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Contractual design and public-private parternships for hospitals

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Abstract

Recently the Portuguese Government announced the launching of public private partnerships to build hospitals with the distinctive feature that both infrastructure construction and the clinical activities management will be awarded to a private party. Accordingly there appear coordination issues that are novel in the design of PPP contracts. We explore the conditions allowing for the optimal design contracts design under several some plausible scenarios.

Keywords: Public-private partnerships, contract design.

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1 Introduction

Public private partnerships (PPPs) have become a popular strategy in the production and delivery of public services. Given the financial constraints faced by governments, PPPs allow the possibility of providing high quality public services from both public and private sectors in partnership, thus extending the scope of analysis to what is known as the "new public management" in the provision of public services. Broadbent and Laughlin (2003) and Webb and Pulle (2002) provide complete introductions to this topic, Grimsey and Lewis (2004) provide an in-depth analysis of the PPPs, and Grimsey and Lewis (2005) present a selection of the main papers in the relatively new literature on public private partnerships.

PPPs have been most developed in the UK's so-called Private Finance Initiative (PFI), but PPPs are spreading across the world (EU countries, Canada, USA, Japan, Australia, New Zealand, and South Africa are representative examples)[1] in multiple forms.[2] Key sectors where PPPs are often applied are health, education, transport, and defense.

The introduction of the PPPs has not avoided controversy. On the one hand, Gaffney *et al.* (1999) show concerns on the fact that (health care) facilities funded through PFI in most cases provided less capacity than those they were intended to replace; Ahadzi and Bowles (2004) and Pollock *et al.* (1997) focus on the high costs and pre-contract time overruns that are often reported; Shortell *et al.* (2002), Spitz and Ritter (2002), Emanuel and Titlow (2002) or Deakin (2002) alert on the negative or mixed results of the evaluations of the public private partnerships as a device to improve community health. Bazzoli *et al.* (1997) however, sustain that public-private partnerships have great potential to improve coordination and effectiveness in community health delivery. On the other hand, Carvel (2002) supports the use of the PFI, and Shaw (2003) explores the pros and cons of the use of PFIs within the New Labour's policy paradigm of the Blair government. Finally, Atun and McKee (2005) clarify the failure of the PFI in the UK because of the accountancy criteria in the public budget rather than by the mechanism itself. Nevertheless, they remark that a fundamental flaw at the heart of the PFI scheme is its lack of flexibility due to the combination of long term contracts with the faster pace of change in

[1] Information on PPP projects by sectors and countries is available at www.pppbulletin.co.uk. For the UK, the HM Treasury Department (www.hm-treasury.gov.uk) updates biannually the information on the PFI signed projects.

[2] See, for instance, the European Commission guidelines for PPPs (2003) as an attempt to harmonize criteria and practices across the EU countries.

the delivery of health care. De Bettignies and Ross (2004) review the fundamental underlying economics of the PPPs to clarify the controversies driven by ideology more than careful analysis.

In general, there are two main reasons for public private partnerships. These are high risk and the appropriability issue (Bachula, 1998). Technology-based competition erodes appropriability and increases risk. Thus, these are factors working against the social objectives of an effective competition policy. In turn, competition policy is designed on the premise that innovation leads to a faster technological advance which increases economic growth and competitiveness of firms. Accordingly, there is a trade off between multiple independent firms competing and the benefits of the coordination to reduce risk and appropriability problems. One approach to this trade off is the design of guidelines for a public private partnership competition policy. Link and Scott (2001) contribute to this literature. Grimshaw *et al.* (2002) argue that there is little evidence of mutual gains from PPPs and, when they arise, their distribution is not equitable. In a somewhat similar line, Wettenhall (2003) studies necessary conditions for successful public private partnerships for protecting the public interest against the power exert by market forces. Pongsiri (2002) argues that the merit of public private partnerships is that they are oriented towards the mutual benefit. But as the role of the government is also to monitor the market place, it is necessary a well-defined regulation framework. Such regulatory scheme should ensure efficiency and optimality in the resources available to the partnership in line with the general policy objectives. Also, it should provide protection to the private sector against expropriation, respect for contractual agreements, and legitimate recovery of costs and profit proportional to the risk undertaken. On a different viewpoint Timmons and Marx (2004) address consumer protection and safety under the presence of public private partnerships in the health care sector.

