(e) - \alpha b'(e) = 1] \rightarrow [c'(e) = 1]$ , and  $[\lambda \alpha (c'(e) - b'(e)) = 1] \rightarrow [\lambda \alpha (c'(e)) = 1]$  as  $\alpha > \frac{1}{2}$ . The lower  $\lambda$  is, the closer from the first-best incentives become. Private contracting allows then to generate the incentives closer to the first best level. Suppose now that  $\theta \rightarrow c'(e)$ , then  $[c'(e)] \rightarrow 0$ .

$[c'(e) - \alpha b'(e) = 1] \rightarrow [c'(e)(1 - \alpha) = 1]$ , and  $\lambda \alpha (c'(e) - b'(e)) \rightarrow 0$ . Private and public relational contracting offer similar incentives for  $\lambda = 1$  and  $\alpha = \frac{1}{2}$ . So, when  $\alpha > \frac{1}{2}$ , relational public contracts entails more cost-reducing incentives than spot public provision, but the more  $\alpha$  converges to 1, the more incentives under relational private contracting outperform those of public management.

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