The Law of Small Numbers: Investigating the Benefits of Restricted Auctions for Public Procurement

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Abstract

A commonly accepted view in the academic literature on auctions is that a large pool of suppliers has to be attracted in order to obtain economically advantageous conditions. Some arguments can however be found to explain why buyers might prefer interacting with few selected firms rather than using the full strength of competition (i.e. opening call for tender to all possible bidders). But, to the best of our knowledge no study investigates how buyers select the suppliers invited to bid. In addition, as far as we know, the potential benefits of restricted auctions to attribute simple short-term contracts have never been empirically assessed. These are the two questions we address in this paper using an original dataset of 182 contracts, attributed between 2006 and 2009 in Paris by the local public buyer of social housing. Our results suggest that invited bidders are not selected randomly. Moreover, we show that pre-selecting bidders may lead to significant costs savings without loss of quality. Our results therefore provide economic justifications to the willingness of buyers to reduce competitive intensity.

JEL Codes: D44, L22, D21
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Introduction

Although public procurement markets represent a major stake for economic activity and a large part of public spending [1], few empirical works have been made so far to investigate the procurement practices of public buyers. Yet, theoretical academic papers as well as regulations are full of recommendations on the way to organize such markets. Their advices can be summed up shortly as they largely emphasize the use of open auctions to manufacture these markets for this type of procedure is transparent and provides strong incentives to bidders to reveal their private information (Bulow and Klemperer, 1996)). A commonly accepted view in the academic literature is indeed that a large pool of suppliers has to be attracted in order to obtain economically advantageous conditions.

However, as highlighted for instance by Heijboer and Telgen (2002) or Bajari, McMillan, and Tadelis (2009), some buyers deliberately choose to restrict competition or even to engage in negotiated procedures with a single candidate, which suggests that more competition may not always be desirable.

The main reason given to explain such choice is that free entry, that is open auctions, may lead to inefficient outcomes when the good or service to be procured is technically complex and/or hardly contractible (Levin and Smith 1994). Indeed, buyers are not necessarily able to evaluate the credibility of the posted bids and the costs incurred to assess the relevance of tenders are likely to increase with the complexity of the project and the numbers of bids to be examined (Levin and Smith 1994, Chong et al. 2009). In addition, with open auctions, as the number of tenders is not known beforehand, the time and resources needed to be spent are uncertain.

Furthermore, if the buyer fails to specify the subject matter of the bid with precision so that the contract is incomplete, open auction may lead to choosing the most opportunistic bidder, that is to say the one who is the most aware of the contractual blanks he could exploit. Anticipating that he will be able to take advantage of situations that are unforeseen in the contract by renegotiating the initial arrangement, this strategic candidate will not hesitate to adopt a low-balling strategy and submit an overly low bid. As put by Bajari et al. (2007), "competitive tendering may lead to a problem of ex ante opportunism that is more problematic when projects are complex. After [the winner] is awarded the project, the pitfalls he anticipated will materialize and he will be in position to reap excessive profits from the required changes" (ibid, p. 133). The same kind of argument is developed by Kim (1998) who shows that contractual incompleteness regarding quality is hardly compatible with open auctions.

A last reason why restricted auctions might be preferred to open auctions is that, in common value settings, candidates are likely to make involuntary prediction errors and engage in a winner's curse. In other words, the winner tends to be the most optimistic

[1] They represented more than 17% of the European GNP in 2007

or naïve candidate, whose bid turns out to be too low, leaving him with a non profitable contract. But, as theorized by Milgrom (1989) and corroborated by several empirical studies (Hong and Shum (2002), Athias and Nunez (2008)), rational bidders anticipate this risk so that the higher the risk, that is to say the larger the number of competitors, the less aggressive the bids. In the same vein, Hallwood (1996) argues that candidates compete more seriously as the number of bidders is restricted because their perceived chance of winning the contract is higher than when entry is free

Several arguments can therefore be found to explain why buyers might prefer restricting competition rather than using open auctions. However, to the best of our knowledge, no study investigates how buyers select the candidates invited to bid in restricted auctions. In addition, the impact of the number and characteristics of preselected candidates on auction's outcome has never been assessed. These are the main issues we address in this paper.

More precisely, in line with Bajari, Houghton, and Tadelis (2006) we investigate the impact of candidates' reputation on their likelihood to be invited to bid, and following Gil and Marion (2009b), we analyze whether future business opportunities are taken into account by buyers.