In this paper we will concentrate in the design of PPPs in the health care sector. The same type of general questions and concerns arise when the public and private sectors coordinate in the production and delivery of health care services. Drevdahl (2002) looks at the consequences of the partnership between the public health agencies and managed care organizations in terms of the sustainability of the provision of population-oriented care, given the conflict between concern for populations and communities and the interest of the stockholders. In this line, Nishtar (2004) calls for the need to define global ethical and procedural principles and norms guiding

the PPP projects in the health care sector.[3] In a very critical approach Richter (2004) argues that the wave of PPPs are not necessarily innovative and may carry high risks. She suggests to replace the PPP policy paradigm by a policy paradigm centered on the public interest, where the interaction between public and private actors is guided by the achievement of health for all. This change of paradigm should start by the critical assessment and debate on the merits and risks of the PPP paradigm. Along this line, Buse and Harmer (2004) review the political dimensions of the public private health partnerships to argue how the emergence of PPPs has altered the distribution of power between public and private organizations, including the World Health Organizations or the World Bank.

From a different perspective, Broadbent *et al.* (2003) note that there are many criteria to guide whether PFI in the UK National Health Service should be pursued at the pre-decision stage.[4] However, they raise their concern on the lack of post-project evaluation and suggest a design for a system for post-project evaluation.

It has already been mentioned the differences among countries in the design of public private partnership contracts. Accordingly, it is difficult to make a general analysis of say, the efficiency or optimality properties of the PPPs. Thus, a more fruitful approach calls for a case by case basis. This spirit inspires this paper. The motivating situation stems from the recent announcement by the Portuguese Government of the launching of public private partnerships to build new hospitals.F

The novelty of the Portuguese PFI lies in that both infrastructure construction and the clinical activities management will be awarded to a private party. This makes a significant departure from PFIs in other countries, where typically only the infrastructure construction is given to the private agent. Therefore, a careful economic analysis of the properties of this option may shed light on potential problems to be expected, and provide guidelines for contract design of public-private partnerships. It is also clear that it introduces coordination issues that do not arise in the traditional public-private partnerships, and therefore one needs to check whether usual prescriptions from economic theory do still hold.

The Portuguese PFI will force the creation of two entities, one in charge of infrastructure

[3] See also World Bank (2001).

[4] See the webpage of the Department of Health on PPPs, www.dh.gov.uk/ProcurementAndProposals/fs/en

construction, the other with responsibility of clinical operations. The shareholder structure of the winning parties in each contract is expected to coincide to a considerable extent. The contract for infrastructure construction will have a duration of 30 years, while the contract for clinical services management will be of 10 years, renewable twice. A constraint present in the Portuguese programme, by design, is that the same core consortium will take both contracts in a first phase, though independent juridic entities will be in charge of each contract. Despite the existence of a substantial overlap in shareholders identities in both institutions, they need not be necessarily identical.

The implementation of this public-private partnership program demands a careful contract design, and the definition of what is included in the contract of one entity and what remains to be included in the contract of the other one. Some activities are clearly on one side or the other. However, there are activities that can conceivably can be included in any of the two private parties. These are, essentially, the soft facilities, like laundry, catering, cleaning services and the like.

The definition of boundaries may have a significant impact on the contract private economic agents are willing to take, and it constitutes part of the contract design problem for the Government. The quality of these services can be easily observed by the entity in charge of clinical activities, though it may well be non-contractible in the sense that it cannot appear in the contracts established by the Government.

