ANALYSIS OF ALTERNATIVE TENDERING MECHANISMS FOR TRANSPORTATION PUBLIC-PRIVATE PARTNERSHIPS

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ABSTRACT

This paper describes a theoretical model based primarily on transaction costs, for comparing the various tendering mechanisms used for transportation Public-Private Partnership (PPP) projects. In particular, the model contrasts negotiated procedures with the open procedure, as defined by the current European Union legislation on public tendering. The model includes both *ex ante* transaction costs (borne during the tendering stage) and *ex post* transaction costs (such as enforcement costs, re-negotiation costs, and costs arising from litigation between partners), explaining the trade-off between them. Generally speaking, it is assumed that the open procedure implies lower transaction costs *ex ante*, while the negotiated procedure reduces the probability of the appearance of new contingencies not foreseen in the contract, hence diminishing the expected value of transaction costs *ex post*. Therefore, the balance between *ex ante* and *ex post* transaction costs is the main criterion for deciding whether the open or negotiated procedure would be optimal. Notwithstanding, empirical evidence currently exists only on *ex ante* transaction costs in transportation infrastructure projects. This evidence has shown a relevant difference between the two procedures as far as *ex ante* costs are concerned, favouring the open procedure. The model developed in this paper also demonstrates that a larger degree of complexity in a contract does not unequivocally favour the use of a negotiated procedure. Only in those cases dealing with very innovative projects, where important dimensions of the quality of the asset or service are not verifiable, may we observe an advantage in favour of the negotiated procedure. The bottom line is that we find it difficult to justify the employment of negotiated procedures in most transportation PPP contracts, especially in the field of roads. Nevertheless, the field remains open for future empirical work and research on the levels of transaction costs borne *ex post* in PPP contracts, as well as on the probabilities of such costs appearing under any of the procurement procedures.

Keywords: transaction costs, public procurement, infrastructure, public-private partnership

INTRODUCTION

While the use of Public-Private Partnerships (PPPs) in the field of transportation has spread widely in many countries over the past two decades, public opinion continues to harbor doubts and mistrust of the PPP mechanism as a provider of infrastructure or public services. In some contexts, suspicion and even strong confrontation against PPPs are not uncommon.

One factor underpinning the lack of confidence in PPP schemes may be the poor degree of project transparency and subsequent *ex post* evaluation of performance (Stambrook, 2005). Indeed, when such evaluations have been carried out, the outcomes obtained clearly question the great optimism of some governments regarding PPPs (see, for instance, Shaoul, Stafford and Stapleton, 2006)

In this context, we believe that one fundamental of PPP arrangements demanding deeper analysis and eventual improvement is the use of good practices in the bidding and contract award procedures. This issue already raises a great deal of concern within public agencies and institutions. According to a UN report on the development of PPPs worldwide, there is generally speaking a gap between the capacity to organize competitive tenders, especially at the local level, and the public perception of inadequate transparency in awarding PPP deals (United Nations Economic Commission for Europe, 2007).

In particular, the concerns of both governments and institutions tend to focus on the transaction costs of PPP arrangements: there is a general perception that high transaction costs are borne at the tendering phase of PPP deals. Here we may cite, out of the specialized literature on the subject, the contributions of Debande (2002), Riess (2005), and Välilä (2005), just to name a few. All these authors assume high costs in the preparation, bidding, and award of PPP contracts. In the UK in particular, the National Audit Office (2007) has tackled the issue of high transaction costs in PPPs at the bidding phase, pointing out the need to manage the tendering stage more effectively so as not to jeopardise the goal of Value for Money (VfM). The NAO study expresses concern over lengthy tendering projects and cites an overall average tendering period of 33 months across various UK sectors.

However, from our point of view, past studies of the transaction costs in tendering PPP deals have disregarded a key factor -- probably the most important and essential to determining the level of such costs. This factor is the mechanism used to tender projects, and the reason that this factor is not regarded in most studies carried out to date is the prevalence of negotiated procedures for bidding such contracts. Up to a point, the type of contract (that is to say, PPP versus traditional public provision) is linked automatically with its tendering mechanism (negotiated procedure versus auction or other alternative mechanisms), when it need not be so. In fact, “non-negotiated” mechanisms are also used to tender PPP contracts (though to a lesser degree so far), and there is some empirical evidence showing that the tendering mechanism has a significant impact on the level of transaction costs borne during the preparation and launch of projects, as asserted, for the transportation sector, in Sánchez Soliño and Gago de Santos (2010). To a certain extent, this contribution proved that high transaction costs at the bidding phase are more an outcome of the use of the negotiated

procedure in the bidding of PPP contracts than an inherent trait or characteristic of PPP arrangements. The above-mentioned NAO study supports this statement when it argues that high transaction costs mainly arise due to long and complex contract negotiations and delays in project delivery; such time-consuming negotiations demand the involvement of legal advisers and other human resources for more than two years, on average.