To test these propositions, we use an original dataset of 182 contracts, attributed via restricted auctions between 2006 and 2009 in Paris by the local public buyer of social housing. These contracts deal with services attached to construction operations and are associated with short-lived, simple and recurrent transactions. The attribution procedure is a restricted auction, with three to six invited bidders, selected among a list of pre-qualified candidates. For each contract and tendering procedure, we have information on 1) all the pre-qualified firms and their characteristics, 2) the bids of each invited bidder, 3) the winner of the auction. Hence, we can assess the impact of the number and characteristics of invited bidders on the level and competitiveness of the final bids.

We find that invited bidders are not selected randomly. Past performances of candidates as well as their on-going activity are significant determinants of the likelihood to be invited to bid. Moreover, using an Heckman selection model, we show that pre-selecting bidders according to these criteria leads to significant costs savings. Our results therefore justify the willingness of buyers to reduce competitive intensity. An additional contribution of the present paper is to show that restricted auctions may not be beneficial only for complex goods or services involving long-term contracts and large amounts of money. We indeed point out that limiting competition may also be efficient for simple repeated transactions as it allows reducing ex ante transaction costs while maintaining competitive pressure.

The paper is organized as follows. In section 1, building on previous theoretical literature, we develop propositions concerning the way a buyer should restrict competition and select invited bidders. Section 2 is dedicated to the presentation of our data set and our empirical strategy. In section 3, we present our results and discuss the effect of reducing

competition on final bids. Conclusions follow.

1. Restricted competition: Theory and Propositions

According to Demsetz (1968), competition for the field, through auctions, is an efficient mechanism to select a provider of goods or services. In the same vein, Bulow and Klemperer (1996) show that rising competition rather than negotiating with few bidders should always be the preferred option. However, the information that is transmitted by an auction is primarily restricted to price. When projects are complex the relative significance of price may be dwarfed by other considerations. Hence, if candidates are imperfectly informed about contract valuation or if contracts are incomplete, other awarding mechanisms might be preferred. Benefits of additional competition are not systematic any longer and restricted auction may help to generate competition (Bajari, McMillan, and Tadelis, 2009).

Incomplete contracts and opportunism

Because specifying services may be a complex task, especially in an uncertain environment, buyers may have no choice but to rely on incomplete contracting and bear risks of ex post adaptation (Bajari and Tadelis (2001), Guasch, Laffont, and Straub (2008), Athias and Saussier (2005)). It might then be preferable for buyers to opt for restricted auctions and preselect bidders according to their propensity not to behave opportunistically (Bajari, McMillan, and Tadelis (2009)). The literature concerning firm cooperation and alliance recognized a long time ago that one way to deal with potentially opportunistic partners is to take their cumulative past behavior as a guide to their future behavior, or—when such information is unavailable—to use reputation as a proxy for knowledge of future opportunistic intentions (Parkhe, 1993). Reputation is indeed often considered as a mean to increase cooperation between economic partners, because it can be a substitute for costly monitoring devices (Kogut, 1989). Some authors develop this argument and argue that reputation mechanisms may even be more efficient than the threat of legal sanctions in assuring cooperation in strategic relationships (Wright and Lockett, 2003)). It is indeed in the interest of bidders to maintain and foster a good reputation (*i.e.* a reputation for high reliability) as it allows increasing the value of their ongoing relationships and improving their chance of developing future business opportunities. In practice, each partner's reputation can act as a hostage by securing the on-going relationship (Williamson, 1983) and

avoiding mutual distrust prompted by fears of opportunistic intentions. Following those arguments, we postulate that the candidates invited to bid in a restricted auction should be selected according to their reputation, as the latter may be considered as an hostage that would be lost in case of opportunistic behaviors.

Proposition 1: In restricted auctions, firms are less likely to be invited to bid in case of past failures

Bidders pre-selection may also depend on future business opportunities, as the perspective of losing future business contracts may act as a self-enforcing mechanism (Gil and Marion (2009b)). Indeed, if parties anticipate large business opportunities, they will be less prone to opportunism (Bull (1987); Baker, Gibbons, and Murphy (2002)). Indeed, if parties anticipate high future businesses, they will be less prone to opportunism. In particular, firms have little interest in exploiting informational asymmetries and in shirking on non-contractible dimensions. In the same vein, to make agreements self-enforceable, buyers might prefer selecting bidders with on-going contracts , since the perspective of losing several (instead of one) on-going contracts might deter firms from adopting opportunistic behaviors (Desrieux, Chong, and Saussier (2010)).

Proposition 2: In restricted auctions, firms with on-going contracts are more likely to be invited to bid.

