Implicit Contracts and Flexibility in Public Procurement

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Very Preliminary

Abstract

Public-Private Partnerships and analogous large public procurements are typically regulated by complex and costly explicit contracts that have sometimes taken over a year to be written. These contracts have also typically been accompanied by informal agreements (thus the term "partnership") on how to manage the contract in practice. In this paper we explore theoretically the interaction between explicit contracts and implicit agreements in a world where writing explicit contracts is costly and public authorities are constrained not to operate discretionary monetary transfers.

We show, among other things, that the efficient explicit contract tends to display rigidity, by "over"contracting on tasks that are not needed in some states, but can be used as threats to facilitate contract flexibility on adaptations that are needed in those states but were not contracted upon. We then identify output specifications that will (or should) be regulated by implicit agreements and those which will be regulated by explicit contracting, in the form of either spot contracting or rigid or contingent clauses.

Keywords: contract flexibility, explicit versus implicit contracting, rigidity public procurement and public-private partnerships.

JEL Classification:

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1 Introduction

Public Private Partnerships (PPP) are procurement contracts between the private and the public sector for the delivery of a public service. PPPs often develop along a long time horizon, 25-30 years or more over which users needs may dramatically change. There is therefore a need for flexibility and adaptation of the contractual relationship far greater than in more standard types of procurement.

Contracts are legally binding instruments that prescribe a course of action the contracting parties agreed upon, and that make it costly for each party to unilaterally change that course (i.e. contracts make it costly to violate the promises they contain). Contracts, therefore, have the precise objective to constrain the parties' ability to choose in the future, in order to increase the predictability of future actions. For example, when a party must undertake non-contractible investments that are specific to the business relationship, a contract protects it by limiting the other party's ability to 'hold up' the investing party asking for new terms of trade after the first party has committed its investment.

Prescribing a course of action for every possible contingency that might arise in the future is however costly, if not impossible. The parties may then face a reduced ability to adapt their behaviour to novel circumstances not regulated by the contract. The cost of this reduced flexibility may in turn depend on a variety of factors, including the likelihood of changes in the environment, the value of adaptations, the level of transaction cost, and the number of contingencies over which the contract is silent.

An important trade off between the benefits from contractual protection and predictability and the costs of contractual rigidity is therefore present in any long-term transaction. In PPPs and concession contracts, for example, significant costs are incurred to increase the built-in flexibility/adaptability of the contract by regulating more contingencies. An example of this are the built-in adjustment mechanisms for tariffs and other payments, like the indexation clauses, linking payments to price, or cost indexes. The investment in a more complex, complete, and adaptable contract design to enhance flexibility can be very significant because the number of contingencies to regulate (not to mention unexpected ones) may grow exponentially with the duration a contract and writing (good) contracts is very costly. In PPPs it has been estimated that transaction costs at the contracting stage can reach 5% of the value of the 30-year long transaction (Yescombe 2007), and contracting time can take so long that a review of the tendering, negotiation and contracting process has been called upon (NAO, 2007).

Of course, when substantial changes occur that make the original contract specifications inappropriate, the contractual agreement can be modified by the mutual consent of the parties. Contract renegotiation is a (set of) change(s) in the original contract terms that is agreed upon by both parties and formalized by legally binding changes in the contract terms. It is an element that can always increase flexibility if the parties agree to it. However, contract renegotiation typically occurs in a very different situation than the original contract drafting and awarding did, in particular in a bilateral 'lock-in' rather than in a multilateral competitive situation. Because Williamson's 'fundamental transformation' took place, contract renegotiation, as well as any analogous form of contractual change (modification or simply enrichment) taking place after the contract is signed, are subject to the risk of abuse from the party with strong bargaining position. Several recent reports on PPP contracting highlight the cost of changes in user needs that – in the presence of rigid contracts - have sometimes triggered costly renegotiation (see e.g. HM Treasury 2006). In the UK it was reported that changes occurred during negotiations with the contractors for 33% of Central Government Departments PPP projects signed between 2004 and 2006. The changes amounted to a value of over £4m per project per year equivalent to about 17% of the value of the project (NAO, 2007). Renegotiation by the government of concession contracts in Latin American and Caribbean Countries is also widespread. Considering a compiled data set of more than 1,000 concessions granted during 1985–2000, Guasch (2004) showed that 30% of the concessions were renegotiated and in 26 % of the cases, the government initiated the renegotiation.[1]

Relational or implicit contracts, self-enforcing informal agreements may help to complement the rigid, incomplete explicit contracts to achieve the contractual flexibility necessary to govern adaptation at reasonable cost, as forcefully stressed by Klein (2000). Relational contracting is however difficult in Public Procurement, because accountability rules severely limit discretion, both in terms of monetary rewards that can be paid against non-verifiable performance, and of the way contractors can be selected

[1] Estache (2006) also points out at the high degree of contract incompleteness that characterizes concession contracts in Latin American and Caribbean countries and which has lead to numerous contract renegotiations.

(the two main channels through which reputational forces and corruption typically work). Still, and perhaps surprisingly, the use of relational contracting in PPP appears widespread: in evaluating factors of success for the UK PFI, the UK Treasury (HM Treasury 2006) writes: "*A spirit of partnership espoused between the contracting parties is key for successful performance...*" and "*...informal agreements have often been developed by contract managers to make the management of changes easier...*".

Starting from these observations, in this paper we study a model of procurement that endogenizes the contacting mode, exploring the interaction and trade offs between explicit and implicit contracting when the cost of writing contracts are sizable. To tailor the analysis to a public procurement context, we take on board the observation that public authorities typically do not have the ability to reward non-verifiable performance that private procurement managers have, as they are accountable to the general public and must follow strict procurement rules. For the purpose of our analysis we take in particular the limit that exist on public authorities' ability to operate 'discretionary' monetary transfers to reward private contractors, like bonuses for observable but non-verifiable performance, ruling out such transfers tout court. Also, to capture how accountability rules constrain reputational forces by favouring open tendering, we will focus on the case of a single, isolated transaction ending when the explicit contract expires.

In this context, we show, among other things, that the efficient explicit contract tends to display rigidity, by requiring some tasks and adaptations even in states in which they are not really needed,. These contractual obligations can then be used as threats to facilitate contract flexibility on adaptations that are needed in those states but were not contracted upon because it was too costly to specify them. In the implicit contract the firm accepts to adapt its output to new user needs when contingencies evolve and in exchange the public authority does not enforce the contractual obligations on some of the tasks prescribed by the rigid clause. Absent this ability of the public authority to 'ignore' some explicitly contracted requirements, which appears to be standard in the practice of 'contract management', no implicit contracting would be feasible because of the public authority's bureaucratic limit on the use of discretionary transfers (which excludes monetary rewards for non-verifiable performace) and on its contractor selection policy (which excludes 'in kind' rewards through repeated interaction).

Rigid clauses produce also other benefits. Compared to contingent clauses, they save on the contracting costs of specifying contingencies, whilst compared to spot clauses, they save on the ex-post rent that the firm would gain under 'spot contracting' (regulating contractually the particular task only once the state has realized, or renegotiating to adapt a non-contingent contract), thanks to its locked in position. Using a rigid clause thus reduces the firm's ex-post utility in the states of nature left to spot contracting. In case of disagreement, the public authority can always enforce the explicit contract which is costly to the firm and yields no surplus to both parties. Clearly, this mechanism allows the public authority to get a larger share of the renegotiation surplus and extract a higher ex ante rent.

As emphasized recently by Chakracarty and MacLeod (2009) among others, legally enforceable contracts typically display a great deal of rigidity. Our paper then provides a novel and counter-intuitive explanation for rigidity in contracting, namely that it helps to ensure contract flexibility.

We further show that all four modes of contracting may be used in equilibrium, informal contracting, explicit contracting with rigid clauses, with contingent clauses and explicit spot contracting. Which contingencies will be regulated by one mode or the other will then depend on the characteristics of the service being provided. These include, the cost of adaptation, the surplus from adaptation, the cost of writing contingent clauses, the cost of writing spot contracts, the cost of renegotiation and the bargaining power of the firm once it is locked in.