In the present paper we shall follow the classification of the bidding mechanisms established in the European legislation on the issue. In particular, we shall use the content of EU Directive 2004/18/EC of the European Parliament and Council (European Union, 2004). The EU Directive takes into consideration four different procurement procedures for the award of public contracts, namely: open procedures, restricted procedures, negotiated procedures, and Competitive Dialogue. As the definition of these procedures is important to a better understanding of this paper, we provide the following summary.

According to the EU Directive, open procedures are defined as those whereby any interested economic operator may submit a tender. A key feature of the open procedure is that the proposals submitted by the candidates are binding and thus cannot be changed or negotiated during the procedure. The contract is awarded on the basis of the "most economically advantageous tender", which does not necessarily mean the one with the lowest price. Some advantages of the open procedure are that it enhances competition in the tendering process and facilitates the comparability of proposals. However, this procedure requires that the contracting authority provide advanced bidding documentation, in which the main features of the project are well defined. The contracting authority should have a clear understanding of its own objectives and the means to achieve them before tendering a project under an open procedure.

Restricted procedure means, in the definition given by the Directive, those procedures in which any economic operator may request to participate, but where only those economic operators invited by the contracting authority may submit a tender. The awarding process is similar to that of the open procedure, but the number of bidders is limited.

Negotiated procedures are those where the contracting authorities consult the economic operators of their choice and negotiate the terms of contract with one or more of these. In the current practice, negotiated procedures are structured into different stages (Pre-qualification, Invitation to Negotiate, Best and Final Offer, Preferred Bidder). In each of these stages, the number of participants is reduced until the Preferred Bidder is finally chosen, although negotiations continue in this last stage.

The Competitive Dialogue is a new procedure introduced by the EU Directive. It is described as a procedure in which any economic operator may request to participate and whereby the contracting authority conducts a dialogue with the candidates admitted to the procedure, with the aim of developing one or more suitable alternatives capable of meeting its requirements, on the basis of which the chosen candidates are invited to tender. Even though the Competitive Dialogue is more structured and regulated than the negotiated procedure, they share many similarities, especially in the early stages of the tendering process.

The EU procurement Directive has been in force in most member countries since January 31, 2006. At present, within the EU, very few contracting authorities (national, regional, or local bodies) resort to an open procurement procedure to launch PPPs. The UK, Ireland, Portugal, the Netherlands, France, and Italy, to name a few, are prone to negotiated procedures. Spain and Germany are indeed particular cases since they have implemented both open and negotiated procedures (although to date Spain has resorted mostly to open procedures). Regarding the Competitive Dialogue, experience so far has been limited, although most EU countries have adopted the new regulatory framework into their national laws.

For the purpose of this paper, it is interesting to contrast two basic types of procedures: non-negotiated and negotiated. In this way, we can simplify and re-group the four procedures described above into two classes: on the one hand, open and restricted procedures (both non-negotiated), and on the other, negotiated procedures, including Competitive Dialogue. Among the first class, the open procedure is more used in practice and is the option most often referred to throughout this paper. Furthermore, the term “open procedure” (which responds to legal terminology used in European legislation) can be associated with the concept of “auction” widely used in the field of procurement economics. In this paper, therefore, we shall use the terms “open procedure” and “auction” interchangeably.

The empirical contrast between PPP bidding procedures, as carried out in Sánchez Soliño and Gago de Santos (2010), refers specifically to transaction costs accrued in the preparation and bidding phases. The results obtained were unequivocal; contracts bid through an open procedure registered lower transaction costs in transportation infrastructure projects than those contracted through a negotiated procedure. However, further comparison between the different bidding procedures would require a broader and more general framework, in order to include transaction costs borne over the entire life-cycle of the contract, among other aspects.

Such is addressed in the present paper, our approach taking into account recent literature on procurement and information economics, where authors have studied the advantages and drawbacks of auctions and negotiations. First of all, we should highlight that the difference between auctions and negotiations is not always clear-cut. For Gimpel *et al.* (2008), auctions may be seen as negotiations with a well specified and enforceable protocol. From this point of view, the key feature of auctions is that the auctioneer follows a predefined algorithm to compute the final contract, from among only the offers made. In contrast, in the negotiated procedure, the negotiating parties themselves have the discretion to decide on the acceptability of an offer: the decision is not limited to any predefined algorithm, and it is not solely limited to consideration of the offers.

Among those scarce contributions dedicated to the comparison between auctions and negotiations, we should point out the work of Bajari, McMillan, and Tadelis (2003), who have constructed a theoretical framework to guide the client’s choice on procurement procedures (negotiations versus competitive auctions); these authors then apply empirical analysis directly to building contracts undertaken in the private sector. Their view is that the choice

between procurement procedures is bundled with the choice of contractual form. That is, in their analysis they established a link between each of the procurement procedures and a specific contractual form: while the negotiated procedure is associated with *cost-plus* contracts, the use of the auctions is identified with *fixed-price* contracts. In *cost-plus* contracts the private contractor receives a payment from the public sector equal to the cost incurred plus a fee, while in *fixed-price* contracts the contractor receives a fixed amount, independent of the cost supported. The former is seen as a low-powered incentive scheme, while the latter represents a high-powered incentive scheme (Laffont and Tirole, 1993).