Winner's curse and partner's experience

In common value settings, bidders are likely to make involuntary prediction errors and engage in a winner's curse. In other words, the winner tends to be the most optimistic or naïve candidate, whose bid may turn out to be too low, leaving him with a non profitable contract. But, as theorized by Milgrom (1989), rational bidders anticipate this risk so that the higher the risk, that is to say the larger the number of competitors, the less aggressive the bids, a result corroborated by several empirical studies (Hong and Shum (2002); Athias and Nunez (2008)).

According to the literature, the winner's curse is mainly related to transactions' characteristics. Hong and Shum (2002) for instance, show that the effects of the winner's curse depend on the level of complexity of the transactions at stake. Another determinant of the magnitude of the winner's curse effects is studied by De Silva, Kosmopoulou, and Lamarche (2009) who point at that, in common value settings, when bidders are non-symmetrically informed about the true contract valuation, new entrants are more prone to make pre-

diction errors than incumbent bidders.[2] Thus, a kind of learning effect would limit the winner's curse,. Furthermore, we can assume that learning effects come progressively: the more a firm has interacted with the buyer, the more she is aware of the true value of future contracts, which might reduce the winner's curse effect.

In addition, Gil and Marion (2009b) argue that parties are less prone to anticipate high coordination costs when they have already interacted. This effect is more likely to be the main one in our data because, as already mentioned, we are considering simple transactions.

Thus, selecting experienced bidders seem to be a relevant strategy. This is an additional argument supporting our third proposition:

Proposition 3: In restricted auctions, experienced firms are more likely to be invited to bid.

Collusion and Competition

Our propositions argue in favor of a limitation of competition to few well-known firms. But a major issue with such a strategy is collusion and the survival of competition. If a buyer interacts only with few selected firms, they are likely to progressively know their rivals' identity, which facilitate the implementation of a collusive strategy. Moreover, the strategy that consists in selecting only the best firms is a risky one if few firms outperform others. Thus, the buyer may be interested in maintaining a competitive pressure by not selecting firms that already won large contracts, especially in the recent past period.

Proposition 4: In order to maintain some competitive pressure, the buyer might disqualifying efficient firms that already won large contracts in the recent past.

2. Data and empirical strategy

Data and Institutional Framework

Paris Habitat-OPH is the local public operator of Paris' social housing, awarding around 500 contracts a year. It manages 119 294 residential units, 3 895 commercial premises and

[2] They defined "new entrants" as firms that have entered after a fixed date, opposed to incumbents that were already presents before this date.

40 885 parking spaces. It is the first social bailey in Europe (Paris Habitat-OPH's annual report 2009).

Public procurement is organized according to the French Public Procurement Code which defines the rules public buyers have to respect when organizing their purchases. The traditional open call for tender is still the reference mechanism and the only one allowed beyond a threshold (Since 2004 this threshold is around 200Keuros. Since 2008, it is defined each year at the European level). Yet, for few years (since 2004 and the new French Code that was aligned to the European rules), notable evolutions tend to limit its mandatory application's area and public buyers have now a lot of freedom to organize their procedures, as long as they respect the three main principles of the Code: transparency, equal treatment of candidates and freedom of access to public contracts. New procurement tools are therefore available for French public buyers. Our purpose is to analyze one of them.

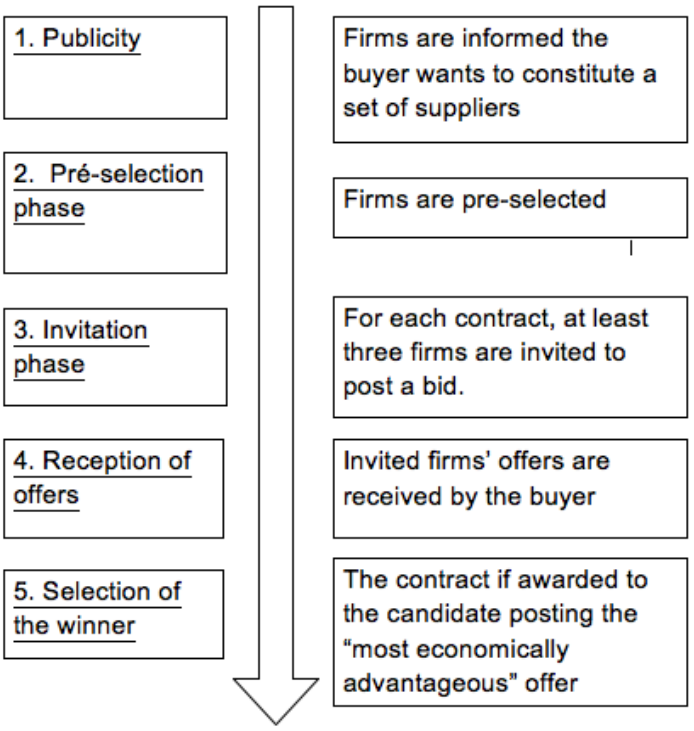
The data used in this paper deals with 182 services contracts attributed by Paris Habitat through restricted auctions between January 2006 and December 2009. More precisely, studied contracts are short-lived, recurrent and deal with activities of project management. The average estimated value[3] of studied projects is 43 234 euros which is low, reflecting the fact that we are dealing with simple transactions giving rise to short term contracts.

