Expected Number of Bidders and Winning Bids:

Evidence from the London Bus Tendering Model

Miguel Amaral (IAE, University of Paris I Sorbonne), Stéphane Saussier (IAE, University of Paris I Sorbonne), Anne Yvrande-Billon (CES, University of Paris I Sorbonne)

Address for Correspondence: Centre d'Economie de la Sorbonne, University of Paris 1, 106-112 Boulevard de l'Hôpital 75013 Paris, France. Tel : +33(0)1-44-07-83-23, Fax : +33(0)1-44-07-83-20, E-mail : yvrande@univ-paris1.fr.

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Abstract:

We investigate the relationship between operating cost and number of bidders for local bus contracts in London. Using an original database on 806 calls for tender on bus routes, we find that a higher number of bidders, whether actual or expected, is associated with a lower cost of service. This finding has important policy implications, especially for countries in which only few bidders can participate (as in France). Our results indeed point out that the unbundling of an urban transport network may be a source of significant costs reductions.

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1. Introduction

In many countries, governments are pushing for the introduction of competition in the organization of public services and more broadly in public procurement (Armstrong and Sappington 2006). The development of competitive tendering throughout the world is a good illustration of this trend. In Europe in particular, several directives are to be implemented to make the use of competitive tendering in local public services compulsory (for example Regulation (EC) N°1370/2007).

The use of auction procedures aims at replacing competition in the field by competition for the field. The intuition is that an increase in competition (that is to say an increase of the number of bidders) should encourage more aggressive bidding, that is lower bids, so that, in the limit, as the number of bidders becomes large, prices decrease toward efficiency prices. [1] This is called the *competition effect*.

However, recent theoretical developments point out that an increase in the number of bidders does not systematically lead to a price reduction and highlight how difficult it is to empirically assess such effect.

First, competition may not negatively impact on prices when auctions are common-value auctions. Indeed, in such situations, the winner's curse pushes toward conservative bids (taht is to say higher expected prices). This *winner's curse effect* even increases with competition so that when this effect is greater than the competition effect, prices are likely to increase with the number of competitors.

Second, even if competition among bidders leads them to reduce their bid, the winning bidder may, *ex post*, renege on her initial commitments. Recent empirical works show that it may be misleading to consider public-private contracts as renegotiation-proof agreements. For instance, Guasch (2004), in a study of more than 1,000 concession contracts in Latin

[1] As we deal with public utilities services, prices refer here to the amount required by bidders to operate the service. This represents expenses for public authorities. Hence their objective might be to minimize it and more aggressive bids from the participants mean lower bids.

America, points out that more than 50 per cent of them are renegotiated only two years after being started. Athias and Saussier (2010) obtain the same result with contracts signed in Europe. This empirical evidence is crucial for studying the impact of the number of bidders on prices and leads one to reconsider the relevance of the traditional arguments on competitive tendering. Indeed, the potential for renegotiation might lead bidders to make very aggressive bids, even in common-value auctions. From an empirical perspective, this implies that assessing the impact of the number of bidders on price requires controlling for potential contractual renegotiations. As far as we know, it has not been done in previous empirical studies.

Lastly, opportunities for empirical works are restricted by the lack of suitable data on bidding behavior and the non-homogeneity of the tendered products, although some empirical tests exist and provide estimations of the effect of the number of bidders on prices (Thiel 1988; Brannman *et al.* 1987; Gómez-Lobo and Szymanski 2001; Hong and Shum 2002; Bajari and Hortaçsu 2003; Athias and Nunez 2008).

In this paper we investigate empirically the relationship between costs of service and number of bidders in the London bus market. This case is of particular interest because it allows us to control for the impact of contracts renegotiations. Indeed, London buses' contracts are short-term contracts, which are strictly regulated. In addition, following Cantillon and Pesendorfer (2006, 2007), we can reasonably support the hypothesis that auctions in the London bus market are private value auctions. Thus, we should observe only a competition effect in our data.

Using an original database on 806 calls for tender on London bus contracts, we find that a higher number of bidders is associated with a lower cost of service. This result holds even when taking into account the potential endogeneity of the number of bidders. This finding, based on one of the few empirical tests of a crucial theoretical issue has important policy implications, especially for countries in which bids are organized such that only few bidders can respond (as in France). Our results indeed point out the cost reductions that may accrue from the unbundling of urban transport networks and from the regulator's ability to commit.