Since quality of these soft facilities may not be contractible in all relevant dimensions, the contractual design must provide the proper incentives. One instrument available to the Government is the choice of the entity that will manage such facilities.

To simplify matters, we take a crude view of soft facilities management. We assume that either soft facilities are included in the contract of clinical activities management, or alternatively, they are included in the infrastructure institution, being directly paid by the Government. In the first option, the clinical activities management has to contract with the soft facilities provider its input. Another option would be the clinical activities management to provide directly the soft facilities services, a situation we term vertical integration. Macho-Stadler and Perez-Castrillo (1998) study the optimal allocation of contracting capacity in a moral hazard environment.

We also assume linear payments on costs, which conform well with observed practice. Fi-

nally, the contracts for infrastructure construction (and maintenance) and for clinical services management are assumed to specify in full all economic transactions between the entities and the Government.

We focus on the external effects of having two contracts, one for soft facilities services provision and the other for clinical services management. For that purpose, we abstract from the usual asymmetric information problems. It turns out that first-best choices can be achieved under each regime (not really surprising, as we assumed away the usual informational problems), with appropriate definition of the payment rule.

In particular, we want to address here the optimal contract design under the assumption that quality decisions in soft facilities can be observed by the entity in charge of clinical activities but not by the Government. Clinical activities provide their own input, which combined with infrastructure and soft facilities quality, "produce" treatment to patients.

We can look at this issue from several perspectives. The more general one is to take it as a direct application of asset specificity theories, within the theory of the firm (Hart, 1995), and ask whether, or not, there is a motive for integration of soft facilities into the clinical activities management entity. At a general level, this takes us to the discussion of which party makes the more decisive specific-investment and which one is the more sensitive to the awarding of control rights.

Along this line, it seems reasonable to argue that clinical activities should lead the process of vertical integration, as its marginal contribution and sensitivity of asset-specific investment is presumably greater than that of soft-facilities management.

This straightforward argument, however, is only part of the story as the existence of a payer to both entities providing services and the design of the payment schedules introduce some further structure into the model, and complementarities between inputs may play a decisive role.

The recent model of Jelovac and Macho-Stadler (2002) looks precisely at the issue of centralization and decentralization in the context of health care provision. Their primary example uses hospitals and physicians as the relevant agents. Decentralization in their setting means that an entity contracted by the payer (a hospital) will set the contract to a second entity (the physicians). Centralization means the payer offers directly contracts to both physicians and hospitals.

In terms of our problem, the agents will be the managers of clinical activities and the man-

agers of soft facilities. The Government may set the contracts to both (centralization) or allow for the manager of clinical activities to set the contract for the soft-facilities manager (decentralization). According to the results of Jelovac and Macho-Stadler (2002), and assuming the contribution of clinical activities to the health of patients to be more important than that of soft facilities, we fall again in an argument in favor of including soft-facilities management within the clinical activities contract, and then let the managers of clinical activities "hire" and organize the soft facilities input. However, the setting of Jelovac and Macho-Stadler (2002) leaves out two elements relevant in our analysis: first, the application of linear payment schedules, and, second, allowing for patients' welfare to be a concern to providers as well, which takes us to a version of the model of Ellis and McGuire (1986).

The paper is organized in the following way. Section 2 describes the model. Section 3 discusses under what conditions the first-best allocation can be implemented under each of the two contractual designs. Finally, section 4 presents some final remarks.

2 The model

Hospital production uses different types of inputs. We consider here three aggregate inputs: clinical activities, soft facilities (like laundry and catering) and hard facilities (like building and maintenance).