The restricted auction is organized as follows. Firstly, for each kind of transactions, Paris Habitat-OPH pre-qualifies candidates that will belong to a "basket" of short-listed suppliers for a fixed term. This short-list is renewed about every two years. Secondly, for each auction, at least three candidates are invited to post a bid. And finally, the winner is the "best" offer, according to price and quality criteria. Thus, the lowest bid regarding price is not necessarily the winning bid (See Figure 1). Several baskets are put in place simultaneously by the buyer, mainly depending on activities for which the buyer is looking for future contracts. It turns out that such procedure has two main objectives: 1/the reduction of the cost of the call for tenders by reducing the number of posted bids to be evaluated by the buyer and 2/to enhance the relational dimension of the contractual relationship because such procedure send a clear signal to short-listed firms that future business is possible as the buyer commits to pick-up firms for the near future only in this basket.

Our main interest concerns the probability of a given firm to be selected in a given call for tenders and the impact of the selection process on final bids received by the buyer. Does the buyer select rationally candidates invited to post a bid? Does this selection improve received bids?

[3] For each project, the buyer makes his own estimation.

Figure 1: The "Basket" Restricted Auction Procedure



Empirical strategy

How Candidates are Selected?

According to our propositions, bidders should be selected to make an offer depending on their past successes and failures, their experience, the scope of their on-going contracts but also in relation with the willingness of the buyer to maintain through time some competitive pressure. We herein use the following probit model, which estimates the probability of selecting one firm:

$$Selected_{ijt} = 1\left[Selected^{*}_{ijt} = x_{it}\gamma_1 + z_j\gamma_2 + a_t\gamma_4 + b_i\gamma_5 + C\gamma_6 + e_{it} < 0\right]$$

where 1 is the indicator function, which takes a value of 1 whenever the statement in brackets is true, and 0 otherwise; $SELECTED_{ijt}$ is the binary variable that indicates whether firm i is selected or not renewed at time t for contract j ; x_{it} is a vector of characteristics concerning past performances, potential future business, experience and on going contracts of candidate i at time t; z_j is a vector of variables capturing the characteristics of the contract j ; e_{ijt} is the error term; and γ_1, γ_2 are vectors of parameters that correspond to x_{it}, z_j respectively. We also add some fixed effects, capturing specificity of the time the contract is attributed (year, month) and specificity of the candidates. Finally we add several control variables, C.

Used Variables

We have information about short-listed firms that have been invited to post a bid at least one time on the studied period. More precisely, we know the number of time a firm has been invited to bid, the value of its posted bids, the number and the volume of its won contracts, the number of its posted bids considered as being technically insufficient and disqualified, the number of time the invited firm voluntary decides to decline and post no bid and so on. We also have information about contracts' characteristics and about the identity of Paris Habitat-OPH's employee that organizes each auction. This permits us to construct a set of variables in relation with our propositions. They are presented in table 2.

Firms' Reputation - In order to capture the reputation of each firm, we use three variables that are capturing their past failures: $NoResponse\_Rate$, $Rate\_Insufficient$ and $Renegotiation\_Rate$. The first variable, $NoResponse\_Rate$, captures the fact that short-listed firms that are allowed to post a bid may refuse to do so conducing them to have a low answer rate. The second variable, $Rate\_Insufficient$, is measuring the fact that a firm is frequently proposing low but technically insufficient bids that are disqualified by the buyer. This second variable is potentially capturing opportunistic candidates, who tries to maximize their chance of winning the contract without taking into account buyer's expectations. The third variable, $Renegotiation\_Rate$, is measuring the propensity of a given firm to renegotiate its contracts. Following or proposition 1, we expect that those three variables, reflecting past failures, impact negatively on the probability for a given firm to be selected in order to give an offer.