The paper is organized as follows. Section 2 discusses the related literature. Section 3 discusses some evidence on contractual modes used in PPPs. Section 4 describes the building block. Section 5 studies explicit contracts, comparing contingent clauses and spot contracting, whilst Section 6 analyzes the feasibility of informal contracts. Section 7 considers rigid contractual clauses, Section 7.3 derives the optimal contracting mode and section 8 concludes.

2 Related Literature

On the interaction between implicit and explicit contracts. Several papers touch on this issue, and we cannot mention them all here.[2] Classic references include Baker, Gibbons and Murphy (1994) and Schmidt and Schnitzer (1995), who emphasized

[2]See MacLeod (2007) and Malcomson (fortchoming) for excellent surveys.

that effective explicit contracting may hinder relational contracts by improving parties' fallback position after defections.[3] Baker, Gibbons and Murphy also showed that there are circumstances in which the presence of an explicit contract facilitates implicit ones on a single task, so that explicit and implicit contracts complement each other.[4] Pearce and Stacchetti (1998) showed that a risk neutral principal will adjust the discretionary bonuses of the implicit agreement to further insure the risk averse agent, smoothing his income across periods. Klein (2000) argued informally that parties may design explicit contracts with the aim of facilitating the relational contracts that complement them by limiting temptations to defect. He also argued that a crucial role of relational contracts is facilitating adaptation to a changing environment, made often more difficult by formal explicit contracts.

That incomplete explicit contracts may be designed to facilitate implicit ones is also stressed in the models of Aghion, Dewatripont and Rey (2002) and Baker, Gibbons and Murphy (2006) in relation to the effects of the contractual allocation of decision rights on future cooperation. Most papers in this literature involve repeated interaction, however, and would have no implications for a Public Procurement environment where discretionary payments and repeated interaction conditional on non-verifiable performance are banned by accountability rules.

On endogenous contract incompleteness. We are also close to the literature on costly contracting and endogenous contract incompleteness. In his seminal paper Dye (1985) assumed that the cost of writing contracts is increasing in the number of its contingencies, and showed that the complexity of writing contracts can indeed be a source of contractual incompleteness. Anderlini and Felli (1999) and Battigalli and Maggi (2002) are important further steps in this direction.[5] The papers closest to our in this strand are those focussing on the tension between the ex ante protection offered by costly contract specifications and the ex post forces pushing for changes and renegotiations, like Bajari and Tadelis (2001). These authors endogenize contract incompleteness when the cost of adaptations is private information of the firm and ex ante design completeness is costly to achieve. They focus on the choice between

[3] The former in a single task environment with two performance signals, one contractible and one not; the latter in a multi-tasking environment, where one of the tasks is not contractible.

[4] This is the case when both unverifiable and verifiable performance measures are present, but the latter is so noisy that it can only improve performance together with a relational contract on the unverifiable signal.

[5] In his discussion of incomplete contracts, Tirole (1999) identifies three causes of contract incompleteness: (i) unforseen contingencies, (ii) cost of writing contracts, (iii) costs of enforcing contracts.

fixed-price and cost-plus contracts in procurements with different degree of complexity and predictability, showing that sectors where changes in plan are highly expected and can take many different forms should be procured through cost-plus contracts that are characterized by a high degree of design incompleteness. They do not deal however with implicit agreements, which is the core issue we are focussing on here. Analogously, Schwartz and Watson (2004) is related to our work, as they also take into account non-prohibitive costs of both writing contracts and renegotiating them. They find, among other things, that when the cost of writing contracts is large, parties may have a strict preference for moderately high renegotiation costs, though in other situations they may prefer low ones. In our paper positive renegotiation costs also play an important, albeit different role. Our paper is however very different, as the focus is on the relation between explicit and implicit agreements, something they do not consider.

On endogenous contract mode and relational governance. The most closely related strand of literature is that trying both to endogenize contract incompleteness and at the same time explore the interaction between explicit and implicit agreements. In particular, Bernheim and Whinston (1998) show that there are many situations in which if some states cannot specified contractually, then it may be better not to specify other states that are instead contractible, even though they have no contracting cost. In the last part of their paper they emphasize that relational contracts need discretion to punish defections, so that limiting explicit contracting on valuable and contractible tasks may allow tougher punishments and be efficient from a relational perspective.[6] Our results contrast with theirs, as we show that contracts covering all possible contingencies may in fact be the best way to facilitate implicit contracts even when when the costs of writing contacts are substantial. Moreover, they also allow for discretionary transfers, repetition, and conditioning of future behavior on past non-contractible history, which makes it hard to relate their model with our Public Procurement context. The model has a single task and bilateral interaction, so that no 'lock in' effect in the sense of Williamson is present. Also, discretionary monetary payments are allowed for and the interaction has infinite horizon, so that the model has little implications for our environment, where lock in is crucial, interaction on non-contractible features resembles a finite horizon (one-shot) game, and discretionary

[6] Note that this is a rather different point from that of Boot, Greenbaum and Thakor (1993). These authors explain the use of relational contracts in finance when explicit contracts are available by the possibility to renege on them at lower monetary costs - but higher reputational cost - when the situation is unexpectedly tough. This allows to 'liquidate' reputational capital when needed.

transfers are prohibited.

Kvaløy and Olsen (2009a) endogenize the degree of explicit contracting by introducing an initial costly investment to an 'hold up' game that makes ex post verification of behavior by a court of justice more likely. In the static version of the model - spot contracting - explicit contracts are not very effective as they either cannot sustain any surplus, or can sustain low surplus but are always litigated ex post, depending on the type of damages the contract prescribes. They then look at the best sustainable relational contract when the contracting game is infinitely repeated at different levels of the discount factor. They find, among other things, that non-contractible quality may be higher with spot contracting than in a relational contract, and that easier relational contracting (a higher discount factor) may lead to lower levels of quality as the surplus from the relationship may come from lower contracting costs.[7] Focussing explicitely on procurement, Corts (2009) develops a repeated version of Bajari and Tadelis (2001) showing that when relational contracts are 'strong', i.e. easy to sustain, then less complete cost-plus contracts coupled with the implicit threat to interrupt the relationship are optimal in a wide set of circumstances.

These models also have a single task, do not not consider the 'lock in' effect induced by Williamson's fundamental transformation, allow for discretionary payments and for repeated interaction, so that their results are hardly applicable to the problem we are analyzing.

Closer to us is Battigalli and Maggi (2008), as they also use a model with multiple tasks and because we explicitly adopt the way of modelling contracting costs developed there and in Battigalli and Maggi (2002). In Battigalli and Maggi (2008) a principal and an agent interact in an infinite horizon repeated game in which they can write explicit contracts at any point in time, writing enforceable contracts is costly and the cost increases with the amount of detail. When discussing the choice between informal and formal contracting, Battigalli and Maggi (2008) highlight a trade off. On the one hand, the potential advantage of informal contracts is that they can be communicated informally, rather than being written formally, and this saves on writing costs. On the other hand, if parties to a contract are not very patient, they are unable to govern all tasks by informal contracting. The coexistence of implicit and explicit contracts is

[7] See also Kvaloy and Olsen (2009b) where a similar model is used to analyze the relationship between contracting costs and the the power of incentive schemes, with and without relational contracting.

then explained by the cost of writing explicit contracts; tasks characterized by a lower cost for the agent are regulated by information contracting, whilst higher-cost tasks are regulated by formal contracting. This is because the agent has stronger incentive to deviate from the implicit agreement when the task is costlier.[8]

In our paper the coexistence of explicit and implicit contracts is also partly explained by the cost of writing explicit contracts, as in Battigalli and Maggi (2008), and we also show that explicit contracts are often used for outputs that are costlier to the agent. However, we also find that tasks regulated by informal contracting may be the ones for which the firm cannot significantly benefit from its lock-in position, an effect absent in their paper where there is no Williamsonian transformation. The lock-in effect explains, for example, why in our setting the relative gain from informal contracting is higher when the potential surplus from adaptation is lower, whilst it is the opposite in their setting. Also, we show that writing costs increase the cost of explicit contingent clauses but reduce the potential gain for the firm from exploiting its lock in situation, which makes informal contracting easier to sustain. Writing costs then have an ambiguous effect on the relative importance of explicit contracts in our setting, whilst they decrease the scope for informal contracting in Battigalli and Maggi because they increase the present value of future writing costs. Finally, we must stress that the use of explicit contracts as a threat when the required tasks have low value, e.g. because needs have changed, allow to sustain informal agreements when no monetary transfers are possible but those explicitly contracted ex ante and the game is not repeated. In Battigalli and Maggi no implicit contracting at all can take place if these features typical of regulated Public Procurement is present.