2.0. Auctions, number of bidders and prices: Propositions

2.1. Number of bidders and winning bids in common-value auctions

In common value auctions, the increase of the number of bidders has two counteracting effects on equilibrium bidding behavior. On the one side, we might expect a competition effect leading to more aggressive bids. On the other side, we might expect the winner's curse effect to become more severe as the number of bidders increases (Milgrom 1989). Depending of the relative size of these two effects, the impact of the number of bidders on the winning bid might be positive or negative.

2.2. Number of bidders and winning bids in private-value auctions

Recent developments in the literature on auctions point out that even in the case of pure private-value auctions, competition induces a selection bias in favour of optimistic bidders, as long as one considers the possibility for bidders to make prediction errors[2] (Compte 2004). The winner's curse is thus not specific to common-value setting. The more bidders, the higher the probability of the winner's expected profit to be negative. To be immune from the winner's curse effect, bidders should then mark-up the estimation of their costs, the size of this mark-up increasing with the level of competition.

[2] For example because bidders might be overconfident in the signal they receive about their costs or valuation of the auctioned good.

2.3. Number of bidders and winning bids in renegotiated contracts

Auctions may be a way to introduce competition in utilities industries. However, as pointed out by Guasch (2004), many (long term) auctioned contracts are renegotiated shortly after their signature. Depending on the bidders' beliefs on the probability of a future renegotiation, competition and winner's curse effects may be affected or even inexistent, simply because bidders are not committed with auction's results.

2.4. Proposition

This set of arguments leads us to the following proposition:

Proposition: Winning bids should decrease with the number of bidders if:

(1) Bidders perfectly know the value of what is auctioned (that is in case of private-value auctions),

(2) Bidders do not make any errors concerning their costs (that is no winner's curse effect due to prediction errors),

(3) Bidders know that contracts will not be renegotiated (that is to say bidders commit to their bids).

In other words, if conditions (1), (2) and (3) are respected, we should observe only a competition effect, that is to say a negative impact of competition on prices.

Surprisingly, although this issue is central in auction theory, the ratio of empirical tests over theoretical developments remains too low to conclude or even highlight the debate on the impact of the number of bidders on the price of public services. The confrontation of auction theory to facts has been limited by the lack of suitable data on bidding behavior and the non-homogeneity of the tendered goods.

However, bus transport services in London are relatively homogeneous and the compulsory use of competitive tendering since 1994 provides a natural experiment to assess the effect of bidding on prices. Furthermore, we believe that in this case the three necessary conditions for our proposition to hold are respected, allowing us to estimate a pure competition effect.

3.0. The London Bus Tendering Model – Description and Data

With approximately 700 routes serving an area of 1630 square kilometres and more than 6 million passengers every weekday[3], the bus network is an essential element to support economic and social activities in the city. As a consequence, the functioning of the London bus routes market, which received 700 million Pounds of subsidies in 2008/2009[4], has deserved particular attention, especially since the reform of 1984.

3.1. The 1984 reform

The regulatory framework, the contracting mode and the form of ownership within the London bus market have all evolved over the past 25 years as a consequence of the London Regional Transport Act 1984. Prior to the reform launched by the Act, bus operations in London were provided by a publicly-owned and subsidised company, London Transport (LT), which was not exposed to competition. In the mid 1980s however it was decided that the industry should remain regulated but that competitive forces should be introduced via a regime of bus route tendering[5] in order to increase efficiency and reduce financial assistance from public funds. Consequently, in 1985, LT created an operational subsidiary known as London Buses Limited (LBL), which was then split into 13 locally based subsidiary companies. As a step towards the reform of the sector, LBL subsidiaries were privatised in 1994. The introduction of competition for the market and the involvement of the private

[3] Source: Transport for London (2008).
[4] Source: Greater London Authority (2010).
[5] The reform was more radical outside the greater London since bus operations throughout Great Britain were completely privatised and deregulated.

sector have therefore been gradual. The first tenders took place in 1985 and, until 1994, competition for the right to serve the market was between the public sector subsidiaries of LBL and an emerging group of private bus operators[6]. In the early stages the routes put out to tender were very small, peripheral routes requiring few vehicles to operate so as to facilitate the entry of small independent operators (Glaister and Beesley 1991). Progressively, more and more routes were put out to tender such that, by the end of 1995, half of the network had been tendered at least once[7] and, in the beginning of 2001, all the bus miles operated were supplied under tendered contracts.

