REDUCING THE COSTS OF PUBLIC TENDERS: A MODEST PROPOSAL

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ABSTRACT. While in the private sector the buyer chooses the number of potential suppliers to involve in an exchange, in the public sector the procedures to follow usually oblige the purchasing manager to behave in a different way. According to the European Directive 2004/18/EC, the Public Administration has to consider all the bids belonging to all the suppliers willing, and able, to take part into the trade. The main purpose of the law is to increase the competitiveness among several bidders in order to reduce the public spending, avoiding monopolistic or oligopolistic behaviours. However the legislator has not taken into account the costs associated with participation in the single tender. In the paper we underline that these costs are relevant and so by limiting the number of bidders it is possible to save money both for the Public Administration and the private sector.

INTRODUCTION

Although the public sector sometimes relies on its in-house workforce to provide services, there are many goods and services that are procured from business firms (Waara, 2008).

Procurement in the public sector differs from the private sector in a number of ways especially based on the constrictions (Ferlie, 1992; Furlong *et al.*, 1994; Boyett *et al.*, 1996; Bryntse, 1996, Bright, 1994; Gordon, 1996). First of all the governmental purchasing system administrates the money that belong "to all". Secondly the variety and

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the number of the purchased products are greater for the public sector. Also the number of customers (governmental agencies) and the suppliers of the governmental purchasing system is often excessively large. Although this can happen, public market are often uncompetitive in that they fail the test of economic models that require features such as perfect information and particularly low barriers to supplier entry (exit) (Caldwell et al., 2005). However during these last years the buyer/seller relationship is deeply changed. For example, in traditional public procurement and contracting relationship, governments attempt to deal with complexity by transferring as much risk as possible for performance failure to contractors; in a partnership relationship, on the contrary, the partners should share in both the risks and the rewards (Lawther et al., 2005).

Moreover the public sector is covered by a number of public procurement regulations (e.g. in the EU a number of public procurement directives are effective), bringing legislative requirements into force. As a consequence, although governmental and private procurement share the same essential purpose of finding supply sources at the cheapest price and at acceptable quality, several dissimilarities arise between these two procurement systems. In particular, public procurement differs from the private one in the fact that prescribed procedures are to be followed and transparency is imperative. In other words, it is crucial that public procurement follows strict and clear business models that optimize the specific service objectives and considers the impact on processes across the considered governmental organization. However, in most governmental areas the process of procurement may be a very complex and expensive task, since often (particularly for smaller purchasing values) the dimension of the vendor set (group of potential suppliers willing to bid) is excessively large. Moreover, although such a decision problem is often characterized by conflicting objectives and imprecise and qualitative information, as previously remarked, decisions have to be based on simple economic evaluations, due to the imperative request of full transparency.

The reference law for public tenders in the European Union is the 2004/18/EC Directive, also called the Public Procurement Directive, enacted by the European Parliament (2004). According to such a directive, the contract for a public tender should be awarded on the basis of objective criteria which ensure compliance with the principles of transparency, non-discrimination and equal treatment, while guaranteeing that tenders are assessed in conditions of effective competition. As a result, only the application of either one of the following two award criteria is allowed: the “Lowest Price” (LP) and the “Most Economically Advantageous Tender” (MEAT) criterion. Typically, the LP principle is significant in case the main purpose is to save money. On the other hand, when the contract is awarded on the basis of the MEAT criterion, various criteria are considered for awarding the contract in question, depending on the object of the contract: delivery or completion date, running costs, cost-effectiveness, quality, aesthetic and functional characteristics, environmental characteristics, technical merit, after-sales service and technical assistance etc. In particular, in the MEAT case it is the responsibility of contracting authorities to indicate the multiple criteria for the award of the contract and the relative weighting or at least the descending order of importance of the criteria.

Summing up, while the LP criterion essentially takes into account the traditional purchasing concept of awarding the contract at the cheapest price, the MEAT criterion reflects the necessity for a more complex purchasing management process, taking into account other key parameters than price in the vendor selection. Finally, note that the European legislation assumes that the tender is managed by a public committee, including a person responsible for the committee itself. When calling tenders, the public authority may choose between open or restricted procedure. In some case, also a “negotiated” procedure is allowed. In particular when the requested product is a commodity or if the service is relatively simple, the open procedure is chosen. In such cases anyone interested may bid. When procuring customized product or complex service, the best solution is the restricted procedure. This choice gives the public authority the possibility to check the technical and economic competence of the bidders by carrying out their prequalification. Typically in case of an open procedure the selection criterion is the LP, while in case of a restricted procedure also the MEAT criterion can be used.