Iossa and Spagnolo (2009) is by far the closest paper to the present one, in this strand of literature and in general, as it first endogenizes the choice whether an explicit contract on a contractible task signed ex ante will actually be enforced ex post (or simply ignored), and the role of explicit contracts as threats that may help sustain implicit agreements on non-contractible tasks. That paper shows that 'overcontracting', i.e. signing explicit contractual clauses requiring apparently low value but costly to perform tasks is often the best strategy to facilitate relational contracts on high

[8]In Battigalli and Maggi (2002), instead, writing explicit and implicit contracts is equally costly and the cost increases in the number of contingencies specified in the contract and in the difficulty to describe the agent's task. The issue there is when it is preferable to leave discretion to the agent, by not specifying the agent's task with sufficient precision, or have a rigid contract where the agent's obligation is not sufficiently contingent to the external state.

value non-contractible tasks. It also shows that overcontracting may enforce implicit agreements even in the absence of discretionary transfers and repeated interaction. In that paper, however, parties interact bilaterally so that there is no role for the lock-in effect induced by Williamson's fundamental transformation, which is core in this paper and in Public Procurement. Moreover, there are no contracting costs, nor possible change of needs that may transform an ex ante rigid contract into a valueless clause that can be waived or used as a threat to obtain flexibility.

Empirical studies on contractual price provisions. The empirical studies of Masten and Crocker (1991), Crocker and Reynolds (1993), and Bajari, Houghton and Tadelis (2006) describe how parties choose the degree of price flexibility in a contract. Their focus is on ex-ante explicit contracting; they do not discuss informal agreements. Crocker and Reynolds (1993) and Banarjee and Duflo (2000) discuss the effect of reputation (measured by the number of previous interaction or by past disputes or by ISO certification or by age) on the form of explicit contract in terms of risk sharing, whilst Athias and Saussier (2007) use a database of 71 toll-road concessions to discuss the choice between ex-post renegotiation to ensure adaptation and commitment not to renegotiate to provide incentives.

3 Evidence on Contract Flexibility in Public Procurement

(Incomplete)

Changes in service requirements can take various forms in complex public procurement projects such as PPPs: (i) changes in use or functionality, for example conversion of non-teaching to teaching areas or greater community use of schools; (ii) changes in capacity or throughput, for example more classrooms, additional operating theatres or ward spaces or more prison places, increase in waste processing capacity; (iii) changes in service specifications or performance standards, for example changes in construction standards, higher recycling targets (in waste management), new nutritional requirements for schools catering, and/or o introduction of new services (e.g. offender management in prisons).

PPP contracts are typically covered by confidentiality agreements and little is known of how they regulate changes in practice. However, some information can be inferred from case studies, public reports on major PPP projects and from standardized contracts designed and publicized by local or central authorities.

In the standardized PPP contract (SC) provided by the UK HM Treasury (2008), contingent clauses are recommended for changes to requirements which are foreseeable (e.g. in street lighting projects, demographic projections may suggest that the Authority is quite likely to require new units to be brought into the scope of the contract as housing increases in the area). The contract then specifies the possible adaptations and provides for the contractor to commit to pricing pre-specified changes. The SC however also recommends to regulate a limited volume of unanticipated changes through a well-defined procedure, the "change mechanism clause".

For example, in the PPP contracts for London Underground, a combination of contingent and spot clauses are employed for making changes. Contingent clauses ("specified rights") regard for example actions for the new Heathrow Terminal 5 and are of varying value. Spot contracts are used instead for major enhancements of negotiable value, which the contractor is not mandated to deliver and for which London Underground (LU, the Body responsible for operating passenger trains and stations and for passenger safety) may use alternative providers. Benchmarking of contractors' costs against market rates is used to resolve any eventual dispute over costs. Examples include station congestion relief projects and line extension programmes. Minor and Intermediate works are mandated via rigid clauses, which give LU the right to request that a contractor undertake (i) minor works (mandatory) below £20,000, to a maximum aggregate of £4m per contract in any one year and (ii) intermediate works (mandatory) on *non* pre-determined subject matters between £20,000 and £5m, up to a maximum aggregate value of £5m per year.

Apart from regulating day to day transactions within the "partnership agreements", as discussed in the Introduction, implicit agreements are used also to ensure contract flexibility. Robinson and Scott (2009) report of a PFI hospital project where the contractor agreed to make alterations to core and ancillary services without pursuing increases in the unitary charge when changes were minor and did not have a significant cost or time implication. They also report evidence of the public sector forgoing entitled deductions in the 'spirit of partnership' and in exchange for minor contract variations in the output specifications. Consistently, HM Treasury (2006) writes that *"There exists anecdotal evidence that the public sector can sometimes be reluctant to* *levy deductions for fear of spoiling the relationship with the private sector". n* I their study of PPP contracts, Zheng, Roehrich and Lewis (2008) find that the relational contracting governance was found to be appropriate in dealing with contract variations during the early stages of operations. They report a public sector management stating that :*[...] every time something changed we [public and private partner] did not necessarily want to go running off to our various lawyers and spend a lot of time and money if there was just a minor change to the operational relationship [...]".*

4 Building Block

We consider a contracting problem between a governmental authority (G) and a firm (F). At time 0, G and F may contract on the provision of some public service to take place at time 1. After the contracting stage, the state of the world realizes; different states of the world require different output specifications of the public service. We denote by $h = 1, 2...S$ the state of the world, by p_h the probability that h realizes, by q_0 a basic service, and by $q = 1, 2...Q$ additional and valuable output specifications (also refereed to as "adaptations") that can complement the basic service. The basic service q_0 delivers value v_0 at cost c_0 which we assume costlessly contracted upon for the sake of crispness.

The cost for F of performing an adaptation q is c_q and each adaptation is valuable in just one state, thus $Q = S$. The value of adaptation q for G is v_q if $q = h$ and zero otherwise. We let $w_q \equiv v_q - c_q$ denote the net surplus from the provision of q in state $h = q$. The value, cost and surplus of an adaptation q in state h all increase in the complexity of the adaptation. We adopt the convention that the complexity of q_1 is greater than that of q_2 an so on. Thus: $w_q > w_{q+1}; v_q > v_{q+1}$ and $c_q > c_{q+1}$ for all $q \geq 1$. Alternative assumptions are discussed in Section X. (to be done)

Beyond valuable tasks, there are also possible output specifications that are costly but never valuable, some "wasteful tasks". We denote a generic wasteful task by x with associated cost for F given by $\chi \in [0,\infty]$.

We assume that writing explicit contracts is costly and that the cost is proportional to the complexity of each adaptation q specified. Thus, writing a state-contingent clause prescribing q in state h costs k_q with $k_q > k_{q+1}$: more complex output specifications are also more costly to describe in a contract. Writing spot contracts is cheaper. A spot contract only describes output specifications, not the state, since it is written once the state has already realized. We denote by $(1-\gamma)\,k_q$ the cost of writing a spot contract on q.

The parties can always agree to ignore the provisions of a previously signed explicit contract by avoiding to call for its application. [9] We let k_q and $(1-\gamma)\,k_q$ denote respectively the writing costs of contingent clauses and spot contracts for wasteful tasks. Finally, we assume for the moment that writing a complete contract is feasible and that the net surplus from doing it always positive, that is $\omega_q - k_q > 0$ for all q.