3.2. The tendering process and the auction format

Since 1995, an invitation to tender is issued by the regulator (Transport for London, TfL) every two or three weeks so that about 20 per cent of the London bus network is tendered each year. The tenders are open to all licensed operators and the invitation may cover several routes, usually in the same area of London, and provides a detailed description of the service to deliver (for example service frequency, vehicle type, network routes). The contract to operate each bus route is generally for five years, with a possible 2 years extension (TfL 2008). Since most of the contracts are gross cost contracts[8], the bids consist of an annual price at which the bidder accepts to provide the service. The criterion for selection of a winning bid is the "best economic value" that is to say that the contract is awarded to the lowest bidder but other qualitative factors may also be considered at the margin. Thus, for instance, promises of extra off-peak or Sunday services or promises of new vehicles may be considered and lead to the selection of a bidder who is not the lowest one.

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[6] National Bus Company operators, municipal operators and other private operators.
[7] Non-tendered routes remained operated by the subsidiaries of LBL under a negotiated block grant.
[8] That is to say that the operator receives a fixed fee for the service and the revenues from fares accrue to the regulator.

The auction format adopted in the London bus routes market is a variant of a combinatorial first price auction. Indeed, bidders can submit bids on any number of routes and route packages. For instance, a bidder can submit a bid on a package without submitting a bid on the individual routes included in the package. But bidders are not allowed to bid more for a package than the sum of the stand-alone bids of that package. The auction format therefore implies that bidders are committed by their route bids, that is to say that stand-alone route bids define implicitly a package bid with value equal to the sum of the route bids. This rule was motivated by the regulator's wish to detect and exploit economies of scale despite the fragmentation of the network. The auction system adopted in London is therefore an attempt to reach two contradictory objectives. On the one hand, the unbundling of the network is expected to encourage the participation of small bus operators, and consequently to foster competition. On the other hand, the possibility to bid for packages of routes is supposed to allow benefiting from coordination synergies and economies of scale.

In accordance with Cantillon and Pesendorfer (2006, 2007), we argue that in the London bus market auctions are private value auctions. A first reason is that there is little uncertainty among bidders regarding the expected costs of most of the inputs incurred in carrying out the contract, particularly labour and fuel, which have well-functioning markets. Moreover, considering that a vast majority of the operators come from the bus industry and given that the current system is in place since more than 25 years, we can reasonably think that bidders are experienced enough to be able to forecast accurately their costs and not to be influenced by their competitors' cost forecasts.

3.3. Data and summary statistics

We collected data on all the auctions for London bus service contracts that were conducted between May 1999 and May 2008. Over this period, 806 individual routes were put out to tender. The awarding procedures and their result are well documented. Indeed, the regulator publishes on his website many data related to the auctions[9]. Thanks to this source we have at our disposal data on:

- The number of bidders per individual route;
- The lowest and the highest individual compliant bids;
- The accepted bid in current £ and the corresponding cost per mile of the awarded contract;
- The identity of the successful bidder;
- The type of bid submitted by the winner, that is to say whether the ultimate award was for a package of routes, that is to say for a joint bid;
- The package bid proposed by the winner;
- The number of routes attributed in a same package;
- The annual scheduled mileage.

Descriptive summary statistics on the evolution of the number of bidders per route are reported in Table 1.

-Insert Table 1-

On average, over the period covered by our database (May 1999- May 2008), 2.83 tenderers submitted a bid for an individual route and 17 per cent of the routes put out to tender received only one bid. In addition, the average number of bidders appears to be increasing. This contrasts with the competition intensity observed in other countries like France where local authorities organize larger size auctions. As reported by Amaral et al. (2009), the French case is indeed characterized by few bidders (1.8 in average over the period 1995-2005), a decreasing number of bidders through time and a high proportion of route tender bids which attract only one bidder (53.5 per cent in average over the period 1995-2005).

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[9] (http://www.tfl.gov.uk/buses/bus-tender/default.asp).

Regarding the market structure, Figure 1 indicates that the London bus market is fairly competitive. Although the number of operators has consolidated in recent years, from twenty operators in 2000 to ten by the end of 2009, no single group has yet achieved a total scheduled kilometres that exceeds twenty five percent of the total market. This is due to the fact that bidders can be automatically disqualified if, should they win the bid, their market share exceeds 25 per cent of the total scheduled vehicle kilometres.

Lastly, it is to be noted that until 2009 a public company (East Thames Buses) was operating bus routes in London, allowing the regulator to benchmark private operators with their public competitor.