The output of the hospital is described by a production function H:

$$H(x, q; k) \tag{1}$$

where x is the input level of clinical activities and q is the quality of soft facilities. Parameter k denotes the investment in infrastructures. The health production function H is assumed to have the standard regularity properties: positive marginal effects of each input ($\partial H/\partial x > 0; \partial H/\partial q > 0$) at a decreasing rate ($\partial^2 H/\partial x^2 < 0; \partial^2 H/\partial q^2 < 0$); and, an increase in one input increases the marginal value of the other ($\partial H^2/\partial x \partial q > 0$). We assume infrastructure input, k, to be fixed, for presentation purposes (this assumption will be relaxed later on). We conjecture the main implications of our analysis to be qualitatively independent of this assumption.[5]

[5]This conjecture is important because by fixing k we are implicitly assuming that hospitals are already in place, while our motivating example refers to new hospitals to be built.

This output measure, the health of patients, is known to the Government, though its individual components are not, and it cannot be used to condition payments to health care providers.

Costs of providing clinical services are given by a cost function $C(x)$ and costs of providing quality are given by $\psi(q)$. We consider positive and increasing marginal costs in both activities ($\partial C/\partial x > 0$; $\partial^2 C/\partial x^2 > 0$; $\partial \psi/\partial q > 0$; $\partial^2 \psi/\partial q^2 > 0$). We assume away the existence of economies of scope.[6] Abusing notation, these cost functions also include other cost determinants unknown to the Government, making x and q non-contractible although payments may be related to C and ψ (x and q are not observable to the Government, who also does not know the cost functions, it only observes realized cost in each activity).

Payment rules can only be conditional on observed costs. That is, the health outcome and the intermediate inputs x and q are non-contractible. We further restrict the set of possible payment rules to linear payments on observed costs.

Our first group of results look at the equilibrium characteristics under each of the two possible contract structures, using a version of the Ellis and McGuire (1986) model of the hospital.

The Government maximizes total benefits to the patients net of the total payments made, T. Ti save on notation, we assume benefit H to be defined already in monetary units. Therefore, the social welfare function is simply:

$$SW = H(x, q; k) - C(x) - \psi(q) \tag{2}$$

Whenever the Government sets two contracts, $T = T_1 + T_2$, with

$$T_1 = \alpha_0 + \alpha_1 C(x), T_2 = \beta_0 + \beta_1 \psi(q) \tag{3}$$

if a single contract exists, the payment rule is described by

$$T = \alpha_0 + \alpha_1 (C(x) + \Omega(q)) \tag{4}$$

where $\Omega(q)$ is the payment made by the entity in charge of clinical activities management for the the soft facilities input. The change from T_1 to T is related to the reference costs used for payment, not on the linear form of the rule. Naturally, the optimal values of the parameters

The objective function of each entity takes into account benefits for patients and own profits:

$$V_1(H(x, q; k), T_1 - C(x)) \tag{5}$$

[6] Its existence would naturally favor joint production.

for the entity that explores clinical activities, and

$$V_2(H(x,q;k), T_2 - \psi(q)) \tag{6}$$

for the entity that is in charge of soft facilities management. Assuming, for simplicity, that $V_1 = V_2 = V$, that is, both entities value in the same way patients' welfare and own profits. Under integration of both activities in the same entity, we obtain

$$V(H(x,q;k), T_1 + T_2 - C(x) - \psi(q)) \tag{7}$$

which may differ from the single contract case as long as $\Omega(q)$ differs from $\psi(q)$.

Our interest lies in the comparison of two alternative contracting strategies by the Government. In a first possibility, the Government sets two different contracts, one with the entity managing clinical activities, the other with the soft utilities management.

In the second case, the Government establishes a single contract with the entity responsible for clinical activities, which has the duty to hire/contract the provision of the soft facilities input.

Several options can be considered here. We are particularly interested when the clinical activities management is able to perfectly control and monitor provision of soft facilities quality and to determine its payment.