Remark 1 *Writing costs could be re-interpreted as the cost of making actions and states verifiable, in the sense that the more the parties invest in specifying contract terms, the higher is the probability that the court can verify the realized output specification and the verified state, as in the spirit of Kvaløy and Olsend (2009a). The cost k_q of writing a state-contingent contractual clause would then represent the cost of making verifiable an event and the state where it might realize. The cost $(1-\gamma)\,k_q$ of writing a spot contract would instead be re-interpreted as the cost of foreseeing an event regardless of the state.*

The parties can choose to renegotiate the explicit contract, by mutual consent. We denote by z the cost of renegotiation, which captures Williamson's "haggling costs", like the effort and the time it takes to bargain and reach a new agreement, the delay in the provision of the service this may cause and so on, plus the costs of bureaucratic provisions linked to accountability checks required for renegotiating public contracts. We shall refer to z as haggling cost, to distinguish it from the total transaction cost of renegotiation, given by $z + (1-\gamma)\,k_q$. In practice, these costs are a function of the willingness of the contracting parties to enter or not in conflict during the negotiations.

We assume that at time 0 G has all the bargaining power (say because of the use of competitive tendering for the selection F), but that the distribution of bargaining power changes during the contract life. We denote by $\alpha > 0$ the bargaining power of F ex post, i.e., at the provision stage. Most contracts for the provision of public services are procured through competitive tendering (and even when negotiation is used, alternative providers are generally available at procurement stage) but once the contract is signed,

[9] It can be shown that results would qualitatively be unchanged if nullifying a clause involved cost up to $(1-\gamma)\,k$. (To be completed)

the contractor becomes the sole provider. The increase in the bargaining power of F from the procurement to the provision stage constitutes a simple way to reflect this transformation in our model.

G maximizes total surplus net of the transfer it gives to F and of the writing cost which he bears. F maximizes its profit, given by the transfer it receives from G and the cost of providing the output. As G has all the bargaining power ex ante, it can use ex ante payments to extract any future profit F may make from the execution of contract and thus also from renegotiation. These rents play an import role in practice, as G is typically unable to extract all the ex-ante surplus from F and does lose from renegotiating contract terms ex post. To capture in a simple way the effect of these ex post rents on the choice of the contracting mode we then assume that parties discount the future differently. Whilst G does not discount the future, F discounts it at rate $\delta \leq 1$. For any ex post profit of 1\$, $G's$ expected payoff decreases by $(1-\delta)$ \$.

TIMING:

Step 1: G and F sign the explicit contract, operate the contracted transfer t, and agree upon any implicit contract.

Step 2: Nature draws state: h with probability p_h

Step 3: F chooses whether to comply with the explicit and/or implicit contract.

Step 4: G observes $F's$ decision and chooses whether to comply with the explicit and/or implicit contract. Renegotiation may occur in which case G and F bargain to share the gain from renegotiation.

The contract between G and F can be characterized by some verifiable (court-enforceable) terms and by non-verifiable ingredients, the implicit self-enforcing part of the agreement on non-verifiable (and, possibly, some verifiable) dimensions. We let $\Omega_C = \{t, q_0, C, H_C, X_C\}$ denote the explicit contract, where t is the ex-ante payment that G makes to F, q_0 is the basic service always present, C is the set of contracted valuable output specifications complementing the basic service, X_C is the set of contracted wasteful tasks and H_C is the set of contracted upon set of states. A state-contingent clause specifies the state in which output specifications must change and the adaptations required. Without loss of generality we focus on state-contingent clauses where $q = h$.

As to the implicit contract, as anticipated we assume that G is not allowed to operate discretionary payments that are not part of an explicit contract, say because it would be too hard then to prevent some dishonest public officials present in the population to unduly appropriate part of such transfers. We shall refer to this assumption as Bureaucratic Control (BC). Rules of this type exist in public procurement legislations in most developed countries. We let $\Omega_I = \{I, X_I, H_I\}$ denote the implicit contract, where I is the set of implicitly contracted valuable output specifications, X_I is the set of implicitly contracted wasteful tasks and H_I is the set of implicitly contracted upon set of states.

We denote by $\Omega_S = \{S, T_S, H_S\}$ the set of spot contracts, where S denotes the set of valuable output specifications that are left unregulated ex ante and are regulated if needed ex post through spot contracting, T_S the set of transfers and H_S the set of states where spot contracting is used.

5 Explicit contracting: spot contracting and contingent clauses

Consider the choice between a contingent clause and spot contracting for the provision of output q in state h. When a state not specified in the initial explicit or implicit contract realizes, F and G can bargain to agree to share the gain from adaptation. Because of its locked in position at renegotiation stage, F obtains a share α of the surplus Π from adaptation,

$$\alpha\Pi = \alpha \left[w_q - z - (1-\gamma)\, k_q \right].$$

Since F and G discount their payoffs differently, G is able to extract ex ante (through an ex-ante payment) only a fraction δ of the amount $\alpha\Pi$ that F obtains ex-post. The adaptation therefore brings a benefit to G (in ex ante terms) given by $[1-\alpha(1-\delta)]\,\Pi$, where the amount $(1-\delta)\,\alpha\Pi$ is the cost for G of the locked in position of F. It follows that G will prefer contingent clauses to spot contracting if

$$p_q \left(v_q - \delta c_q\right) - k_q > p_q \left[1 - \alpha(1-\delta)\right] \Pi,$$

which yields:

Proposition 1 *G will prefer contingent clauses to spot contracting if the following condition holds*

$$(1-\delta)(\alpha\Pi + c_q) > \frac{k_q}{p_q} - (1-\gamma) k_q - z. \tag{1}$$

Compared to contingent clauses, spot contracting saves on the cost of specifying contingencies, and the cost of writing contacts is incurred only when the state is realized. But spot contracting generates haggling cost and an ex-post rent for F that is costly for G. It follows that G will prefer contingent clauses if :

(i) The state $h = q$ is likely (p_q high) because the contracting costs are borne with probability 1 under contingent contracting but only with probability p_q under spot contracting.

(ii) The cost k_q of writing state-contingent clauses is not too large compared to the transaction cost of renegotiating the initial agreement ex-post, given by the writing cost of spot contracting $(1-\gamma) k_q$ and the haggling cost, z.

(iii) The discount factor δ of F is low, and $F's$ ex-post bargaining power is high (α high), because this raises the ex-post rent that F will be able to appropriate under spot contracting.

(iv) The cost of adaptation c_q is high. Then G gains more from reimbursing F early of the cost c_q of the adaptation, through contingent clauses, than ex-post through spot contracting. This effect is linked to F discounting the future at higher rate than G (low δ).

(v) The surplus from adaptation w_q is high because G can appropriate a greater share of this surplus when contracting takes place ex-ante than ex-post. Thus, the value of the adaptation v_i is high. (The effect of the cost of adaptation c_q here is dominated by the effect described in (iv).

The simplest case arises when $\delta = 1$. Then condition (1) becomes

$$p_q [(1-\gamma) k_q + z] > k_q, \tag{2}$$

which has an immediate interpretation. If G can extract ex ante the whole future rent of F, as it can when $\delta = 1$, then spot contracting is preferred to contingent contracting only for states that are very unlikely (low p_q), or when the transaction cost of renegotiation is small enough compared to the cost of writing contingent-contracts. If condition (2) does not hold, then contingent contracting will always be preferable to spot contracting. In practice, we can distinguish two cases:

Essential services: $p_q [(1-\gamma) k_q + z] > k_q$. Here disruptions to the service that might arise when adaptations need to be negotiated with G, make the transaction cost*[s]* of spot contracting prohibitive. Contingent contracts always dominate spot contracts as explicit contracting form.

Non-essential services $p_q [(1-\gamma) k_q + z] < k_q$. Here adaptations refer to non-essential services or aspects of the service. The transaction costs of spot contracting are smaller than the cost of writing contingent contracts.