-Insert Figure 1-

Table 2 focuses on the period covered by our database (May 1999-May 2008) and presents statistics on the observed bids broken down according to the number of actual bidders who participated in the auction.

-Insert Table 2-

The evidence presented in Table 2 supports the view that, in the London bus market, auctions are with private-value, hence the increased competition effect dominates the winner's curse effect. Indeed, as opposed to what was found by Hong and Shum (2002), we do not observe a positive correlation between the number of bidders and the winning bids. On the contrary, the average cost per mile corresponding to the winning bid decreases from about 7.80 £ in 1-bidder auctions to 2.66 £ per mile in 9-bidders auctions.

We also observe that the number of bidders decreases with the size of the contracts put out to tender, that is, with the number of bus miles (column 3, Table 2). This suggests the existence of asymmetries among bidders, some bidders being unable to participate to large auctions. Despite the moderate concentration of the market (Figure 1), only few operators are likely to be interested in bidding for large routes requiring a lot of vehicles to operate. In other words, winning bids and number of bidders are likely to be endogenous variables. This means that investigating the determinants of winning bids by estimating the operating costs proposed by the winner with the number of bidders might be misleading unless this endogeneity problem is solved.

In addition, it seems more realistic to use the expected number of bidders as a covariate instead of the actual number of bidders. As mentioned by De Silva et al. (2009) or Tukiainen (2008), although a vast majority of studies on auctions assume that the number of bidders is known, in many procurement auctions, bidders do not know how many rivals they will face at the time they incur the cost of preparing their bids. The degree of competition bidders anticipate is therefore more likely to be a determinant of their bidding strategy. More precisely, as suggested by Table 3, where the expected number of bidders is defined as the number of bidders at the previous route tender, bidders seem to be even more aggressive that the number of rivals they anticipate is large. Descriptive statistics provided in Table 3 indeed clearly indicate that the operating costs proposed by the winners are decreasing with the expected number of bidders. .

-Insert Table 3-

Moreover, when we compare the expected number of bidders with the actual number of participants to auctions and then link this ratio with the winning bids, it first appears that the actual number of bidders does not coincide with the expected number of bidders as we defined it (Figure 2). More precisely, the actual number of bidders seems to exceed the expected number of bidders when the former is low. On the contrary, the actual number of bidders seems to be systematically inferior to the expected number of candidates when the former is high (that is to say when the expected number of bidders is superior to 3).

We also observe that winning bids are less aggressive when the actual number of bidders exceeds the expected number of bidders, but are very low when the actual number of bidders is inferior to the expected number of competitors. This suggests that bidders are prone to participate in auctions that received few bids in the past but, as they know competition was not fierce at that time, they expect to win with a relatively high bid. Conversely, bidders seem to be discouraged to enter auctions that were highly competed in the past but those who eventually decide to participate place very aggressive bids. These interpretations are consistent with the theoretical results obtained by De Silva *et al*. (2009) who show that, in pure private-value settings, an increase in the expected number of bidders leads to lower cost (this is the competition effect). However, as a result of lower profit margins, the incentive to go through the costly bid preparation process is reduced, which depresses the number of bids submitted (this is the entry effect). As the latter effect can offset the initial competition effect, the net effect of an increased number of expected bidders is uncertain.

What we intend to do in the next section is to disentangle between these two effects -the competitive effect and the entry effect- to assess whether potential entry has an overall positive or negative impact on costs.

-Insert Figure 2-

4.0. Tests and Results

4.1. Empirical strategy

To estimate the impact of the number of bidders on auctions' results, we estimate the following model:

$$C_{itn} = \beta N_{it} + \delta R_{it} + \upsilon_t + \sigma_n + \varepsilon_{itn} \qquad (1)$$

where C_{itn} is the cost per mile submitted for route *i* at date *t* by the winning bidder *n*, N_{it} is the number of bidders that submitted a bid for route *i* at date *t*, R_{it} is a vector of variables which account for the characteristics of the bus route *i*, υ_t is a year fixed effect which accounts for events in year *t* that may impact on observed bids, independently of the number of bidders, σ_n is a term that captures operator specific control variables, and ε_{itn} is a potentially heteroskedastic regression error term. We assume that $\varepsilon_{itn} \sim (0, \Sigma)$.