3 Implementing the first best

3.1 The social optimum

Given our assumptions, it is a simple matter to establish the choice problem faced by the social planner as:

$$\max_{\{x,q\}} H(x,q;k) - C(x) - \psi(q) \tag{8}$$

The first-order conditions characterizing the optimal solution are given by:[7]

$$0 = \frac{\partial H}{\partial x} - \frac{\partial C}{\partial x} \tag{9}$$

$$0 = \frac{\partial H}{\partial q} - \frac{\partial \psi}{\partial q} \tag{10}$$

[7]Under our standard assumptions regarding the health production function and cost functions, second-order conditions for a maximum are also satisfied.

These first-order conditions will serve as a benchmark to the analysis in the next sections. Since we do not consider here the distortions arising from asymmetries of information, the first-best will be implementable under certain parameter configurations. Ensuring that equilibrium values satisfy the first-order conditions for a social optimum define such parameter configurations.

3.2 Under two separate contracts

The first case we consider is the one where the Government sets two different contracts, one for payment of clinical activities, the other for payment of soft facilities quality.

Solving by backward induction, we first present the optimal choice of each entity, given the linear payment rule. Then we discuss the optimal choice, by the Government, of the parameters defining the payment rules.

The problem faced by the soft facilities management is

$$\max_{q} V_2 = V(H(x, q; k), T_2(q) - \psi(q)) \tag{11}$$

The associated first-order condition is given by:[8]

$$\frac{\partial V}{\partial H}\frac{\partial H}{\partial q} - \frac{\partial V}{\partial \Pi_2}\left(\frac{\partial T_2}{\partial q} - \frac{\partial \psi}{\partial q}\right) = 0 \tag{12}$$

where $\Pi_2 = T_2(q) - \psi(q)$ is the financial surplus accruing to the management of soft facilities. Similarly, the problem faced by clinical activities management is:

$$\max_{x} V_1 = V(H(x, q; k), T_1(x) - C(x)) \tag{13}$$

The first-order condition is:[9]

$$\frac{\partial V}{\partial H}\frac{\partial H}{\partial x} + \frac{\partial V}{\partial \Pi_1}\left(\frac{\partial T_1}{\partial x} - \frac{\partial C}{\partial x}\right) = 0 \tag{14}$$

where $\Pi_1 = T_1(x) - C(x)$. We can now take the problem of the Government:

$$\begin{aligned} \max_{\{\alpha_0,\alpha_1,\beta_0,\beta_1\}} \quad & H(x, q; k) - C(x) - \psi(q) \\ s.t. \quad & x = x^*(\alpha_0, \alpha_1), \qquad V_1^* \geq 0 \\ & q = q^*(\beta_0, \beta_1), \qquad V_2^* \geq 0 \end{aligned} \tag{15}$$

[8] The standard regularity assumptions assumed earlier ensure second-order conditions for a maximum hold.

[9] Like in the previous case, the regularity properties imposed imply second-order conditions for a maximum to be satisfied.

where x^* and q^* are the optimal solutions resulting from the previous problems.

Given the simple structure of the problem, the implementation of the social optimum requires

$$\frac{\partial T_1}{\partial x} = \alpha_1 = 1 - \frac{\partial V/\partial H}{\partial V/\partial \Pi} \tag{16}$$

$$\frac{\partial T_2}{\partial q} = \beta_1 = 1 - \frac{\partial V/\partial H}{\partial V/\partial \Pi} \tag{17}$$

and (α_0, β_0) are chosen such that $V_1^* = 0$ and $V_2^* = 0$.

A first question is whether these conditions give origin to a well-defined set of parameters. Since $\partial T_1/\partial x = \alpha_1$ and $\partial T_2/\partial q = \beta_1$ in our linear payment structure, notice that in equation (16) we are interested in the relative weights for the clinical activities management between patients' welfare and profits and in equation (17) the relevant agent is the soft facilities management. Thus, by appropriate definition of the parameters, the first-best allocation is achieved with the Government contracting with both entities, even if the Government does not control directly the input of soft facilities management and of clinical activities. This is, essentially, an extension of the Ellis and McGuire (1986) result, to the case of two decision variables.