As in Battigalli and Maggi (2008) compared to spot contracting, contingent clauses are favoured when haggling costs z are high or when the cost of describing states of world is low relative to the cost of describing output/behavior. Battigalli and Maggi however assume an infinitively repeated relationship, thus contingent contracting saves on the cost to describe the agent's behaviour repeatedly. This effect is absent here as our game is one shot, whilst we focus on the cost for G of F exploiting its locked in position, an aspect they do not consider. Absent writing costs, their model has no predictive power; instead, our model would suggest that spot clauses are never used because of the rent that the firm's lock in generates.[10]

6 Implicit contracting

Consider now the effect of BC on the feasibility of standard implicit contracting, i.e. on informal agreements between G and F that are not sustained by an explicit contract. With BC imposing no discretionary transfers from G to F, implicit contracting is unfeasible: F will never agree to change the output specifications, or to perform any other costly non-contracted task, without being compensated for it. To emphasize:

Lemma 1 ***(Bureaucratic Control).*** *With the principal subject to BC and demand*

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We have ruled out the possibility that renegotiation or haggling cost depend on the surplus from renegotiation. Taking this realistic possibility into account would have the same effect as the discount factor $\delta < 1$. That is larger inefficiencies at renegotiation stage increase the cost for G from spot contracting in locked-in situations, thus favouring contingent clauses compared to spot contracting.

for output specifications that were not explicitly contracted upon, standard relational contracting cannot sustain any contract flexibility.

However, G can circumvent the reduction of discretion induced by BC by including in the explicit contract a clause requiring a [writing an explicit contract on] wasteful task $x \in X_C$, and use that to motivate F to provide valuable output specifications in states not covered by the explicit contract. In particular, G and F may agree on an implicit contract prescribing $q = h$ for $h \in H_C$ on the equilibrium path, sustained by the threat of enforcing the explicit contract on x_C in case a defection is observed. The transfer in this 'indirect' relational contract is then the saving of the cost χ of providing x which compensates the firm for its provision of $q_j > 0$. In this case the participation constraints of G and F are respectively given by:

$$\sum_{q \in C} p_q (v_q - k_q) + \sum_{q \in I} p_q v_q + \sum_{q \in S} p_q (v_q - t_q - (1-\gamma) k_q) - t \geq 0,$$

and

$$t - \delta \left[\sum_{q \in C} p_q c_q - \sum_{q \in I} p_q c_q + \sum_{q \in S} p_q (t_q - c_q) \right] \geq 0.$$

Note that under the explicit contract, payment is not discretionary. Then, contrary to the standard case of relational contracting, G cannot defect by reneging on the promised payment as t must be paid in all events. However, in our setup, G can profitably defect from the implicit contract by reneging on the promise not to call for the application of the provision on the wasteful task x. Since providing x is costly for F and valueless to G, there might be gains to be shared from agreeing not to apply the contract. In particular, if the haggling cost z is smaller than the cost saving χ, G and F will find it mutually convenient to share the gain $\chi - z$ from waiving the contractual clause.

Therefore, the relational incentive constraints of the principal is

$$0 \geq (1-\alpha)(\chi - z) \text{ if } z \leq \chi. \tag{3}$$

If $z > \chi$, no deviation by G is profitable.

Conversely, F can profitably defect from the implicit contract by refusing to provide the required adaptation $q = h$ when state h has realized, but then F would have to provide the wasteful task x at cost χ. Further, if renegotiation costs are sufficiently small, with the break up of the implicit contract it is efficient for G and F to renegotiate the explicit contract cancelling the provision of x, given that x is costly but valueless. The gain from renegotiation is thus given by the surplus from adaptation w_q and the cost saving χ from the non-implementation of the inefficient explicit clause on x, net of the cost $(1-\gamma)\,k_q$ of writing the spot contract and the haggling cost z. The gain from renegotiation is therefore

$$\chi + \Pi$$

where

$$\Pi \equiv w_q - z - (1-\gamma)\,k_q \qquad (4)$$

is the net surplus from spot contracting.

Thus, when $z \geq \chi + w_q - (1-\gamma)\,k_q$, $\chi + \Pi$ is negative and no renegotiation of the explicit contract takes place since transaction costs are too high compared to the surplus from renegotiation. In this case, F will have incentive to provide the required adaptation $q = h$ when state h has realized if it costs less than providing the wasteful task x, that is if

$$c_q \leq \chi. \qquad (5)$$

Instead, when $z < \chi + w_q - (1-\gamma)\,k_q$, $\chi + \Pi$ is positive and renegotiation occurs. Assuming Nash bargaining with weights $\{\alpha, 1-\alpha\}$ for F and G respectively, in the bargaining F obtains

$$-\chi + \alpha\,(\chi + \Pi) = \alpha\Pi - \chi\,(1-\alpha)\,,$$

whilst G obtains $(1-\alpha)\,\Pi$.

Therefore, the incentive constraint of F when $z < \chi + w_q - (1-\gamma)\,k_q$, is given by

$$\begin{array}{rcl} -c_q & \leq & -\chi + \alpha\,(\chi + \Pi) \\ & & i.e. \\ -c_q & \geq & \alpha\,[w_q - z - (1-\gamma)\,k_q] - \chi\,(1-\alpha)\,. \end{array} \qquad (6)$$

By cooperating, F incurs the cost c_q of providing the adaptation q and foregoes the gain $-\chi + \alpha\,(\chi + \Pi)$ from exploiting its lock-in position with G, but it saves on the cost χ of undertaking the explicitely-contracted task x.

The following Proposition is then obtained.

Proposition 2 ***(The Value of Overcontracting to Ensure Flexibility).*** *With the government subject to BC, explicit (over-)contracting on wasteful tasks acts as a threat that allows to sustain otherwise unfeasible implicit contracts, implementing positive levels of the valuable but non-contracted upon adaptations in the state where they are needed. The set of adaptations that can be sustained through an implicit contract is characterized by the condition*

$$c_q + \alpha \left[w_q - (1-\gamma) k_q - z \right] \leq z (1-\alpha). \tag{7}$$

Proof. The RHS of the incentive constraints of F, given by (5) and (6), is decreasing in χ whilst the LHS is independent of χ. Thus raising χ eases the incentive constraint of F. However, $z \geq \chi$ is necessary to satisfy the incentive constraint of G, given by (3), otherwise no implicit contract can be used to regulate the provision of adaptations. Thus $\chi = z$ is the upperbound value of χ for the implicit contract to be sustainable and it is also the optimal value, in the sense that it maximizes the set of possible adaptations. At $\chi = z$, we have $z < \chi + w_q - (1-\gamma) k_q$, thus the relevant incentive constraint for F is (6). Substituting for $\chi = z$ in (6), we obtain condition (7). ■

Proposition 2 provides a rationale as to why explicit contracts may be signed but not applied, when the principals in these contracts are members of a governmental organizations, like Civil Servants procuring for a Government or Procurement Managers, and writing contracts is costly. *Overcontracting* can be a means to sustain implicit contracting when discretionary transfers are not allowed. With overcontracting on outputs that are costly to F but of no use for the principal, G can exchange discretionally the non-implementation of such explicit contract against the provision of non-contracted upon output adaptations.

The Corollary below discusses how the parameters of the model affect the set of implicit contract that is sustainable by using contracts as threats.

Corollary 1 *The degree of flexibility that can be achieved with an implicit contract increases with the cost of haggling (z) and with the cost of writing spot contracts* $(1-\gamma) k_q$ *whilst it decreases with the cost of adaptation (c_q), the bargaining power of F at renegotiation stage (α), and the importance of the surplus from (w_q).*

The degree of flexibility that can be achieved with an implicit contract decreases with the gain that F can obtain from refusing to do the adaptation unrewarded and bargain for better terms. Thus, the higher the ex-post bargaining power of F, α, or the surplus from the adaptation, $\omega_{q,}$ or the lower the transaction costs of renegotiation, $z+(1-\gamma)k_q$, the higher is the amount that F can appropriate by exploiting its improved bargaining position. An increase in the cost of adaptation c_q also reduces flexibility since it raises the cost for F from doing the adaptation unrewarded.