By the potential suppliers’ point of view, usually bidding for a MEAT tender is more expensive than bidding for a LP one. So, often, in the case of tender for simple purchasing or “normal” public works (LP criterion), a large number of potential suppliers can decide to bid (open procedure) or to ask to be invited to bid (restricted procedure).

Sometimes involving a big number of potential suppliers in a procurement process, on the other side, can be a source of “waste” (in terms of costs for the bidding process, that are a part of the broader “Transaction Costs”), bigger than the advantages connected to the competition among the bidders.

The waste of money is not only for the contracting firm but also for the supplier. As remarked by Leenders and Fearon (1993), in fact, submitting a bid can be very expensive: sometimes “suppliers might lose interest in bidding when they are never or only seldomly awarded the contract” (De Boer *et al.*, 2000).

De Boer *et al.* (2000) calculate the optimal number of suppliers to involve in an exchange (called Economic Tender Quantity) by dividing the tendering costs into fixed and variable costs. The fixed costs don’t depend on the number of suppliers involved in the exchange. They consist in writing the invitation to tender and defining the evaluation procedure. The variable costs can be direct and indirect ones. The direct costs are those related to the number of bidders and connected to the activities of identification the suppliers, sending them the invitation, handling their queries, evaluating each bid and informing them about the outcome of the evaluation. The indirect costs arise when suppliers are never or only seldomly awarded the contract. These costs are difficult to evaluate but still they are part of the so called tendering costs. In the model presented by the authors only the variable costs are considered since this is an optimization problem decision. Different distributions for the bids are considered by the authors to find the economic tender quantity.

Some differences between the model presented by De Boer *et al.*, and our model arise in the classification of the costs and in the way to evaluate them. First of all we divide the tendering costs in those paid by the buyer (i.e. the Public Administration) and those paid by the tendering firms. All the costs are expressed in terms of average time of the administrative employee and his hour cost based on interviews with people involved in the tender. Moreover the optimization decision model is here based on a simulation as discussed later on.

In a way all the costs we consider are a part of the transaction costs, first addressed by Coase (1937). He first, in fact, studied the phenomena connected to an exchange; later on, Williamson developed the same research focalizing the difference between hierarchy and market.

According to him (1979, 1991), a transaction occurs when a product or service is transferred across a technologically separable interface. Transactions involve costs related to the issues of finding a counterpart, drawing up a contract or monitoring the task completion. These costs are both incurred by government organizations or autonomized parts of these organizations (North, 1990). Unfortunately, as Coase himself remarked (1993) there are many difficulties in applying the Transaction Costs Economics theory to a quantitative study.

The present paper develops a previous study carried out by the authors (Costantino *et al.*, 2007) in which they analyze the so-called Total Cost of Purchasing (TCP) that arise both in the private and public purchase and that is the summation of the Purchasing Price (PP) and the Additional Costs of Purchasing (ACP). The model – with a Monte Carlo approach – allows to evaluate, by a probabilistic point of view, the number of bidding firms that minimizes the Total Purchasing Cost, for the public administration and/or for the whole market (including, in this case, the bidders' costs).

A validation test has been conducted on a public tender consisting in the renovation of a building facility of Politecnico di Bari, Italy in 2005. The tender has been treated according the Italian Law which is based on the European Law. The bidders were 45. Based on the simulation model, the tender has been studied to simulate the effects of an (hypothetic) choice to reduce the number of bidding firms in order to reduce the TCP.

Starting from this results the authors indicate a modest proposal to improve the way of managing a public tender by limiting the number of bidders not only by (possible) prequalification criteria, but also by a random choice of the bidding vendors.

METHODOLOGY

Stating that the Total Cost of Purchasing (TCP) is the summation of the Purchasing Price (PP) and the Additional Costs of Purchasing (ACP), following we describe these latter costs assuming that the first and more simple LP criterion defined by the Public Procurement Directive is applied.

In a generic public tender, the contracting authority receives the bids of a set of private vendors. As just said the total amount paid for the exchange by both the Public Administration (PA) and the private sector is given by:

$$TCP = PP + ACP \tag{1}$$

where PP is the purchasing price or the bid offered by the vendor that is awarded the contract (that is to say the lowest price among the several offered ones) and ACP represents the Additional Costs of Purchasing. In particular we split them into ACP_1 and ACP_2 bearing in mind that the former are those paid by the PA and the latter are those paid by the bidding firms.