Note that we need both conditions to hold simultaneously, as marginal valuations for one entity are conditional on the decision taken by other entity.

There is no efficiency cost, under our assumptions, from the existence of two different contracts. Therefore, the possibility of monitoring soft facilities management by clinical activities management can, at best, lead to the same optimal allocation of resources (although surplus allocation across economic agents may well differ).

3.3 Sequence of contracts

We take now the decentralized contractual setting. By this, we have in mind the case where the Government sets a single contract with the clinical activities provider, who in turn has to set the contract to the soft facilities management.

A consequence of this cascade, or sequence, of contracts is that payments by the clinical activities entity to the soft facilities management is a cost to clinical activities management that is eligible for reimbursement. As such, it is included in the allowable cost basis for payment purposes.

We take first the case where clinical activities management can perfectly monitor soft facilities quality. Thus, clinical activities management can effectively choose q and set payment $\Omega(q)$ so that the participation constraint of soft facilities management is satisfied.

When one entity (clinical activities) hires the other, the objective function for the clinical activities management entity becomes

$$V(H(x,q;k), T - C(x) - \Omega(q)) \tag{18}$$

where $T = \alpha_0 + \alpha_1(C(x) + \Omega(q))$, $\Omega(q) = \omega_0 + \omega_1\psi(q)$.

The second-stage choice problem is given by

$$\max_{\{x,q,w_0,w_1\}} \quad V(H(x,q;k), \alpha_0 + (\alpha_1 - 1)(C(x) + w_0 + w_1\psi(q))) \tag{19}$$

$$s.t. \quad V(H(x,q), w_0 + (w_1 - 1)\psi(q)) \geq \overline{V}_2 \tag{20}$$

where the constraint requires that a minimum level of utility is achieved by soft facilities managers.

The corresponding first-order conditions are (with λ being the Lagrange multiplier):

$$0 = \frac{\partial V}{\partial H}\frac{\partial H}{\partial x} + (\alpha_1 - 1)\frac{\partial V}{\partial \Pi_1}\frac{\partial C}{\partial x} + \lambda\frac{\partial V}{\partial H}\frac{\partial H}{\partial x} \tag{21}$$

$$0 = \frac{\partial V}{\partial H}\frac{\partial H}{\partial q} + (\alpha_1 - 1)w_1\frac{\partial \psi}{\partial q}\frac{\partial V}{\partial \Pi_2} + \lambda\left(\frac{\partial V}{\partial H}\frac{\partial H}{\partial q} + \frac{\partial V}{\partial \Pi_2}(w_1 - 1)\frac{\partial \psi}{\partial q}\right) \tag{22}$$

$$0 = \frac{\partial V}{\partial \Pi_2}(\alpha_1 - 1)\psi(q) + \lambda\frac{\partial V}{\partial \Pi_2}\psi(q) \tag{23}$$

$$0 = \frac{\partial V}{\partial \Pi_2}(\alpha_1 - 1) + \lambda\frac{\partial V}{\partial \Pi_2} \tag{24}$$

$$\overline{V} = V(H(x,q), w_0 + (w_1 - 1)\psi(q)) \tag{25}$$

Inspection of first-order conditions reveal that equations (23) and (24) define the same constraint for $\psi(q) > 0$, which introduces one degree of freedom in the payment rule. Moreover, from these conditions, $\lambda = 1 - \alpha_1$, which allows to simplify equation (21) to

$$\frac{\partial V}{\partial H}\frac{\partial H}{\partial x} + (\alpha_1 - 1)\frac{\partial V}{\partial H}\frac{\partial C}{\partial x} + (1 - \alpha_1)\frac{\partial V}{\partial H}\frac{\partial H}{\partial x} = 0 \tag{26}$$

or

$$\frac{\partial H}{\partial x}\frac{\partial V}{\partial H}(2 - \alpha_1) = (1 - \alpha_1)\frac{\partial V}{\partial \Pi}\frac{\partial C}{\partial x} \tag{27}$$