7 Rigid contracts

Let us now turn to analyze rigid clauses. Following Battigalli and Maggi (2002) we shall define a rigid clause as a rule which forces F to perform a given adaptation q in all states h even if worthless to G when $h \neq q$. In order to isolate the effect of rigid clauses on the optimal contract we assume that wasteful tasks are absent. We will show that an implicit contract between G and F may still be sustained if G decides to include rigid clauses into the contract and then use them as a credible threat if the realized state makes the adaptations they prescribe worthless.

For the sake of simplicity we assume here that only one adaptation, if any, can be regulated through a rigid clause. Note that this assumption is without any loss of generality for all these adaptations that are exclusive, in the sense that if F performs adaptation q_1 then he cannot also perform another adaptation q_2.[11] There exist several adaptations that are not exclusive, however, so this assumption will be relaxed later on in the paper to capture these cases as well.

We shall see that, in our framework, the role of rigid contracts is threefold. First, in the state where the prescribed adaptation is useful realizes, the rigid contract allows to obtain the adaptation at the only cost of the initial non-contingent contract. Second, if a state where the prescribed adaptation is not valuable realizes and haggling costs are substantial, G may use the rigid clause as a threat to sustain an implicit contract handling other adaptations at cheaper costs. Third, even if haggling costs are too low for rigid clauses to work as credible threats, such clauses may still be optimal for G because - by establishing a duty for F at competitive conditions (before Williamson's

[11] For example, if F adds bicycle and pedestrian paths on the sides of a bridge there may be no more room left for an extra line reserved to cabs and public busses; if he colors the school red he cannot color it blue, if enlarges windows to increase natural light in a hospital he cannot downsize them reduce the cost of heating. In all these case more than one rigid clause would contradict and nullify each other in front of a court.

the 'fundamental transfornmation') - they improve on $G's$ bargaining position versus F in states were valuable adaptations are left to spot contracting in a 'locked in' situation.

7.1 Rigid Clauses as Discipline Device on Spot Contracting

In this section we show that rigid contracts can act as a discipline device on soft contracting and thus have a beneficial value on G's expected profits irrespective of whether they are used as threat on implicit contracting. More precisely, G can always gain by substituting a spot contract with a rigid clause.

Let $C,\ I,\ S$ denote the set of q optimally regulated by a contingent clause, an implicit contract and a spot clause when rigid clauses are not possible, and suppose that one of these clauses, say $q \in C$, is now regulated by way of a rigid clause. Let

$$\tilde{w}_q^C = (v_q - \delta c_q) - k_q/p_q$$

$$\tilde{w}_q^I = v_q - \delta c_q$$

$$\tilde{w}_q^S = (1 - \alpha (1 - \delta)) (v_q - c_q - z - (1 - \gamma) k_q) .$$

As long as G keeps q under an explicit contingent rule, his expected profit is

$$\pi (q \in C) = p_q \tilde{w}_q^C + \sum_{q' \in C - q} p_{q'} \tilde{w}_q^C + \sum_{q' \in I} p_{q'} \tilde{w}_{q'}^I + \sum_{q' \in S} p_q \tilde{w}_q^S. \tag{8}$$

Suppose now that G decides to regulate q by way of a rigid clause and that $z \leq c_q$. In this case G might use the rigid clause as a bargaining threat on all other tasks regulated by way of a spot contract $q' \in S$. Indeed, on all these tasks the ex post surplus shared at the bargaining stage is

$$\Pi_{q'} = w_{q'} - z + c_q - (1 - \gamma) K_{q'},$$

where c_q is the cost saving that F obtains when G does not enforce the rigid clause, so that G gets a share of this surplus

$$(1 - \alpha) \Pi_{q'},$$

while F gets

$$-c_q + \alpha \Pi_{q'} = -c_q (1 - \alpha) + \alpha \tilde{w}_{q'}^S / (1 - \alpha (1 - \delta)) .$$

It follows that ex ante, in all states $h \in S$, G gets

$$(1-\alpha)\,\Pi_{q'} - \delta c_q + \alpha\delta\Pi_{q'} = \tilde{w}^S_{q'} + (1-\alpha)\,(1-\delta)\,c_q,$$

which is strictly greater than $\tilde{w}^S_{q'}$. When a rigid contract is in place, F's ex post bargaining power weakens as G uses this rigid contract to hold up F at the bargaining stage. In each state $h \in S$, G exchanges the non-implementation of the rigid clause on $q \neq h$ for a lower price for the adaptation $q = h$. This saves him the amount $(1-\alpha)\,c_q$ ex post and thus $(1-\alpha)\,(1-\delta)\,c_q$ ex ante.

Lemma 2 *Whenever feasible, a rigid clause helps G to increase the surplus from spot contracting.*

7.2 Rigid Contracts as Probabilistic Threats

In this section we analyze the effect of rigid clauses on implicit contracting. To this purpose, we still consider the case where wasteful tasks are unavailable, and suppose that only one adaptation can be regulated by way of a rigid clause. Moreover, we assume that the haggling cost z has to be paid on each aspect of the contract that is renegotiated. For simplicity, the 'cost of cancelling' an existing clause is normalized to zero with no loss of insights.

The implicit contract that we want to study in this section takes a simple form: given the adaptation q subject to the rigid clause, F has not to perform q in states $h' \notin q$ and $h' \in I$ as long as he has delivered $q' = h'$. Otherwise, G will enforce the rigid clause which requires F to perform the adaptation q even if this is worthless in state $h' \neq q$. For this course of actions to be part of an optimal contract two conditions need to be satisfied.

- **(Enforceability)** The implicit agreement must be robust to unilateral deviations by both G and F.
- **(Optimality)** G must gain from including the rigid clause into the optimal contract.

Let us start with the enforceability conditions. Consider an explicit contract that specifies a rigid clause for task q, and an implicit agreement that requires the agent to perform a set I of tasks. G's incentive to follow this rule is determined by the following renegotiation-proof condition:

$$z \geq c_q. \tag{9}$$

When this condition is not met the threat of enforcing the rigid clause would not be credible. Indeed, when $c_q > z$, G would gain a positive surplus $\alpha(z - c_q)$ by renegotiating on the rigid clause. An important point to notice here is that, since haggling costs have to be paid on each aspect of the contract that is changed, the renegotiation-proof constraint (9) implies that reneging on the rigid clause in never profitable when task q is worthless. F's incentive to obey to the implicit contract then implies the following constraints:

$$c_q \geq c_{q'} \quad \text{for all } q' \in I, \tag{10}$$

as long as renegotiation on q' is not profitable when this adaptation is not performed — i.e., if the renegotiation surplus $\Pi_{q'} = w_{q'} - z - (1-\gamma)\, K_{q'}$ is negative. Conversely, when renegotiation is profitable, i.e., $z < w_{q'} - (1-\gamma)\, K_{q'}$, F's incentive constraint rewrites as:

$$-c_q + \alpha \Pi_{q'} \leq -c_{q'}, \tag{11}$$

The following lemma summarizes the enforceability analysis:

Lemma 3 *As long as $z \geq c_q$ contracts being rigid on adaptation q can act as a threat that allows to sustain implicit agreements, implementing positive levels of the valuable but non-contracted upon adaptations in the state where they are needed. Formally, an adaptation q' can be sustained through an implicit contract only if*

$$c_{q'} \leq c_q \quad \textit{for} \quad z \geq w_{q'} - (1-\gamma)\, k_{q'}, \tag{12}$$

and only if

$$c_{q'} + \alpha(w_{q'} - z - (1-\gamma) k_{q'}) \leq c_q \quad \textit{for} \quad z < w_{q'} - (1-\gamma)\, k_{q'}. \tag{13}$$

Proof. The proof of this result immediately follows from gathering the incentive constraints (9)-(11) together. ■

Intuitively, only when the cost of renegotiation z in large enough neither G nor F have an incentive to break the implicit contract.

7.3 Optimal Contracting Mode

(preliminary and incomplete)

Building on the insight developed above, in this section we endogenize the choice of the contracting mode for governing flexibility, comparing ex-post explicit contracting with ex-ante contracting, contingent or rigid, and with implicit agreements. For the sake of simplicity, in what follows we shall present the analysis for the simplest case where the adaptation cost c_q is constant, that is, $c_q = c$ for all q. Of course, we focus on the region of parameters where $c \leq z$ as otherwise G would always renege on the rigid clause, i.e., the constraint $c_q \leq z$ would never be met.