Firms' Current Ties with the buyer - In order to capture current ties between the buyer and potential bidders, we created the variable $Current$ that reflecting on-going projects of the buyer that is already in the hands of a given firm. This variable captures the on-going businesses between the firm and the buyer. According to our second proposition, the more a firm has not yet completed on-going contracts with Paris Habitat-OPH, the more probably it should be selected, because it has fewer interest in behaving opportunistically and the buyer have more opportunities to punish her in case of opportunistic behaviors. We thus expect this variable to impact positively on the probability for a given firm to be selected in order to give a offer.

Firms' experience - Each contract for which firms are invited to post a bid is managed by one given employee on the buyer's side. The more they interact together, the more

we can expect coordination costs to be reduced (Gil and Marion (2009a)). To capture this effect, we created the variable *Employee_Rate* taking care of past experiences of the buyer's employee with each candidate. We expect, in accordance with our proposition 3, that the more an employee interact with a candidate, deciding to lead access to a big fraction of his procured contracts in the past, the more their coordination costs are decreased and the more probably the firm is to be selected again.

Buyer's Willingness to Generate Competition - Because the buyer want to maintain competition through time, it is not excluded that successful firms will not be selected, especially when considering recent successes. Indeed, the buyer might want to implement a rotation of market access between potential bidders. We use two variable to capture this effect. The first one is the variable $Market\_Share$ that is considering the number of contracts won by a firm in comparison with the whole number of contracts for which a call for tenders has been done, the last 6 months, within one basket. We expect the higher the market share of a given firm, the lower its probability to be selected. In addition, we use a second variable $Never\_Selected$ that is a dichotomic variable taking value 1 when a given firm has never been selected in the past within one basket (i.e. from the time the basket has been implemented). We expect that when a firm has not yet been selected, its probability to be selected should be higher.

Control Variable and Fixed Effects - As we mentioned, the buyer first selects a number of short listed firms (the firms basket) that will belong to the basket in which he will select firms allowed to post a bid to its future call for tenders. If the buyer has the legal obligation to select at least three candidates for each contract, the number of chosen candidate might vary a lot as well as the size of the basket. Naturally, the more numerous the short listed firms are, the less probably a firm will be selected. On the contrary, the more numerous candidates are invited to post a bid, the more probably a firm will be selected. That is why we use variable *Selection_Rate* to control for this effect. For a given call for tender, the higher the selection rate (i.e. the number of selected firms compared to the size of the basket) the higher the probability for a given firm to be selected.

In addition, we added fixed effects for years, months, firms, sectors and buyer's employees. A simple comparison between the two samples – selected and non selected firms – indicates differences between the two groups of firms (See Table 1).

Table 1: FIRMS' CHARACTERISTICS AND SELECTION

Variable	Selected firms	Unselected firms
$Rate\_Insufficient_{it}$	0.08	0.10
$NoResponse\_Rate_{it}$	0.09	0.10
$Renegotiation\_Rate_{it}$	0.01	0.02
$Current_{it}$	38523	28501
$Employee\_Rate_{it}$	0.15	0.10
$Market\_Share_{it}$	0.07	0.06
$Never\_Selected_{it}$	0.16	0.12

Selection Process and Received Bids?

Another issue we are interested in is the impact of the selection process at stake on the quality of final offers received by the buyer. Indeed, the interest of selecting candidates that are allowed to post a bid is to reduce the cost of the bid process but also to receive competitive offers and to limit offers that are considered as inefficient by the buyer. In order to assess the competitiveness of a received bid, we used the variable *Relative_Bid* measuring the quality of the offer relative to the estimation made ex ante by the buyer.

Our strategy is to assess the fact that received bids are competitive or not *given* the selection process at stake. However, we can only observe bids of invited firms. We have no idea of the offers that non invited firms would have made. To take care of self selection, we used a two-step Heckman method (Heckman, 1979):

$$Relative\_Bid_{ijt} = x_{it}\beta_1 + z_j'\beta_2 + a_t\beta_3 + b_i\beta_4 + C\beta_5 + \epsilon_{it} < 0 \mid Selected_{ijt} = 1$$

where x_{it} is a vector of characteristics concerning past performances, potential future business, experience and on going contracts of candidate i at time t; z_j' is a vector of variables capturing the characteristics of the contract j ; ε_{it} is the error term; and β_1 and β_2 are the vectors of the parameters that correspond to x_{it} and z_i' respectively. We also add some fixed effects and control variables C like in our selection estimates. However, we use the variable *Employee_Rate* as an instrument (not included in z_i' but in z_i). It indeed reflects past interactions between each employee and each firm. This information is known by the employee at the selection stage, but not by the firm at the bidding stage. If the employee has already widely interacted with a particular firm, he will probably try to interact again in the future. Because firms have no information about the identity of the employee that is organizing the auction, they are not supposed to adapt their bids to employee's identity. That is why we believe this is a valid instrument impacting on the selection process but not on the final received bids.