Bajari *et al.* (2003) argue that *cost-plus* contracts do not lend themselves to competitive auction, while most of the contracts bid through a negotiated procedure are indeed of this type (*cost-plus* contracts). However, in our case this is not so, since we must take into account that PPP contracts are characterised precisely by a high transfer of risks to the private sector. In fact, the transfer of construction risks is one of the requisites imposed by Eurostat (2004) on EU member countries so that investments undertaken via PPP arrangement have an off-balance sheet status for the public sector. This transfer of risks in PPP contracts usually includes the risk of deviation from estimated costs for the construction, or for the service provided, and this transfer of risks occurs whether under auction or negotiated procedure. Consequently, PPP contracts may be seen, generally speaking, as *high-powered incentive* contracts, as stressed by Debande (2002).

As a consequence, the model developed by Bajari *et al.* cannot be applied directly to our study. For this reason, in section 2 we develop a specific model, based mainly on transaction costs, to help us compare the different bidding procedures in PPP deals.

In section 3, some of the assumptions used in the theoretical model of section 2 are lifted. The analysis is carried out taking into account some of the results obtained by Bulow and Klemperer (1996) and Manelli and Vincent (1995), who also compare auctions and negotiations during contract bidding. Finally, Section 4 draws the paper's conclusions.

THEORETICAL MODEL

The model developed below aims to provide a clear and simple theoretical approach to solving the question of how to select the most suitable bidding mechanism to contract a particular PPP project. This model is based mainly on the explicit incorporation of the contract's transaction costs, and it can be applied not only to the transportation sector, but also to other kinds of projects.

Consider a public body or a public agency whose goal is to maximize a social utility function of a specific project under a PPP contract. It is assumed that the contract includes the undertaking of an initial investment in a specific asset (normally infrastructure, facilities, or a building) as well as the asset's operation over a period of time. To carry out the project, the public authority must select a private partner (the so-called contractor). One of our assumptions in this model is that in PPP contracts, the quality of the infrastructure, building,

or service underlying the contract is observable, verifiable, and contractible. Notwithstanding, in section 3 we will also analyze the implications of lifting this assumption.

The public authority must choose the bidding mechanism to maximize the social utility function. The variable describing the type of the bidding mechanism will be **z**, which can take the following values:

z = 0 for open procedure
z = 1 for negotiated procedure

Accomplishment of the project yields a certain value for the society, namely **V,** which represents the overall expected benefits (i.e. the gross social surplus) of the project. According to our key assumption, the public authority demands the project's output to reach a certain level of quality knowing that, as stressed above, such level of quality is verifiable and contractible. Therefore, the quality of the output is exogenously fixed in our model, and the administration can introduce penalties, should the contractor breach such level of quality.

On the other hand, accomplishment of the project will yield a production cost, comprising the initial investment plus the discounted value of the operation costs incurred over the project's whole life-cycle. The expected value of such cost will depend as much on the size project as on a set of traits inherent to the project (such as the type of infrastructure, location, services provided, etc...). To simplify the model, we will reduce all such traits, project size included, to only one variable, **X,** representative of the degree of complexity of the project. Hence, the expected production cost of the project will be C = C(X), a cost that will soar, logically, as the complexity of the project (**X)** grows. We do assume that a PPP contract has the characteristics of a fixed-price contract in both cases (in the open procedure as well as in the negotiated procedure). Therefore, the incentive system for the contractor is similar in both cases, and we do assume that the bidding procedure does not have an influence on the contract's production cost. This assumption, however, is clarified in section 3; in particular, we bear in mind the fact that the expected number of bidders differs from one procedure to the other (with a larger number in the open procedure).

Furthermore, PPP contracts are characterised, in general, by a significant initial investment in construction plus a quite extensive operation period (of normally around 30 years), which means that its execution and delivery are subject to great uncertainty. Because of this, contracts establishing the relationship between an administration and a contractor are in these cases usually long and complex, since they try to regulate all the potential scenarios which may arise over the contract's life cycle. However, despite the high complexity of the specifications established initially, and no matter how detailed they become, it is inevitable that the contract contain legal loopholes governing how the parties will react to the appearance of certain contingencies not explicitly forecast in the contract (or not described with precision). That is to say, following the literature's terminology on this matter, we may state that PPP contracts are, in general, "incomplete" contracts.

As opposed to a complete contract, we may define a contract as incomplete if it has contractual gaps stemming from *ex ante* design (or in its *ex post* interpretation), or if it does not cover a significant part of the contracting possibilities that could ideally be anticipated in the contract completion stage. Although a contract may be legally 'complete' in the sense that it does not hold any breach, it may be called 'incomplete' in economic terms if it neglects to offer a set of duties and responsibilities for every possible 'state of the world'. If we have a set of feasible contracts for a particular purpose, incomplete contracts will be defined as a specific restriction of the whole (Tirole, 1999).