Considering the PA, the ACP_1 can be expressed as follows:

$$ACP_1 = C_E + C_{IF} + C_{IS} + C_B + C_{AW} + C_D\,, \tag{2}$$

detailed in the sequel.

The *equipping costs* C_E are the costs to pay in order to arrange the tender announcement:

$$C_E = C_C + c_S \cdot T_E\,, \tag{3}$$

where C_C is the total amount paid to the evaluating committee, c_S is the hour cost of the administrative employee and T_E is the equipping time.

The *information costs* C_{IF} are the costs paid to provide information on the tender to the bidding firms:

$$C_{IF} = \sigma \cdot c_S \cdot T_{IF}\,, \tag{4}$$

where σ is the number of bidding firms and T_{IF} is the average time consumed by the administrative employee to inform every bidding firm.

The *inspection costs* C_{IS} are the costs paid in order to allow to the technicians of the bidding firms to visit the site:

$$C_{IS} = \sigma \cdot c_{NS} \cdot T_{IS}\,, \tag{5}$$

where c_{NS} representing the hour cost of the contracting authority employee responsible for the inspection and T_{IS} is the average inspection time per bid.

The *bidding costs* C_B are the costs paid to evaluate the bids:

$$C_B = \sigma \cdot c_S \cdot T_B \,, \tag{6}$$

where T_B is the average evaluating time per bid.

The *awarding costs* C_{AW} are the costs paid once the supplier has been chosen:

$$C_{AW} = c_S \cdot T_{AW} \,, \tag{7}$$

where T_{AW} representing the awarding time.

The *drafting and approval of the contract costs* C_D represent the costs to be incurred by the Public Administration to draft and sign the contract with the vendor who has won the tender:

$$C_D = c_S \cdot T_D \,, \tag{8}$$

where T_D is the time for drafting and approval of the contract.

In addition, the overall costs ACP_2 paid by all the bidding firms to participate the tender are the *participation costs* C_P, consisting in a temporary guarantor, in the redaction of a detailed work program (including prices), and in the price of stamps and of the delivery of the bid, as well as the *technical inspection costs* C_T paid to make the investigation on the spot, requested by the European law:

$$ACP_2 = C_P + C_T \,. \tag{9}$$

In particular, the C_P costs are expressed as follows:

$$C_P = \sigma \cdot (C_F + c_A \cdot T_A) \,, \tag{10}$$

where C_F are the fixed costs (such as the temporary guarantor, stamps, etc.), c_A is the hour cost of the firm administrative employee and T_A is the corresponding average time.

Moreover, the C_T costs are expressed as follows:

$$C_T = \sigma \cdot c_T \cdot T_T \,, \tag{11}$$

where c_T is the hour cost of the firm technical employee and T_T is the corresponding average time.

Naturally, the total ACP are the summation of the ACP_1 and of the ACP_2 components, as follows:

$$ACP = ACP_1 + ACP_2 . \quad (12)$$

THE CASE STUDY

The presented model has been applied to a real case study: the renovation of a building facility of Politecnico di Bari. Following we report the tender data:

- Amount based auction: € 148,500.00 + Vat;
- Awarding method: lowest price.

Once the tender has been concluded, we have interviewed some of the actors who played both in the private and the public sector in order to calculate the *ACP* paid by them in terms of wasted time and money. The results have been shown below:

- The *equipping costs* C_E have been evaluated in € 3,645.00;
- The average *information costs* C_{IF} have been € 59.40 for each intervened supplier;
- The average *inspection costs* C_{IS} have been € 18.29 for each bidder;
- The average *bidding costs* C_B have been € 10.80 for each private firm;
- The *awarding costs* C_{AW} have been evaluated in € 3,330.00;
- The *drafting and approval of the contract costs* C_D have been € 1,440.00.
- The average *participation costs* C_P have been € 237.50 each supplier;
- The average *technical inspection costs* C_T paid by each bidder have been € 60.00.