4.2. Endogeneity issue

What we are interested in is the relationship between the observed winning bids and the level of competition. However, the link between these variables may not be unidirectional because both variables are correlated with a third one, for instance the size of the contract. As already explained, the number of bidders is thought to impact on submitted bids. Yet, it can also be argued that the expected value of the winning bid influences the number of participating bidders. In other words the number of bidders, Nit, is likely to be endogenous. In particular, there may be individual heterogeneity across operators, time periods and bus routes that is unobserved by the econometrician but correlated with both the decision to bid and the observed winning bids. Failure to account for this possibility may lead to an inconsistent estimate of β. If the unobservable individual heterogeneity that results in the endogeneity of Nit is time invariant, then, to the extent that we account for time invariant operators fixed effects as well as for year fixed effects in equation (1), we can reasonably consider that these heterogeneity biases are taken into account in our estimates. However, the decision to bid may also be motivated by some unobservable time varying heterogeneity. To account for this potential source of endogeneity we follow two paths.

First, to capture time varying heterogeneity, we add in our regressions the number of auctions organized during the month (NB_MONTH). This number is known by the participants and may alter their willingness to bid aggressively for every auction. Furthermore, the more auctions, the higher the likelihood of collusion among bidders. We also incorporate the number of auctions already won by the winner during the previous month (NB_MONTH_WIN) to control for operators' specific strategies at specific periods of time.

Second, we use Nit-1, the number of bidders who submitted a bid during the previous auction for route i. This requires using the subsample of renewed contracts. Nevertheless, using the lagged variable is interesting for two reasons. First, it helps dealing with the potential endogeneity of Nit. Second, and more interestingly, we believe that bidders are unlikely to know precisely how many rivals are involved in the future auctions; but they know for sure the number of bidders that participated to the previous auctions. It is then more appropriate to consider the impact of the number of participants to previous auctions on the actual observed bids.

4.3. Data

Table 4 presents the variables we used in our econometric test.

-Insert Table 4-

We expect β, the coefficient of the variable NB_BIDDERS, to be negative due to the competition effect.

Vector R of equation (1) includes several route specific variables, namely the number of bus-miles to be supplied on the route (MILES), the variables JOINT, which controls for the fact that the winning bid is a joint bid, and PACKAGE, which controls or the size of the joint bid. In the presence of economies of scale, the unit operating costs should decrease as the volume of service to supply, that is to say the number of vehicle miles to deliver, increases. We therefore expect the coefficient of the variable MILES to be negative. We also expect JOINT and PACKAGE to have a negative impact on C. Indeed, as already mentioned, a central motivation of the London Transportation authority for encouraging combination bids was to allow bidders to pass on some of the cost savings resulting from cost synergies between routes through lower bids. And indeed, when we compare, for each package of routes, the winners' joint bids and the sum of the best stand-alone bids, we observe that bidders offer discount for combinations of routes. More precisely, consistently with results obtained in other studies (Cantillon and Pesendorfer 2006, 2007), the discount of a combination bid relative to the sum of the lowest stand-alone bids equals 4.9 per cent on average in our sample[10]. That is why we expect joint bids to allow bidders to lower costs due to cost synergies.

In addition, we control for incumbency. The theoretical literature on auctions suggests that the incumbent has a higher probability to win due, for instance, to informational advantages. In addition, the regulator (TfL) does not hide that, in some cases, he favours the incumbent. The good performance of the incumbent indeed appears as one of the reasons for not awarding a contract to the lowest bidder that the regulator invokes and publicly displays in the reports on tender results. Furthermore, our estimations indicate that 65.6 per cent of tenders (for which there is incumbent information) have led to the renewal of the incumbent[11]. For these reasons, we include the variable INCUMBENT, and conjecture that it has a positive effect on C.

We also control for the rate of success of the winner during the previous month (NB_MONTH_WIN) and for the number of routes auctioned during the month (NB_MONTH).

At last, we include operators and years dummies in order to capture fixed effects and we also incorporate a trend variable in our regressions (TREND).

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[10] As bidders submitting bids for a package of routes must also submit individual bids for each route of the package, the discount for a combination bid can be estimated by comparing the combination bid to the sum of individual bids submitted for each route of the package.

[11] Note that the incumbent success rate estimated for the 2007-2008 period is even larger (78.4%) (TfL 2009).