For example, in a contract comprising the construction of an important transportation infrastructure, a degree of uncertainty around the conditions of the work to take place will always exist. The contract may foresee which party will assume different risks, and how the parties will proceed in the face of a specific setback, but always with certain limitations, given the infinite number of situations and contingencies (archaeological, geological, labour, environmental, land ownership and acquisition, opposition of local populations, administrative permits, etc.) that may eventually arise.

To introduce this approach in the model, we can establish a probability such as **Π = Π(X, z)** that all relevant contingencies (i.e., with a substantial repercussion on the project) which actually come up during the contract's life cycle are foreseen and well specified in the contract. This probability depends on the project's complexity and on the bidding procedure. Thus, there will be a probability equal to **(1**–**Π)** of at least one relevant contingency arising that was not foreseen in the contract, thus leading to friction between the administration and the contractor, producing a set of enforcement costs, renegotiation and, given the case, litigation burdens between the contractual parties. These are the so-called *ex post* transaction costs; that is to say, costs produced once the contract has been signed, here designated **TCp**. These transaction costs can take different shapes: for instance, as value loss for a project due to execution delays, or as the costs of legal advisors in case of litigation. The value given to TCp, to be introduced in the model, would be an average discounted value of such *ex post* transaction costs, once a contingency not foreseen in the contract materialises. We assume that TCp = TCp (X); i.e., that such costs depend exclusively on the project's degree of complexity. This assumption simplifies the analysis without undermining the conclusions drawn from the model. We also assume that transaction costs TCp grow as **X** increases --much as production costs-- which seems a reasonable hypothesis.

Moreover, contract completion and execution also require incurring a set of *ex ante* transaction costs, namely preparation and bidding costs, designated **TCa**, which can absorb a considerable amount of resources in PPP contracts. In principle, these **TCa** costs will also depend on a project's level of complexity. The more complex a project, the larger the degree of preliminary study required to draw the contract's specifications and to prepare the submission of proposals, meaning that transaction costs will increase along with the project's complexity. In this work, we further assume that **TCa** will depend also, and in particular, on the bidding procedure, namely **z**. Thus, we are assuming that: TCa = TCa(X, z)

Additionally, transaction costs **TCa** are related to the value of the probability **Π**. The existence of *ex ante* transaction costs is precisely due to the need to reduce the vast number of uncertainties around a project before initiation of the tendering phase and selection of a contractor. Therefore, transaction costs **TCa** will be an increasing function of **Π**: to achieve a greater degree of completeness in the contract, more *ex ante* transaction costs need to be borne. This assumption is reflected in **figure 1** (for a project with a given complexity level), in which moreover we can distinguish different functions for each of the bidding procedures.

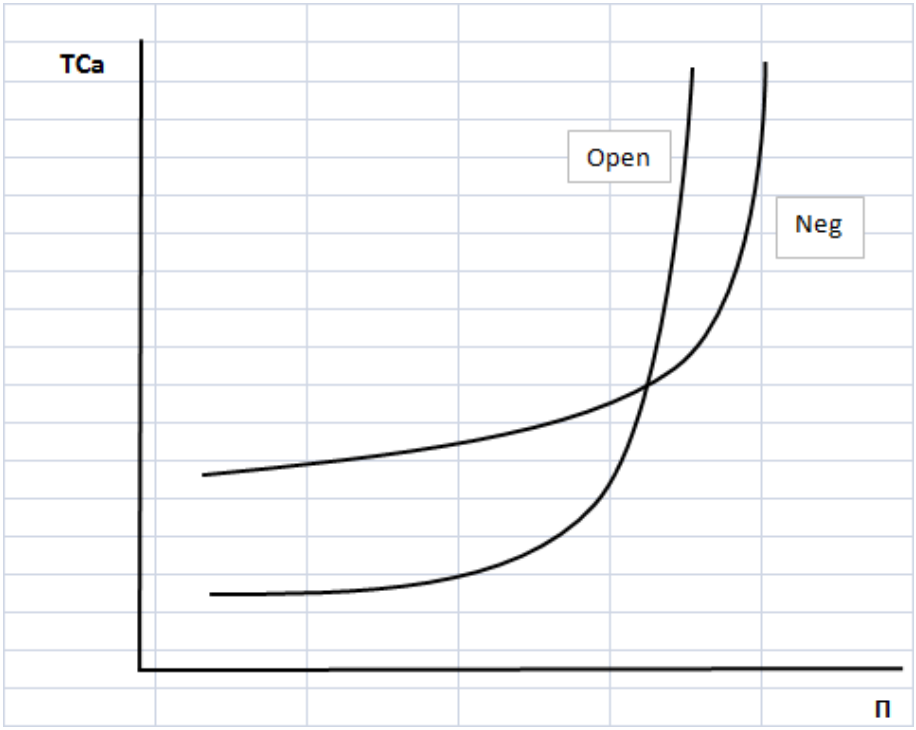

Figure 1

As we observe in figure 1, we assume not only that *ex ante* transaction costs grow as **Π** grows, but also that they grow more than proportionally (with **Π**). That is to say, we assume that when reducing the project's uncertainty (when augmenting **Π**) the marginal transaction costs increase. For example, if we take the case of an underground works project (a railway tunnel, for instance), it is essential to carry out the drilling tests before the signing of the contract, because such tests are able to reduce the project's uncertainty; but they are also very costly. From a given point onward, additional tests will only reduce the project's uncertainty to a very limited extent -- but they will still have a very high cost.