Table 2: DESCRIPTION OF OUR VARIABLES

Variable	Definition	Mean	Min	Max	N
$Selected_{ijt}$	Equals 1 if the candidate i is invited to post a bid for contract j at time t, 0 otherwise	0.26	0	1	2338
$Estimate_{jt}$	Buyer's estimated value of the contract j (in euros)	43234	2500	203000	182
Bid_{ijt}	Posted bid of candidate i for contract j at date t (in euros)	40868	2250	404500	523
$Relative\_Bid_{ijt}$	Posted bid of candidate i for contract j at date t / buyer's estimated value (in euros)	0.99	0.1	4	523
$Insufficient_{ijt}$	Equals 1 if posted bid by candidate i is the lowest for contract j and considered as technically insufficient at date t, 0 otherwise	0.10	0	1	523
$Rate\_Insufficient_{it}$	Number of past technically insufficient low bids of the candidate i at time t / number of past offers	0.09	0	1	2338
$NoResponse\_Rate_{it}$	Number of past call for tenders for which the candidate i has not posted a bid at time t / number of time the candidate has been selected	0.10	0	1	2338
$Renegotiation\_Rate_{it}$	Total value (in d') of the costly past renegotiations of candidate i at time t / value of contracts this candidate won (in euros)	0.02	0	0.29	2338
$Current_{it}$	The fraction of the d' value of projects candidate i is running and not yet completed at time t . We assume that projects are completed linearly by day.	31159	0	254021	2338
$Market\_Share_{it}$	Number of contracts won by candidate i at time t during the last 6 months / Number of contracts the candidate could have been invited to post a bid during this last 6 months	0.06	0	1	2338
$Never\_Selected_{it}$	Equals 1 is the candidate i has never been selected at time t, 0 otherwise	0.11	0	1	2338
$Employee\_Rate_{it}$	Value (in euros) of contracts a given employee gave a candidate i access to / value of contracts this employee procured in sectors candidate$i$ is short listed (in euros)	0.11	0	1	2338

3. Results and discussion

How Candidates are Invited?

Results concerning the way candidates are invited are presented in Table 3. Results are consistent whatever the specification that is retained and suggest that the buyer is not inviting firms that are allowed to post a bid randomly.

Table 3: THE SELECTION OF CANDIDATES

	MODEL 1 ROBUST PROBIT *Selected*	MODEL 2 ROBUST PROBIT *Selected*
$Rate\_Insufficient$	-0.006	0.295
	(0.199)	(0.362)
$NoResponse\_Rate$	-0.321**	-0.771**
	(0.151)	(0.313)
$Renegotiation\_Rate$	-0.141	-4.660**
	(0.783)	(2.084)
$Employee\_Rate$	0.322***	0.262**
	(0.102)	(0.112)
$log(Current)$	0.038***	0.071***
	(0.008)	(0.012)
$Market\_Share$	-0.172	-1.111**
	(0.347)	(0.489)
$Never\_Selected$	0.260***	0.755***
	(0.100)	(0.148)
$Selection\_Rate$	3.190***	3.269***
	(0.193)	(0.714)
$Yearsfixedeffect$	No	Yes
$Monthsfixedeffect$	No	Yes
$Sectorsfixedeffect$	No	Yes
$Employeesfixedeffect$	No	Yes
$Firmsfixedeffect$	No	Yes
$Intercept$	-1.793***	1.187
	(0.091)	(1.170)
$McFaddenR2$	0.13	0.17
N	2338	2304
$Correctly predicted$	78.02%	79.90%

Significance levels: + 0.15, * 0.10, ** 0.05, *** 0.01; Robust standard errors in parentheses.

More precisely, firms past performances impact on the buyer's choice. The fact that a firm renegotiated a lot during its past contracts or did not post an offer while it has been selected to impact negatively, as expected, on its probability to be selected for a given contract. Surprisingly, the frequency of a firm past offers declared unsuccessful do not impact on its probability to be selected. This is strange as we expected this variable to measure the degree of opportunism of a given firm. However, we can note that unsuccessful

bids as we defined them are frequent (10% of posted bids - See Table 1). This might simply reflects the fact that often the best offers concerning price, are not the best economic offers finally retained by the buyer.