4.4. Results

4.4.1. Impact of the number of bidders on costs

The log-log regression has the advantage of directly giving elasticities. It also helps reducing heteroscedasticity problems. Thus we perform the following model:

$$\ln(C_{itn}) = \beta \ln(N_{it-1}) + \delta \ln(R_{it}) + \upsilon_t + \sigma_n + \varepsilon_{itn} \quad (2).$$

In order to check the robustness of our results, we also provide OLS results by estimating equation (1) and equation (3), which capture in more details the impact of the number of bidders on cost:

$$C_{itn} = \beta_2 N\_2_{it} + \beta_3 N\_3_{it} + \beta_4 N\_4_{it} + \beta_5 N\_5_{it} + \beta_6 N\_Sup_{it} + \delta R_{it} + \upsilon_t + \sigma_n + \varepsilon_{itn} \quad (3)$$

where the *N_X* variables are dummies taking value 1 if the number of bidders is equal to X for auction *i* at date *t* and *N_Sup* is a dummy taking value 1 when the number of bidders is superior to 5.

Results are presented in Table 5.

-Insert Table 5-

Consistently with other studies dealing with private value auctions (Kennedy 1995, De Silva et al. 2009), we find a positive cost reducing effect of competition as β is negative and significantly different from zero in all models. This result holds whatever the specification we retain, introducing or not operator fixed effects and using linear or log-log specifications. Hence, in the London bus market, the “discouraging” effect of additional entry seems to be more than compensated by the competitive effect of an increased number of expected bidders. This competitive effect is significant as reflected in Table 6.

-Insert Table 6-

Secondly, our results suggest non-linear economies of scale. Unit operating costs decrease with MILES (the number of bus miles to be delivered) but increase with $MILES^2$ in our linear specifications (Models 3, 4 and 5). We obtain the same results in our log-log specifications

(Models 1 and 2). More precisely, unit operating costs are found to decrease with the volume of output to supply as long as it is inferior to 7.77 million bus miles.[12] This cost minimizing level of production is largely superior to the average contracted volume of output per route (4.34 bus miles, see Table 4), suggesting that economies of scale could be made by increasing the size of the lots. However, a "re-bundling" of the network would contradict the original objective of the reform, which was above all to foster competition. In addition, the possibility to benefit from economies of scale is not absent as tenders generally cover several routes and bidders are allowed to submit bids for packages of routes.

Yet, in our results, the coefficients of the variables PACKAGE and JOINTBID never appear to be significantly different from zero. In other words, on average, winning bids for routes belonging to a package do not significantly differ from those placed for stand-alone routes. Although surprising, this result is consistent with the estimations obtained by Cantillon and Pesendorfer (2006, 2007) who show that bids at the route level are uncorrelated with the size of the auction and conclude that package bidding is driven by strategic motivation rather than cost synergy considerations.

Incumbency does not impact either on winning bids as the coefficient of INCUMBENT never appears as significantly different from zero. Hence, contrary to our expectations, incumbents do not seem to benefit from a first mover advantage, which illustrates the contestability of the London bus market. This result also suggests that the advantage the regulator gives to the incumbents is not detrimental to cost efficiency.

4.4.2. Impact of the past number of bidders on costs

One problem with the regressions presented in Table 5 is that the number of bidders who participate in an auction may be correlated with attributes of the auction that are observable to

[12] This result is obtained from estimates of Model 5 but the other linear models provide approximately the same results.

the bidders, but not to the econometrician. One way to address this endogeneity issue would be to find instruments that are correlated with the number of bidders but not with our dependent variable. Unfortunately, it is hard to think of a natural instrumental variable strategy, since factors correlated with the number of bidders should also enter into the distribution of valuations. One partial solution is to use the lagged number of bidders. This allows mitigating our endogeneity problem but this strategy requires to focus on the subsample of renewed contracts for which we have information on previous bids. Results are provided in Table 7.

-Insert Table 7-

Our main findings remain unchanged: using a lagged variable for the number of bidders involved in the auction gives results in line with previous specifications on our whole sample. The expected number of bidders impacts negatively on costs and seems to be even more explanatory than the actual number of bidders as the overall significance of the models presented in Table 7 varies between 0.493 and 0.738, while in Table 6 R^2 varies between 0.341 and 0.492.

5.0. Conclusion

The introduction of competitive tendering in utilities industries is the subject of large debates among theoreticians and practitioners. In the London bus market it is claimed to have induced a dramatic improvement in the value for money achieved (TfL 2009).