Within each of the curves, we will obtain the optimal point where the following expression holds:

$$\frac{\partial TCa}{\partial \pi} = TCp \qquad (1)$$

Or, in a discrete version:

$$\Delta TCa = TCp\ \Delta\pi \tag{2}$$

In other words, on the optimal point the marginal increase in *ex ante* transaction costs will be equal to the benefit obtained by reducing the margin of uncertainty for the project.

However, in order to simplify the presentation of the model, we can assume that the curves of transaction costs are shaped as shown in **figure 2**.

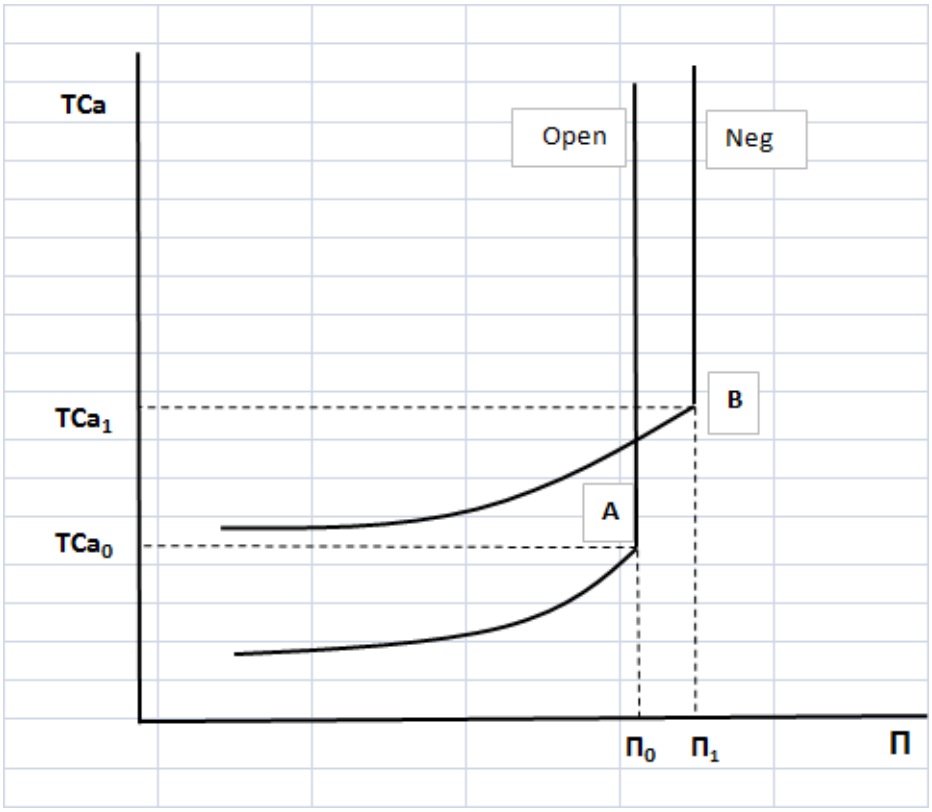

Figure 2

As we may observe in figure 2, we consider the existence of a "corner solution" in each of the curves (points **A** or **B**) from where *ex ante* transaction costs increase vertically. The public authority will tend to be placed, in principle, on one of these two discontinuity points, which differ in the open and the negotiated procedure. The empirical evidence shown in Sánchez Soliño and Gago de Santos (2010) suggests that transaction costs for point A (the open procedure) are significantly lower than those for point B (negotiated procedure). On the other hand, we assume that the negotiated procedure manages to reduce the project's uncertainty to a greater extent than the open procedure. That is to say:

$$TCa_0 < TCa_1 \tag{3}$$

$$\Pi_0 < \Pi_1 \tag{4}$$

The negotiated procedure involves a long and complex dialogue between the public authority and each bidder in the first stage of the tendering phase, and between the public authority

and the *Preferred Bidder* in the second stage. In principle, this procedure would enable the parties --both the public authority and the contractor-- to better resolve the doubts and differences that arise during the detailed dialogue and clarification sessions, thus reaching a more "complete" contract. However, there is (as yet) no empirical evidence confirming such an assumption, nor the degree to which a negotiated procedure could reduce the uncertainty (to augment the **Π** probability) of a specific PPP project.

Nonetheless, admitting all of the above assumptions we can proceed with the resolution of the decision-making dilemma, which comes down to a choice between point **A** or **B** in **figure 2**, for a specific project with a complexity degree of **X**.

In other words, the decision maker would try to maximize (in **z)** the value of the expected utility in the following expression:

$$U(X,z) = V - [1- \Pi (X,z)]\ TCp\ (X) - C(X) - TCa(X,z) \quad (5)$$

As we may observe, it is assumed that the production cost of the project does not depend, in principle, on the bidding procedure.