Note that the cost of writing a rigid clause on task q for G is $(1-\gamma)\, k_q$. Hence, as long as adaptation q is regulated with a rigid clause, G's expected profit can be written as

$$V(q, C, S, I) = p_q v_q - (1-\gamma)\, k_q + \sum_{q' \in C} (p_{q'} v_{q'} - K_{q'}) + \sum_{q' \in I} p_{q'} v_{q'} + \sum_{q' \in S} p_{q'} (v_{q'} - t_{q'}) - t. \quad (14)$$

Recalling that C is the set of adaptations regulated with contingent clauses and that S is the set of those left to spot contracting, G's objective is to choose the sets (S, C, I) and the rigid adaptation q in a way such to solve the following optimization program:

$$\max_{(q,C,S,I)} V(C, R, S, I)$$

subject to the following restrictions:

- F's participation constraint

$$t - \delta \left(p_q c + \sum_{q' \in C} p_{q'} c + \sum_{q' \in I} p_{q'} c + \sum_{q \in S} p_{q'} (t_{q'} - c) \right) \geq 0, \quad (15)$$

- the incentive constraints (12) and (13) stated in Lemma 3.

Let Q be the set of adaptations satisfying either (12) or (13). This set is characterized by the following conditions when c_q is constant.

Lemma 4 *Suppose that $c_{q'} = c$ for all q', then the set of adaptations Q that can be regulated with an implicit contract is*

$$Q = \{q' \neq q : z \geq v_{q'} - c - (1-\gamma)\, k_{q'}\}.$$

The set Q is empty when $z < \min_{q'} \{v_{q'} - c - (1-\gamma)\, k_{q'}\}$. Differently, if $z \geq \max_{q'} \{v_{q'} - c - (1-\gamma)\, k_{q'}$ all adaptations can potentially be regulated by the implicit contract.

Proof. This result simply follows from equations (12) and (13). Indeed, for $c_q = c$, (12) implies that when the surplus from reneging on q' is negative, that is,z exceeds $\Pi_{q'} = w_{q'} - (1-\gamma)\, k_{q'}$, F is always indifferent between performing q' and perform the rigid clause, that is, $c_q = c_{q'} = c$. Differently, when this surplus in positive, equation (13) implies a contradiction since it would write as

$$w_{q'} - (1-\gamma)k_{q'} \leq z \quad \text{for} \quad z < w_{q'} - (1-\gamma)\, k_{q'},$$

which is clearly impossible. It then follows that the set of adaptations that are implementable with the implicit contract is defined by

$$Q = \{q' \neq q : z \geq w_{q'} - (1-\gamma)\, k_{q'}\},$$

which proves the result. ■

Equipped with this characterization we can now characterize the optimal contract with the possibility of rigid clauses. Recall that

$$\tilde{w}_{q'}^R = v_{q'} - \delta c - (1-\gamma)\, k_{q'}/p_{q'},$$

$$\tilde{w}_{q'}^C = v_{q'} - \delta c - k_{q'}/p_{q'},$$

$$\tilde{w}_{q'}^I = v_{q'} - \delta c,$$

$$\tilde{w}_{q'}^S = (1 - \alpha(1-\delta))\,(v_{q'} - c - z - (1-\gamma)\, k_{q'}).$$

The following proposition summarizes the result:

Proposition 3 *Suppose that $c_{q'} = c$ for all q', then:*

- *The optimal contract only specifies a rigid clause on the less complex adaptation q^*, with $q^* = \inf_q (k_q)$, if*

$$z \geq \max_{q'} \{v_{q'} - c - (1-\gamma) k_{q'}\},$$

while all adaptations different than q^* will be regulated with the implicit contract.

- *There is no implicit contracting when*

$$z < \min_{q'} \{v_{q'} - c - (1-\gamma) k_{q'}\},$$

in this case the optimal contract specifies a rigid clause on the clause q^* such that

$$q^* = \arg\max_{q'} \left(\tilde{w}^R_{q'} - \max\left\{\tilde{w}^S_{q'}, \tilde{w}^C_{q'}\right\}\right).$$

all other adaptations are regulated with spot contracting if $\tilde{w}^S_{q'} \geq \tilde{w}^C_{q'}$ and with explicit contracting otherwise.

- *When*

$$\min_{q'} \{v_{q'} - c - (1-\gamma) k_{q'}\} < z < \max_{q'} \{v_{q'} - c - (1-\gamma) k_{q'}\},$$

The optimal contract only specifies a rigid clause on the adaptation q^* such that,

$$q^* = \arg\max_{q' \notin Q} \left(\tilde{w}^R_{q'} - \max\left\{\tilde{w}^S_{q'}, \tilde{w}^C_{q'}\right\}\right),$$

only the subset Q of adaptations is left to implicit contracting. All other adaptations are regulated with spot contracting if $\tilde{w}^S_{q'} \geq \tilde{w}^C_{q'}$ and with explicit contracting otherwise.

Proof. First, showing that the optimal contract only specifies a rigid clause on the less complex adaptation q_1 if

$$z \geq \max_{q'} \{v_{q'} - c - (1-\gamma) k_{q'}\},$$

is immediate from Lemma 4. Indeed, if the above condition is met, then all adaptations can be enforced by the implicit contract, and by definition $\tilde{w}^I_{q'} > \max\left\{\tilde{w}^R_{q'}, \tilde{w}^S_{q'}, \tilde{w}^C_{q'}\right\}$

for all q'. Moreover, since $\tilde{w}_{q'}^{R} < \tilde{w}_{q'}^{I}$ and $p_{q'}\left(\tilde{w}_{q'}^{R} - \tilde{w}_{q'}^{I}\right) = -\left(1-\gamma\right) k_{q'}$ it follows that $q^* = \inf_q \left(k_q\right)$.

Second, from Lemma 4, it is immediate to verify that

$$z < \min_{q'} \left\{v_{q'} - c - \left(1-\gamma\right) k_{q'}\right\},$$

implies that there is no adaptation that can be sustained by the implicit contract. Hence the rigid adaptation q^* will be the one maximizing the difference $\tilde{w}_{q'}^{R} - \max\left\{\tilde{w}_{q'}^{S}, \tilde{w}_{q'}^{C}\right\}$. Moreover, given q^*, all other adaptations will be regulated with an explicit rule if $\tilde{w}_{q'}^{S} \leq \tilde{w}_{q'}^{C}$, and with a spot one otherwise.

Finally, Lemma 4 implies that Q is non-empty when

$$\min_{q'} \left\{v_{q'} - c - \left(1-\gamma\right) k_{q'}\right\} < z < \max_{q'} \left\{v_{q'} - c - \left(1-\gamma\right) k_{q'}\right\}.$$

In this case, all adaptations belonging to Q are regulated by the implicit contract since $\tilde{w}_{q'}^{I} > \max\left\{\tilde{w}_{q'}^{R}, \tilde{w}_{q'}^{S}, \tilde{w}_{q'}^{C}\right\}$ for all q'. Among those such that $q' \notin Q$, the rigid clause, say q^*, is chooses so as to solve:

$$q^* = \arg\max_{q' \notin Q} \left(\tilde{w}_{q'}^{R} - \max\left\{\tilde{w}_{q'}^{S}, \tilde{w}_{q'}^{C}\right\}\right).$$

The remaining adaptations will be regulated with an explicit rule if $\tilde{w}_{q'}^{S} \leq \tilde{w}_{q'}^{C}$, and with a spot one otherwise. ■

Whenever feasible, implicit contracts should be used to regulate the obligations of the parties. By not requiring a written description of actions and contingencies, implicit contracts help to save on the costs of writing contracts. This point was first made in Battigalli and Maggi (2008) but we highlight here different circumstances where implicit contracting might be used, due to the lock in effect.