A second result is that firms with current businesses are significantly more prone to be selected. This might be explained by the buyer's willingness to maintain continuity of the relationship with successful candidates (i.e. relation contracting). Also, firms already engaged in business relationships with the buyer should be less likely to behave opportunistically according to our proposition 2.

We also observe that the more a buyer's employee interact with a given firm, the more probably it will be selected, suggesting that past experience between partners increase their willingness to cooperate together. This is in accordance with our proposition 3 and might be explained by the decreasing cost of coordination coming with frequent interactions. It can also be explained by the fact that Paris Habitat-OPH's employees have private information about firms' abilities, resulting from past interactions. If an employee widely provided a candidate access to its managed contracts, this information is probably positive, which may improve invitation's probability of concerned firms.

Lastly, as expected (See proposition 4), our results suggest the buyer cares about the sustainability of competition. On the one hand, firms with high market shares are less likely to be selected. On the other hand, firms that have never been selected are more probably selected. This may reflect buyer's willingness to maintain a regular entry of new firms.

A natural question that arises then is to see to what extend, this active behavior of the buyer in favor of the reduction of competition is beneficial or not through its impact on the final received bids.

The competitiveness of received offers

Table 4 concerns posted offers without taking into account the selection bias coming from the fact that only selected bidders are allowed to post a bid. The dependent variable is the $Relative\_Bid$ in Model 3 and 4, whereas $log(Bid)$ is estimated in Model 5 and 6. Fixed effects are introduced in Model 4 and 6. Results are consistent across specifications suggesting that more valuable contracts attract more aggressive bids. Furthermore, firms with many current contracts and firms that have posted disqualified bids in the past tend to bid more aggressively and to post lower bids. Those results hold when introducing the selection bias (see Table 5).

Table 4: POSTED BIDS

	Model 3 Ols *Relative_Bid*	Model 4 Ols *Relative_Bid*	Model 5 Ols *log(Bid)*	Model 6 Ols *log(Bid)*
log(Estimate)	-0.111***	-0.090***	0.887***	0.909***
	(0.016)	(0.022)	(0.015)	(0.019)
Rate_Insufficient	-0.384***	-0.124	-0.424**	-0.254
	(0.111)	(0.122)	(0.188)	(0.194)
NoResponse_Rate	-0.017	-0.042	0.018	-0.008
	(0.074)	(0.146)	(0.080)	(0.150)
Renegotiation_Rate	0.160	-0.421	0.231	-0.161
	(0.320)	(0.548)	(0.334)	(0.510)
log(Current)	-0.011***	-0.009**	-0.010***	-0.010***
	(0.003)	(0.004)	(0.003)	(0.004)
Market_Share	-0.029	-0.099	-0.059	-0.030
	(0.117)	(0.196)	(0.102)	(0.134)
Never_Selected	-0.046	0.014	-0.046	-0.017
	(0.042)	(0.052)	(0.040)	(0.045)
Selection_Rate	0.099*	-0.030	0.050	-0.108
	(0.059)	(0.214)	(0.075)	(0.194)
Yearsfixedeffect	No	Yes	No	Yes
Monthsfixedeffect	No	Yes	No	Yes
Sectorsfixedeffect	No	Yes	No	Yes
Employeesfixedeffect	No	Yes	No	Yes
Firmsfixedeffect	No	Yes	No	Yes
Intercept	2.233***	1.966***	1.207***	0.946**
	(0.175)	(0.507)	(0.160)	(0.428)
$r2$	0.13	0.60	0.88	0.95
N	523	523	523	523

Significance levels: + 0.15, * 0.10, ** 0.05, *** 0.01; Robust standard errors in parentheses.

Table 5 presents results concerning the competitiveness of received offers when taking into account the selection bias through a two-step Heckman model. The dependent variable is the *Relative_Bid* in Model 7 and 9, whereas *log(Bid)* is estimated in Model 8 and 10. Model 7 and 8 run on the entire set of received offers, whereas regressions of Model 9 and 10 run on the set of "sufficient" received offers (in other words, bids that have been disqualified by the buyer are excluded i.e. if the variable *Insufficient* is equal to 1). We indeed propose to replicate the estimations of models 7 and 8 after dropping the insufficient offers to check if the decrease of bids is not due to an increase of low quality bids. In other words, if the selection process leads to select more candidates that propose the lowest but

technically insufficient offers, the decrease of prices is driven by a decrease of the quality of proposed bids instead of reflecting competitiveness of received offers.