From the expression above we will obtain the following results for each bidding mechanism:

$$U(X,0) = V - [1- \Pi_0(X)]\ TCp(X) - C(X) - TCa_0(X) \quad (6)$$

$$U(X,1) = V - [1- \Pi_1(X)]\ TCp(X) - C(X) - TCa_1(X) \quad (7)$$

And from there on, after subtracting utilities, we obtain:

$$U(X,0) - U(X,1) = [\Pi_0(X) - \Pi_1(X)]\ TCp(X) + [TCa_1(X) - TCa_0(X)] \quad (8)$$

On the right-hand side of the latter expression (8), the first term $[\Pi_0(X) - \Pi_1(X)]\ TCp(X)$ will always have a negative sign, in accordance with the assumption (4), while by contrast the second term will have a positive sign, in accordance with (3).

In short, our model for choosing the most suitable bidding procedure implies sorting out the trade-off between *ex ante* transaction costs (at the bidding stage) and *ex post* transaction costs (once the contract is signed), taking into account the entire life of the contract. This compromise between transaction costs at the tendering stage and at the operating stage has been studied by Scott and Triantis (2005) in the general context of contracting theory, to explain the existence of incomplete contracts. In the field of PPPs, Stambrook (2005) refers also to the existence of such trade-off, in the context of a discussion on the degree of completeness in PPP contracts.

In our case, this approach serves to compare specifically, on the grounds of the transaction costs, various alternative bidding procedures for PPP contracts. In principle, the open procedure (versus the negotiated procedure) would entail lower *ex ante* transaction costs and a larger probability (given that $\mathbf{1- \Pi_0 > 1-\Pi_1}$) of incurring in *ex post* costs equal to **TCp**.

In the model, choosing the negotiated procedure would be justified only if the following expression holds:

$$[\Pi_1(X) - \Pi_0(X)]\ TCp(X) > [TCa_1(X) - TCa_0(X)] \quad (9)$$

That is, opting for a negotiated procedure as the optimal bidding procedure means that the reduction of uncertainty deriving from the contract must be sufficiently significant to offset the larger transaction costs borne at the tendering phase.

To offer a rough scale for the latter, it could pointed out that, according to Sánchez Soliño and Gago de Santos (2010), for a medium-size project in the field of transportation infrastructure, *ex ante* transaction costs in the negotiated procedure account for approximately 10% of the capital value of the project (jointly for the public authority and the bidders), while in the case of the open procedure, transaction costs total under 3% of capital value, despite bearing a larger number of bidders than the negotiated procedure.

Notwithstanding, there is no empirical evidence, as yet, to obtain an estimation of probabilities $\boldsymbol{\Pi_0}$ and $\boldsymbol{\Pi_1}$. The largest snag in terms of the development of a database to help undertake this empirical task is the scarcity of PPP projects completed worldwide, since we are still dealing with relatively new types of contracts. Consequently, the empirical work on *ex post* transaction costs must be based on case-studies of PPP contracts which have undergone either renegotiation schemes, litigation between parties of the contract, or a final breach of contract.

In this context, we can state that the use of a negotiated procedure does not preclude such *ex post* problems. By way of example, we can take the case of the London Underground PPP contracts, where a negotiated procedure was used. The object of these contracts was the upgrading and maintenance of London Underground´s infrastructure during a thirty years period, while the operation of the trains would remain a public sector responsibility. It is well known that the selection of private partners and the negotiation of the contracts was a long and costly process in this case. The total amount of *ex ante* transaction costs was £455 million (National Audit Office, 2004), including £275 million of bidders´ costs that were reimbursed by the public authority. After a five year procurement process, two private partners were finally selected for three contracts: Tube Lines for one of the contracts (signed on December 2002) and Metronet for the other two contracts (signed on April 2003), covering different London Underground lines. Soon after the signing of the contracts, one of the companies, Metronet, started to declare substantial cost overruns for the works. After a long-running dispute with Transport for London (the public authority in charge of the transport system), about who should pay for those cost overruns, Metronet fell into administration (on July 2007) and was absorbed by the public authority.

One of the reasons for these problems was that the terms of the contracts were unclear. Cost overruns borne by the contractors were limited “provided they act economically and efficiently”, a concept that was untested (House of Commons Committee of Public Accounts, 2005), and that raised discussions between the parties. This kind of rule is a good example

of the incompleteness of a contract, which is difficult to avoid both under a negotiated procedure or under an open procedure.

In short, more empirical studies are needed to compare the performance of negotiated and non-negotiated procedures in the field of PPPs. The advantages of negotiated procedures in terms of increased contract certainty are not clear at present, though there is empirical evidence of significantly smaller *ex ante* transaction costs in non-negotiated procedures.

DISCUSSION AND EXTENSION OF THE MODEL

Starting from the model described in the previous section, it is possible to delve more deeply into certain aspects. Our goal in this section is to develop an extension of the model in order to fine-tune the study of the choice of bidding mechanisms in projects contracted through PPPs.