The suppliers participated to the tender have been 45. The lowest bid has been € 107,967.74. Stating the calculation done below, the ACP_1 and ACP_2 have been:

$$ACP_1 = C_E + C_{IF} + C_{IS} + C_B + C_{AW} + C_{DA} = € \ 12,397.05 ,$$

$$ACP_2 = C_P + C_{ISP} = € \ 13,387.50 .$$

According to (12) the *ACP* paid by both sides have been:

$$ACP = ACP_1 + ACP_2 = 12,397.05 + 13,387.50 = € \ 25,784.55 \, ,$$

and the consequent total "social" cost of the purchase has been, according to (1):

$$TCP = PP + ACP = 107,967.74 + 25,784.55 = € \ 133,752.29 \quad (13)$$

In order to evaluate the TCP if the number of bidders could be less than 45, the authors have simulated the exchange with a number of suppliers variable from 2 to 45.

First of all it is important to underline that in our simulation we build a decision support system able to generate several bids of a tender with the same characteristics of the considered one. We call this system "Bid Generator". Actually bids are extracted at random from a Weibull probability density distribution: the choice of such a distribution is justified by the analysis of several public tenders in these last two years. Through these studies, in fact, we found out that the error in forecasting bids as belonging to a Weibull distribution is lower than using, for example, a Gaussian distribution (the mean squared error – for the same values of the mean value μ and the standard deviation σ – is $1,846 \cdot 10^{-5}$ instead of $2,813 \cdot 10^{-5}$). Further research will verify and support such a choice of set of bids.

As just said, the overall set of bids is dispersed along this distribution characterized by the shape parameter α and the scale parameter β according to this probability density function:

$$\begin{cases} f(x) = \alpha \cdot \beta^{-\alpha} \cdot x^{\alpha-1} \cdot e^{-(x/\beta)^{\alpha}} \\ a \le x \le b \end{cases} \quad (14)$$

where the parameters α and β are connected to the mean value μ and the standard deviation σ as follow:

$$\mu = \frac{\beta}{\alpha} \cdot \Gamma\left(\frac{1}{\alpha}\right)$$

$$\sigma = \frac{\beta^2}{\alpha} \cdot \left\{ 2 \cdot \Gamma\left(\frac{2}{\alpha}\right) - \frac{1}{\alpha}\left[\Gamma\left(\frac{1}{\alpha}\right)\right]^2 \right\},$$

and Γ is the complete gamma function defined through this formula:

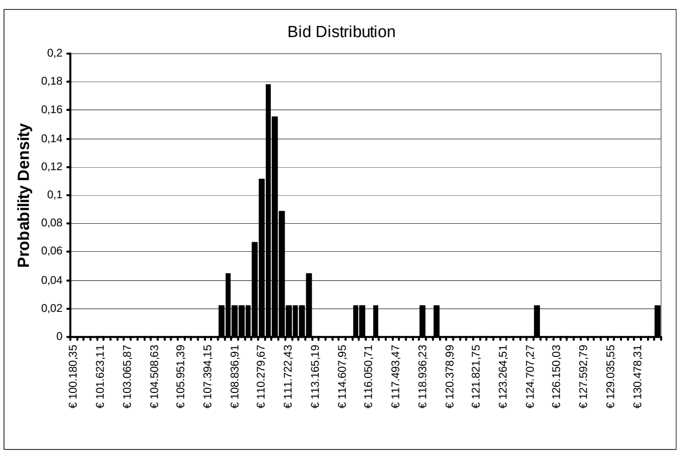
$$\Gamma\left(\alpha\right)=\int_{0}^{\infty} t^{\alpha-1}\cdot e^{-1}\cdot dt\ .$$

Moreover a and b are respective the minimum and maximum value of each bid. Obviously the maximum value is the amount based auction (i.e. € 148,500.00), while the minimum value is given taking into account the standard deviation and the average value of the bids as follow:

$$b=\mu-2\cdot\sigma=112{,}107.48-2\cdot 4{,}328.22=\text{ € }103{,}451.04\,.$$

By considering these upper and lower limits of the bids, it is possible to include all the real bids given in the tender.

FIGURE 1
Bid Distribution



DISCUSSION

To ensure statistic validity to the results, simulation consists in 100 replications, and the final value chosen as the winning bid is determined as the average of all minimum bids for that experiment.

In each experiment ACP_1 and ACP_2 have been calculated according to (2) and (9). Then the TCP has been calculated according (1), considering first of all the ACP_1 and then also the ACP_2. The below figures show the results.