Table 5: ACCEPTED POSTED BIDS

	Model 7 Heckman *Relative_Bid*	Model 8 Heckman *log(Bid)*	Model 9 Heckman *Relative_Bid* ♀	Model 10 Heckman *log(Bid)* ♀
log(Estimate)	-0.094***	0.906***	-0.098***	0.903***
	(0.019)	(0.016)	(0.020)	(0.016)
Rate_Insufficient	-0.183	-0.291***	-0.578***	-0.654***
	(0.137)	(0.110)	(0.208)	(0.170)
NoResponse_Rate	-0.067	-0.023	0.076	0.146
	(0.140)	(0.113)	(0.160)	(0.130)
Renegotiation_Rate	0.080	0.154	0.571	0.638
	(0.696)	(0.557)	(0.841)	(0.688)
log(Current)	-0.021***	-0.018***	-0.031***	-0.031***
	(0.007)	(0.006)	(0.009)	(0.007)
Market_Share	0.070	0.076	0.098	0.143
	(0.146)	(0.116)	(0.156)	(0.128)
Never_Selected	-0.109	-0.094+	-0.130	-0.149*
	(0.081)	(0.065)	(0.093)	(0.076)
Selection_Rate	-0.393	-0.336+	-0.595*	-0.601**
	(0.293)	(0.232)	(0.320)	(0.262)
Yearsfixedeffect	Yes	Yes	Yes	Yes
Monthsfixedeffect	Yes	Yes	Yes	Yes
Sectorsfixedeffect	Yes	Yes	Yes	Yes
Employeesfixedeffect	Yes	Yes	Yes	Yes
Firmsfixedeffect	Yes	Yes	Yes	Yes
Intercept	2.659***	1.381***	2.804***	1.615***
	(0.584)	(0.468)	(0.621)	(0.509)
Mills Lambda	-0.226**	-0.142+	-0.248**	-0.209**
	(0.110)	(0.088)	(0.119)	(0.098)
N	523	523	470	470

♀ Regressions on sufficient received offers only

Significance levels: + 0.15, * 0.10, ** 0.05, *** 0.01; Robust standard errors in parentheses.

One interesting findings concerns the impact of the invitation phase on the competitiveness of received offers: the mills ratio is significant and its negative sign shows that the

selection process leads to lower bids, whatever the specification.

Moreover, estimates are compatible with some of our propositions about the way the invitation has to be implemented. Valuable current contracts lead candidates to post lower bids. Thus the "shadow of the future" actually incites firms to post more aggressive bids. Results also show that firms which have an important rate of insufficient past offers tend to propose lower bids. This result may reflect a low bidding strategy that potentially also implies low technical quality of proposed offers.

Also, contracts' characteristics naturally affect posted bids. More valuable contracts attract lower (relative) bids (see model 7 and 9). Naturally, this effect is not found in model 8 and 10 given that the higher the estimation of the contract, the higher the proposed offer. In addition, a higher selection rate decreases the observed bids, reflecting a competitive effect.

Finally, our results suggest that the selection process enables to obtain more competitive bids. Nevertheless, limits concerning quality issues are still not entirely tackled as we just have information about the quality of the lowest offers. To be conclusive, we should have information about the quality of all the received offers.

5. Conclusion

The first purpose of this article was to understand buyer's decision to restrict auctions. We elaborate propositions derived from the literature to make suggestions about what could be "the law of small numbers", that is to say the efficient way to select few firms allowed to post a bid in a call for tenders. Using a data set of 182 contracts attributed through restricted auctions between January 2006 and December 2009, our results suggest that the buyer's strategy is based on available information about the suppliers' experience and past performances. Such decision criteria gives incentives for the buyer to interact with a stable set of efficient firms. In addition, the buyer has long term interest in maintaining competition, leading to reduce the market access of recently rewarded firms.

The second purpose was to tackle the efficiency of this selection phase. Using a two-step Heckman model (Heckman (1979)), we captured the self-selection' influence on bids either by considering the whole sample of received offers or after dropping the insufficient offers. In both configurations, its significant and negative effect confirms the rationality of buyer's selection criteria. Thus, our results suggest that, by leaving some discretionary power to buyer, restricted auctions may lead to significant savings.

Yet, because of corruption and collusion practices it tends to favour, buyer's discretion is still widely feared in public procurement Ohashi (2009). Considering these new latitudes go with higher transparency requirements, we may expect at least a limitation of these kinds of adverse effects.

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