Sub-optimal choices

As noted above, in Figure 2 the assumption was that the decision maker is placed on one of the two discontinuity points, either **A** or **B**. We assume that to the left of said points, the following expression always holds:

$$\Delta TCa < TCp\,\Delta\pi \tag{10}$$

That is to say, to the left of points **A** or **B**, the marginal increase in *ex ante* transaction costs will be lower than the benefit obtained when reducing the margin of uncertainty for the project. For this reason, any point placed to the left of **A** or **B** will be a sub-optimal choice.

However, in practice, situations arise where the public authority undertakes the tendering phase of a project without possessing optimal information. Such situations occur due mainly to political constraints, which leave less time than required for carrying out the relevant preliminary studies on the project. We must then bear in mind that such scenarios may come to ass, although it remains difficult to assess whether their impact is larger in projects tendered through one bidding procedure or another.

Impact of the tendering mechanism on competition

In the previous section 2 we assumed that the project's production costs depend only upon the degree of complexity, and not upon the type of bidding procedure. Thus, the comparison between bidding procedures is based only on their respective levels of transaction costs. However, while there is not yet sufficient empirical evidence on the impact of the bidding procedure on the efficiency of a PPP contract, we can point out several theoretical studies which compare auctions and negotiations in general.

For example, Bulow and Klemperer (1996) study the case of the sale of a firm, identifying the seller position as that held by a monopolist. With regard to the mechanism used to select the buyer, Bulow and Klemperer prove that a simple competitive auction with "n+1" bidders will yield more expected revenues than a negotiated procedure with "n" bidders, where the seller holds all the bargaining power.

Our case is somewhat different, given that we are dealing with a situation where the public authority is a regulator whose main goal is to maximize a social utility function. However, the public administration may also be viewed, in most cases, as a monopolist acting as a buyer in a PPP contract. If so, the results drawn by Bulow and Klemperer would apply, and we could expect, generally speaking, that a higher payment would be borne by the administration under the negotiated procedure than under the open procedure.

On the other hand, the performance of the negotiated procedure compared to the open procedure declines as the number of negotiating bidders (**n**) decreases. Once again, the *ex ante* transaction costs are a key issue here, because if these costs are excessive, we may find many potential bidders giving up the chance to participate in the tendering phase, due to the high risk of incurring "sunk" costs, which are irrecoverable if the contract is not awarded. This can help us to explain, for example, the decline in the number of bidders in PPP contracts recently bid in the UK. The National Audit Office (NAO, 2007) has pointed out that, in the past few years, prohibitive transaction costs in *Private Finance Initiative* (PFI) deals have made the private sector more selective in developing detailed bids at the Invitation to Negotiate Stage (INS). As a result, PFI projects are now receiving fewer bids than previously, with a high risk of deterring competition. According to NAO data, nearly 50% of the project portfolio bid under the PFI in 2003 or before had four or more bidders; and that percentage decreased to 20% for projects bid between 2004 and 2006. The contractors themselves have also pointed to high bidding costs and lengthy tendering periods as the main reasons behind that tendency, which reduced the number of projects for which contractors were prepared to bid. According to the National Audit Office, a common practice for contractors has been to set an annual budget for how much they were prepared to spend on bidding for PFI, and not to exceed that budget.

The decline in the number of bidders participating in the tendering phase of PPP projects may have strong repercussions on the efficiency of the contract, because it increases the risk of excluding firms that are potentially more efficient than those awarded with the contract. Therefore, from this point of view, our comparison of the two bidding procedures clearly favours the open procedure.

Project complexity and asymmetric information on service quality

Resorting to the negotiated procedure has often been justified by the complexity of the PPP projects (see, for instance, European Union, 2004, and Commission of the European Communities, 2005). Using our model as a basis, it becomes possible to study this question starting from **expression (5)**; where it is easy to observe that, for a given value of **V**, an

increase in the project's complexity (**X)** diminishes the social utility for two reasons: greater production and transaction costs, and greater uncertainty. Formally:

$$\frac{\partial U(X,z)}{\partial X} = \frac{\partial \pi(X,z)}{\partial X} TCp(X) - [1-\pi(X,z)]\frac{\partial TCp(X)}{\partial X} - \frac{\partial C(X)}{\partial X} - \frac{\partial TCa(X,z)}{\partial X} \quad (11)$$

If we accept that:

$$\frac{\partial \pi(X,z)}{\partial X} < 0 \quad (12)$$

and taking into account all the other assumptions of the model, then:

$$\frac{\partial U(X,z)}{\partial X} < 0 \quad (13)$$

Nonetheless, it is not possible to establish *a priori* which bidding procedure depletes social utility more. The economic case for the negotiated procedure would grow (as the project's complexity increases) only if the utility U(X,0) diminishes more rapidly than U(X,1). However, this fact is not conclusive. Starting from equation **(11)**, we obtain, for each bidding mechanism:

$$\frac{\partial U(X,0)}{\partial X} = \frac{\partial \pi_0(X)}{\partial X} TCp(X) - [1-\pi_0(X)]\frac{\partial TCp(X)}{\partial X} - \frac{\partial C(X)}{\partial X} - \frac{\partial TCa_0(X)}{\partial X} \quad (14)$$

$$\frac{\partial U(X,1)}{\partial X} = \frac{\partial \pi_1(X)}{\partial X} TCp(X) - [1-\pi_1(X)]\frac{\partial TCp(X)}{\partial X} - \frac{\partial C(X)}{\partial X} - \frac{\partial TCa_1(X)}{\partial X} \quad (15)$$