FIGURE 2
The TCP Considering only the ACP_1

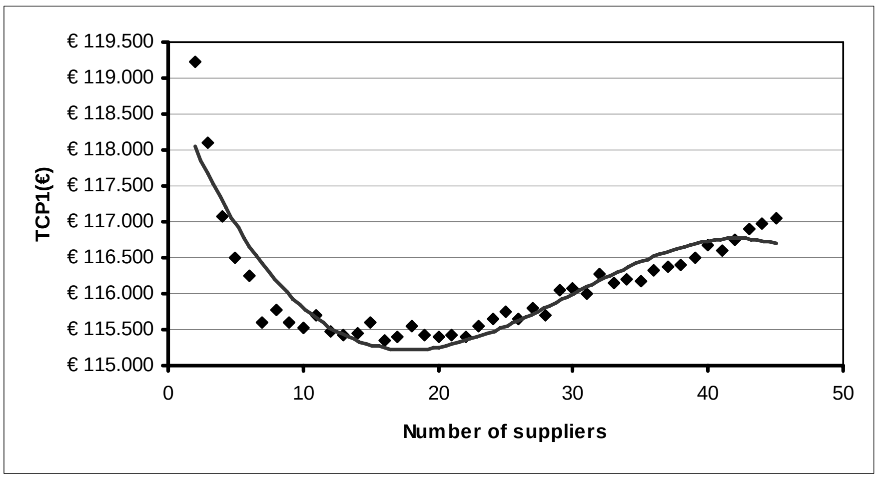
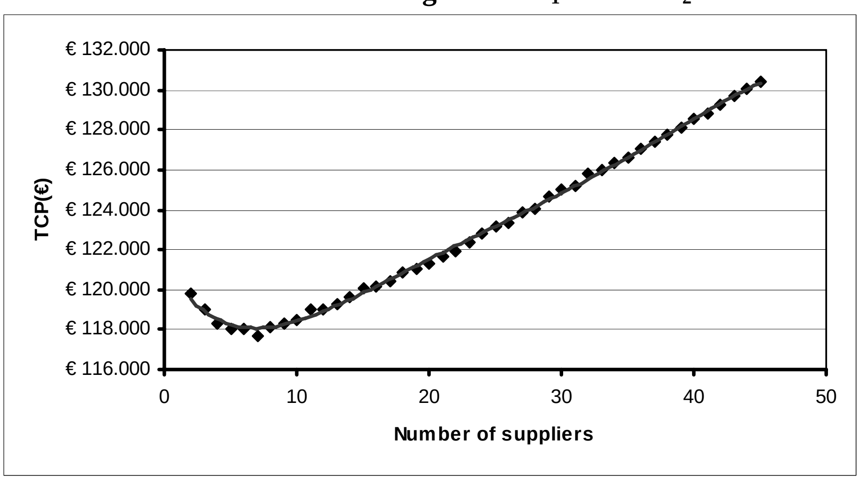


FIGURE 3
The TCP Considering the ACP_1 and ACP_2



As it is possible to see from the simulation results, while increasing the number of suppliers initially leads to more rewarding transactions for the contracting authority, because the possibility of obtaining a lower price is higher, the additional costs involved in the exchange increase (some of them are directly connected with that number).

However considering only the ACP_1, the optimal number of suppliers is between 14 and 24; considering also the ACP_2 this number drops to about 6, 7.

It should be noted that the costs incurred by competitors only apparently are not charged the public authorities. In a market such as the Italian, in fact, where firms tend to specialize on public works or private committed, it is inevitable that repeated unproductive costs (as, indeed, those of bidding without awarding the tender) end up on the burden of overhead costs companies themselves, and thus, indirectly but inevitably, the final customers.

A choice of optimization could be to reduce in advance the number of companies participating in the tender through a draw or other selective choice based on transparent criteria. The idea of drawing lots from a bigger number of potential business competitors, in particular, would make reasonably remote the risk (always present in the case of competition between few competitors) of oligopolistic collusion between participants, at the same time minimizing the total social costs, streamlining the work of public officials and improving the efficiency of the private system. Such a solution would require by the legislator to impose a maximum number of competitors in public tenders related to the size and complexity of the tender itself and the ways chosen for the award.

CONCLUSIONS

The present paper reveals the important and dangerous paradox of competition in a public tender. In fact it is noteworthy that although increasing the number of bids leads to encouraging the competition among different suppliers, the additional costs of purchasing tend to increase, so that the transaction may become less rewarding both from the public and private sides.

The proposed idea to save private and public money consists in limiting the number of involved supplier by prequalification and by choosing at random a certain number depending on the complexity of the requested product and the threshold of the tender.

Further research will verify and support the choice of a Weibull distribution for the bids.

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