In this article, our aim was to confront this assertion with recent data. Thus, we have analysed bids for operation contracts in the London bus market between 1999 and 2008 to test hypotheses about bidding under competition. More precisely, our econometric strategy has consisted in estimating the impact of the expected number of bidders on the winner's cost bid. Whereas a vast majority of studies on auctions assume that bidders always know the number of actual bidders, in many procurement auctions, and in the London bus market auction in particular, bidders do not know how many rivals they will face at the time they incur the cost of preparing their bids. By using the expected number of competitors as a potential determinant of bids, we have been able to relax this hypothesis and to highlight interesting behaviours. Indeed, not only do we obtain the "classical" result that tendering reduces bid prices as the expected number of bidders increases but we also provide empirical evidence suggesting that bidders' strategies are more influenced by the expected number of bidders than by the actual number of rivals.

Such results, in addition of supporting a traditional and yet under-investigated argument in economic theory, highlight the role played by the unbundling in urban transport networks. The London experience indeed demonstrates that significant cost reductions can be achieved by unbundling a bus network as it favours the participation of small operators and contributes to creating the conditions for real contestability.

However, unbundling does not guarantee effective competition unless certain conditions are respected. More particularly, the transparency of the tendering process is a central issue, as well as the capacity of expertise and control of the regulator. In London, the current model of regulation has these characteristics of transparency and control. To our view, this explains why, despite progressive consolidation in the market and although depot ownership is a significant barrier to entry, competition for bus service contracts is real and yields cost savings.

Thus, countries aiming at improving the efficiency of their urban public transport system might not only consider the London model as an illustration of the competitive impact of unbundling. It might also and above all be seen as an example of how regulation and competition for the field must be combined together.

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Table 1: Evolution of the average number of bidders

Source: TfL website and authors' own calculations

Period	*Number of routes put out to tender*	*% of route tenders with one bidder*	*Average number of bidders*
1999 (May-December)	*21*	*24*	*2.76*
2000	*86*	*16*	*2.85*
2001	*133*	*22*	*2.66*
2002	*91*	*22*	*2.50*
2003	*91*	*24*	*2.52*
2004	*89*	*16*	*2.80*
2005	*96*	*16*	*2.96*
2006	*102*	*9*	*2.93*
2007	*75*	*8*	*3.07*
2008 (January-May)	*22*	*9*	*3.27*
Average	***81 (Total = 806)***	***17***	***2.83***

Table 2: Number of actual bidders and cost per mile

Source: Authors' own calculations and Eurostat UK inflation rates

Number of actual bidders per route	Number of auctions	Average bus.miles (10,000)	Average winning bid (£)	Average cost per mile of the awarded contract (£)	Average cost per mile of the awarded contract (£ 1995)
1	133	46.99	2,217,554	9.05	7.80
2	215	47.24	1,933,647	6.20	5.27
3	235	38.20	1,522,683	6.83	5.84
4	140	44.14	1,727,877	4.56	3.85
5	58	41.84	1,647,772	4.01	3.40
6	10	34.15	1,452,628	5.43	4.69
7	5	32.25	1,044,786	3.61	3.10
8	1	57.97	1,797,000	3.10	2.65
9	1	21.53	645,878	3.00	2.66
>5	*17*	*36.47*	*1,105,743*	*4.61*	*3.98*

Table 3 : Expected number of bidders and cost per mile

Expected number of bidders per route	Number of auctions	Average bus.miles (10,000)	Average cost per mile of the awarded contract (£)	Average cost per mile of the awarded contract (£ 1995)
1	44	28.16	12.75	10.47
2	59	38.68	6.60	5.33
3	56	45.28	5.87	4.84
4	25	46.18	4.43	3.63
5	8	30.40	3.77	3.09
>5	2	63.01	3.34	2.79