And then:

$$\frac{\partial U(X,0)}{\partial X} - \frac{\partial U(X,1)}{\partial X} = TCp(X)\left[\frac{\partial \pi_0(X)}{\partial X} - \frac{\partial \pi_1(X)}{\partial X}\right] + \frac{\partial TCp(X)}{\partial X}[\pi_0(X) - \pi_1(X)] + \left[\frac{\partial TCa_1(X)}{\partial X} - \frac{\partial TCa_0(X)}{\partial X}\right] \quad (16)$$

Even admitting that the increase in uncertainty is larger in the open procedure, there is no reason to expect that *ex ante* transaction costs (**TCa**) increase more in the open procedure when the project's complexity grows. Therefore, we cannot assert that the sign of expression **(16)** is negative. As a result, according to this model, we cannot conclude that the use of a negotiated procedure is always justified in the case of complex projects.

However, from another point of view, the project's complexity may have a significant impact on the issue of asymmetric information. Until now we have maintained the assumption of quality being verifiable and contractible (both in the construction of the contract's assets and in the provision of services). However, when the quality of the infrastructure or service proves non-verifiable, and each potential contractor may have private information on the quality of the output to be provided (unavailable to the public authority), the tendering of the contract by auction will result in a low level of quality (even when a high quality level is desirable from the social utility perspective). Manelli and Vincent (1995) stress that in this case, the use of a negotiated procedure for the award of a contract may lead to a social surplus larger than that resulting from an auction. The negotiated procedure allows the public authority to evaluate, for example, the reputation of bidders with regard to their previous performance in similar situations, which can indeed improve the conditions of the contract award. This would mean, in our model, to lift the assumption that the social value of the project is a fixed amount, since the quality of the output (which depends upon the bidding mechanism) is a key determinant of such value. That is to say, $V = V(z)$, when $V(1) > V(0)$.

Notwithstanding, and generally speaking, many PPP contracts in the field of transportation are realized in sectors (such as roads) where expertise already exists in the definition and measurement of quality indicators. Only in certain highly innovative and complex PPP projects does it become likely that important dimensions in quality of output may be non-verifiable.

On the other hand, even in the case of not particularly complex or innovative PPP projects, public administrations (central and local) in certain countries may find it difficult to muster the technical resources (human or material) essential to evaluating quality. This explains why the negotiated procedure is sometimes used to offset the lack of skills and expertise of a public administration.

CONCLUSIONS

The principal aim of this paper is to provide a theoretical framework that may be used as a guideline for assessing empirical work on the advantages and drawbacks of the various bidding procedures used in awarding PPP contracts. The model is based mainly on the transaction costs arising over the entire life-cycle of contracts, including both *ex ante* transaction costs (borne during the tendering stage) and *ex post* transaction costs (such as enforcement costs, renegotiation costs, and costs arising from litigation between partners).

Based on this model, we consider there to be a trade-off between both types of costs; *ex ante* and *ex post* costs. Thus do we obtain different outcomes when a contract is bid through an open procedure or through a negotiated procedure. Generally speaking, we assume that the open procedure implies lower transaction costs *ex ante*, while the negotiated procedure reduces the probability of the appearance of new contingencies not foreseen in the contract, hence diminishing the expected value of transaction costs *ex post*. Therefore, the balance

between *ex ante* and *ex post* transaction costs is the main criterion for deciding whether the open or negotiated procedure would be optimal.

Notwithstanding, empirical evidence currently exists only on *ex ante* transaction costs in transportation infrastructure projects, obtained through a systematic and rigorous analysis of the available data. This evidence has shown a relevant difference between the two procedures as far as *ex ante* costs are concerned -- a difference (favouring the open procedure) that can be estimated at around 7% of the project's capital cost. Furthermore, *ex post* transaction costs may be limited, in the open as well as the negotiated procedure, by resorting to an independent regulatory institution for the settlement of differences in the interpretation of contracts, or in the settlement of disputes.

On the other hand, the impact of the bidding procedure on the production cost of the contract will generally favour the open procedure. In short, we find it difficult to justify the employment of negotiated procedures in most PPP contracts. Even so, the field remains open for future empirical work and research on the levels of transaction cost borne *ex post* in PPP contracts under any of the procedures considered in this paper, as well as on the probabilities of such costs appearing.

The model developed in this paper also demonstrates that a larger degree of complexity in a contract does not unequivocally favour the use of a negotiated procedure. Only in those cases dealing with very innovative projects, where important dimensions of the quality of the asset or service are not verifiable, may we observe an advantage in favour of the negotiated procedure.

Finally, we must highlight that, although the motivation for this work has focused mainly on the high transaction costs registered in most PPP contracts, our approach and outcome may have a broader scope, being applicable to any contract where a high level of *incompleteness* is found.

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