From Proposition 3 implicit contracts should be used whenever (i) the cost of adaptation c_q is low and the gain that F can obtain by deviating from the implicit agreement to exploit its improved bargaining position is small enough compared to the cost of meeting its contractual obligations on the valueless tasks. Thus implicit contracts will be used when: (ii) the value of adaptation for G, v_q or the surplus w_q are low; (iii) the cost of contractually specifying output k_q is high; (iv) the haggling cost z is high.

As in BM, we find that contingent contracts should be used when implicit contracting is not feasible and the saving in writing costs γk_q from not specifying the state in the contract is low compared to the expected transaction costs of spot contracting $p_q(z+k_q)$. Costly adaptations (c_q high) or contingencies that are likely to be realized (p_q high) should therefore be regulated by contingent contracts. But, we also emphasize the role of the lock-in effect which suggests that contingent clauses should be used to regulate adaptations when the cost for G of ex-post contract renegotiation is high, not just because then implicit contracts are unfeasible, but also because then spot contracts are too costly for G. This effect suggests that contingent clauses should be used when (i) the ex-post bargaining power α of F is high; (ii) the value of adaptation for G, v_q, is high or the surplus w_q is high; (iii) the cost of specifying states in the contract γk_q is low, (iv) the haggling cost z is low and (v) the cost of ex-post rent $1-\delta$ is high.

This leads to the following predictions:

1) *Core services and ancillary services.* Adaptation for core services which are complex in nature and characterized by high levels of c_q, v_q and w_q should be regulated by contingent clauses. Adaptations for ancillary services with relatively simple output specifications should instead be regulated by implicit agreements.

2) *Potential competition.* Output adaptations for which competitive pressure by alternative providers is high (thus α is low), as for standardized services, should be regulated by implicit agreements. But when potential competition is small, as for non-standardized services, contingent clauses are preferable.

3) *Likelihood of changes in user needs.* The sustainability of implicit agreements is unaffected by the likelihood of changes in user needs. Within formal contracting, output adaptations which are likely to be needed (high p_q), should be regulated by contingent clauses instead of spot contracts. In relatively stable sectors instead spot contracts are preferable.

4) *Transaction costs:* High transaction costs (high z and $k_q(1-\gamma)$) favour implicit contracting but when transaction costs are small either contingent contracts or spot contracts might be used depending on the cost of specifying contingencies relative to haggling costs.

5) *Unverifiability of outcome:* the case of high writing costs ($k_q(1-\gamma)$) favour implicit contracting but when transaction costs are small either contingent contracts or spot contracts might be used depending on the cost of specifying contingencies relative to haggling costs.

5) *Cost of rents* δ. The sustainability of implicit agreements is unaffected by the cost of rents, but the greater this cost (smaller δ), the less spot contracting should be used instead of contingent clauses.

8 Conclusions

(to be completed)

We have assumed throughout in the paper that the government is benevolent. An interesting extension of the analysis could explore the case of malevolent public buyer using the flexibility generated by overcontracting to extract bribes from the firm, and the optimality of public regulations biased towards control of public buyers monetary expenditures at the expenses of using more complex performance indicators.

(Incomplete references)

References

[1] Aghion, P., Dewatripont, M. and Rey, P. (2002), "On Partial Contracting," *European Economic Review,* 46, 745-753.

[2] Athias, L. and Saussier, S. (2007), 'Contractual Flexibility or Rigidity for Public Private Partnerships? Theory and Evidence from Infrastructure Concession Contracts.' Mimeo.

[3] Bajari P, Tadelis S, (2001), "Incentives versus Transaction Costs: a Theory of Procurement Contracts", *RAND Journal of Economics*, 32(3), pp. 387-407.

[4] Baker, G., Gibbons, R. and Murphy, K.J., (1994), "Subjective Performance Measures in Optimal Incentive Contracts", *Quarterly Journal of Economics*, 109, 1125-56.

[5] Baker, G., Gibbons, R. and Murphy, K.J., (2006), "Contracting for Control", unpublished manuscript, HBS, MIT and USC.

[6] Banerjee A.V., Duflo E., (2000), “Reputation Effects and the Limits of Contracting: A Study of the Indian Software Industry”, *Quarterly Journal of Economics*, 115, pp. 989-1017.

[7] Battigalli, P., and Maggi, G., (2002), "Rigidity, Discretion and the Costs of Writing Contracts," *American Economic Review*, vol. 92(4), pp. 798-817.

[8] Battigalli, P., and Maggi, G., (2008), “Costly Contracting in a Long-Term Relationship,” *Rand Journal of Economics*, vol. 39(2), pp. 352-377.

[9] Bernheim, D. and Whinston, M., (1998), "Incomplete Contracts and Strategic Ambiguity", *American Economic Review,* 88, 902-32.

[10] Boot, A.W., Greenbaum S.I. and A.V. Thakor (1993), “Reputation and Discretion in Financial Contracting.” *American Economic Review*, 83(5): 1165–83.

[11] Chakravarty, S. and Macleod, B. (2009), "Contracting in the Shadow of the Law", forthcoming in the *RAND Journal of Economics.*

[12] Crocker K.J., Reynolds K.J., (1993), "The Efficiency of Incomplete Contracts: An Empirical Analysis of Air Force Engine Procurement", *RAND Journal of Economics*, 24, pp. 126 146.

[13] Dye R. A. (1985) “Costly Contract Contingencies,” *International Economic Review,* 26, pp. 233-250 (1985).

[14] Estache A., Wren-Lewis, L. (2009), "Towards a Theory of Regulation for Developing Countries: Following Jean-Jacques Laffont’s Lead", forthcoming in the *Journal of Economic Literature.*

[15] Guasch, J.L. (2004), “Granting and Renegotiating Infrastructure Concessions: Doing it Right,” *WBI Development studies, the World Bank.*

[16] HM Treasury (2006), PFI: strengthening long-term partnerships. London: HM Treasury.

[17] HM Treasury (2008), Infrastructure procurement: delivering long-term value. London: HM Treasury.

[18] Iossa, E. and Spagnolo, G. (2009), "Contracts as Threats: A Rationale for Contracting on A while Hoping for B ", *SSRN Discussion paper*

[19] Klein, B. (2000), "The Role of Incomplete Contracts in Self-Enforcing Relationships," *Revue D´Economie Industrielle,* 92 67-80

[20] Klein, B. and Leffler, K. (1981), "The Role of Market Forces in Assuring Contractual Performance", *Journal of Political Economy*, 89, 615-41.

[21] Kvaloy, O. and Olsen, T. (2009a), Endogenous Verifiability and Relational Contracting,' *American Economic Review*, 99(5), 2193–2208

[22] Kvaloy, O. and Olsen, T. (2009b), "Incentive provision when contracting is costly," Mimeo.

[23] NAO, National Audit Office (2007). *Improving the PFI Tendering Process.* London: National Audit Office, HC149.

[24] Pearce, D. and Stacchetti, E. (1998), "The Interaction of Implicit and Explicit Contracts in Repeated Agency", *Games and Economic Behavior,* 23(1), 75-96.

[25] Robinson, H. and Scott, J. (2009) Service delivery and performance monitoring in PFI/PPP projects," *Construction Management and Economics* 27, 181–197.

[26] Schmidt, K., and Schnitzer, M. (1995), "The Interaction of Explicit and Implicit Contracts," *Economic Letters,* 48, 193-199.

[27] Schwartz. A. and Watson, J. (2004). "The Law and Economics of Costly Contracting," *Journal of Law, Economics and Organization* 20: 2-31.

[28] Williamson, O., (1983), "Credible Commitments: Using Hostages to Support Exchange," *American Economic Review,* 73, 519-40.

[29] Williamson, Oliver E. (1985), *The Economic Institutions of Capitalism.* New York: The Free Press.

[30] Yescombe, E. (2007), *Public Private Partnerships: Principles of Policy and Finance*, Elsevier.

[31] Zheng, J., Roehrich, J. and Lewis, M. (2008), "The dynamics of contractual relational governance: Evidence from long-term public private procurement arrangements". *Journal of Purchasing & Supply Management, 14: 43-54.*