Comparison with the first-best allocation reveals that the socially optimal choice of x will result if α_1 is defined such that the following condition is satisfied:

$$\frac{\partial V}{\partial H}(2-\alpha_1) = (1-\alpha_1)\frac{\partial V}{\partial \Pi} \tag{28}$$

Taking now the first-order condition associated with quality of soft facilities, q, and substituting for λ, we obtain

$$(2-\alpha_1)\frac{\partial V}{\partial H}\frac{\partial H}{\partial q} = \frac{\partial V}{\partial \Pi}(1-\alpha_1)\frac{\partial \psi}{\partial q} \tag{29}$$

So, the definition of α_1 above is also sufficient to induce the first-best choice of quality q if $\partial V/\partial \Pi_2 = \partial V/\partial \Pi_2$. Therefore, the first-best allocation of resources can also be achieved in a sequence of contracts, though with a different parameter for the cost sharing between the Government and clinical activities management:

$$\alpha_1 = 1 - \frac{\partial V/\partial H}{\partial V/\partial H - \partial V/\partial \Pi} \tag{30}$$

This parameter can be higher or lower than 1, and it can be higher or lower than the one in the case of separating contracts.

Assuming $\partial V/\partial \Pi > \partial V/\partial H$, $\alpha_1 < 1$ and the optimal contract set by the Government will have now less cost sharing than in the case of separate contracts.

The reason for this is relatively simple, as the clinical activities management has a smaller interest in introducing incentives to efficient provision of soft facilities quality the more it benefits from cost sharing.

Two remarks are worth noting. First, if the contract between the Government and the clinical activities management may specify constraints over w_0 and w_1 the first-best may be easier to attain. Suppose that full cost reimbursement is imposed in the payment for soft facilities quality, though clinical activities management can perfectly monitor this quality, and the same financial rent as in the separate contracts situation is given to the parties. Then, the optimal contract between the Government and clinical activities management is equal to the one of the case of two separate contracts.

On the other hand, if there is no clear information advantage in monitoring soft facilities quality by the clinical activities management relative to the Government, then the sequence of contracts cannot implement the first-best allocation.

We decided to model in a very simple way the informational advantage that clinical activities managers have relative to the payer, regarding the quality of soft facilities: they can enforce the desired level of quality, provided the participation constraint is satisfied.

4 Final Remarks

Having provided the main intuition in a very simple setting, we need now to discuss in more detail some extensions. One is the existence of a contract for building and maintenance of the hospital. Therefore, independent soft facilities management in what we termed "decentralization", following Jelovac and Macho-Stadler (2002), is actually inclusion of these activities in the building and maintenance contract. Thus, the discussion must be reinterpreted in terms of the interaction of soft facilities with clinical activities on the one hand, and building and maintenance, on the other hand.

A second issue not addressed is the timing of the contracts. For clinical activities management, contracts are predicted to have a duration of 10 years, while for building and maintenance the contract will be awarded for 30 years. How the different time horizons will change, or not, incentives for investment is an open issue.

A third issue, valid for both options, is the scope for future renegotiation of contracts. Experience has shown hat health care delivery is sensitive to cost shocks due to technological progress (which usually entails more costs), and, in Portugal at least, to "soft budget constraint" problems, making future renegotiation of contract terms a concern that may have a bearing on contract design.

A fourth issue, intentionally left aside, is asymmetric information, which would result under decentralization in a sequence of incentive compatible contracts. This problem has been addressed, in a slighlty different context, by Boadway, Marchand and Sato (2004).

A final issue is the possibility of collusion between the two entities, something that may be fostered by the existence of common shareholders in both entities.

If we take collusion as meaning that both entities behave as a single containing both activities within it, then the first-best is again attainable, and the existence of two contracts or a sequence of contracts is irrelevant, as the effects of the contract between clinical activities management and the soft facilities entity will be fully internalized.

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