Table 4: Checklist of our variables-

Variable	Description	Obs.	Mean	Std	Min.	Max.
C_{itn}	Operating cost per mile proposed for route *i* by the winner *n* at date *t* (in £ 1995)	786	5.38	6.01	1.24	45.43
N_{it}	Number of bidders for route *i* at date *t* (Actual number of bidders)	786	2.80	1.26	1	9
N_{it-1}	Number of bidders for route *i* in the previous auction (Expected number of bidders)	194	2.49	1.19	1	7
$MILES_{it}$	Number of bus.miles to be supplied each year on route *i* / 100,000	786	4.34	3.24	0.000014	17.13
$MILES^2_{it}$	Sq(Number of bus.miles to be supplied each year on route *i* / 100 000)	786	29.44	37.02	$1.9e^{-10}$	293.60
$JOINT_{it}$	Dummy variable taking the value 1 if the winning bid for route *i* is part of a joint bid	786	0.55	0.49	0	1
$PACKAGE_{it}$	Number of routes attributed with route *i* (route *i* included)	786	3.01	2.60	0	11
$INCUMBENT_{it}$	Dummy variable taking the value 1 if the winning bidder of route *i* is the incumbent	786	0.04	0.20	0	1
$NB\_MONTH\_WIN_{itn}$	Number of auctions won by the winning bidder *n* of route *i* during the previous month	786	2.93	2.03	1	10
NB_MONTH_{it}	Number of auctions organized during the same month as the auction for route *i* was organized	786	14.13	7.79	1	31
$TREND_{it}$	Number of months elapsed since January 1995	786	106.12	29.03	55	160

Table 5: Econometric Results

	ln (Cost per Mile)	ln (Cost per Mile)	Cost per Mile	Cost per Mile	Cost per Mile
	Model 1 *Robust OLS*	Model 2 *Robust OLS*	Model 3 *Robust OLS*	Model 4 *Robust OLS*	Model 5 *Robust OLS*
Ln N_{it}	-0.170*** (0.035)	-0.133*** (0.036)			
N_{it}			-0.576*** (0.153)	-0.470*** (0.155)	
N_2					-0.844 (0.646)
N_3					-0.943 (0.730)
N_4					-1.801** (0.654)
N_5					-1.745* (0.701)
N_Sup					-2.857*** (0.863)
Ln $MILES_{it}$	-0.168*** (0.012)	-0.166*** (0.011)			
$MILES_{it}$			-2.383*** (0.226)	-2.363*** (0.217)	-2.346*** (0.218)
$MILES^2_{it}$			0.154*** (0.019)	0.152*** (0.018)	0.151*** (0.018)
$TREND_{it}$	0.001+ (0.001)	0.005 (0.005)	0.009 (0.006)	-0.046 (0.052)	-0.049 (0.053)
$INCUMBENT_{it}$	0.055 (0.077)	0.030 (0.078)	-0.055 (0.854)	-0.314 (0.833)	-0.322 (0.834)
$PACKAGE_{it}^{a}$	-0.023 (0.034)	-0.041 (0.039)	0.019 (0.026)	0.011 (0.083)	0.018 (0.007)
$JOINTBID_{it}$	0.017 (0.059)	0.022 (0.065)	-0.485 (0.458)	-0.514 (0.472)	-0.491 (0.473)
$NB\_MONTH_{it}^{a}$	-0.024 (0.027)	0.014 (0.032)	0.006 (0.027)	-0.010 (0.027)	-0.009 (0.028)
$NB\_MONTH\text{-}WIN_{it}^{a}$	0.021 (0.029)	0.014 (0.032)	0.041 (0.101)	0.043 (0.107)	0.035 (0.109)
OPERATOR Dummies		*Yes***		*Yes***	*Yes***
YEAR Dummies		*Yes***		*Yes***	*Yes***
INTERCEPT	3.495*** (0.175)	3.392*** (0.330)	11.882*** (1.058)	16.398*** (3.389)	16.232*** (3.419)
R^2	0.466	0.492	0.341	0.386	0.387
Obs.	786	786	786	786	786

[a]: the logarithm of the variable is used in models 1 and 2

Huber/White/Sandwich standard errors in ( )

*Significance levels: + 10% *5% ** 1% *** 0.1%.*

Table 6: Estimation of the cost reducing effect of competition

Specification	Model 2	Model 4	Model 5
Impact on average cost per mile of having 6 bidders instead of 2	-21%	-43%	-52%

Table 7: Econometric Results

	Ln (Cost per Mile) Model 6 *Robust OLS*	Ln (Cost per Mile) Model 7 *Robust OLS*	Cost per Mile Model 8 *Robust OLS*	Cost per Mile Model 9 *Robust OLS*	Cost per Mile Model 10 *Robust OLS*
Ln N_{it-1}	-0.146** (0.053)	-0.143* (0.055)			
N_{it-1}			-0.760** (0.325)	-0.509^{+} (0.270)	
N_{t-1}_2					-1.941^{+} (1.142)
N_{t-1}_3					-1.620 (1.185)
N_{t-1}_4					-1.904^{+} (1.103)
N_{t-1}_5					-2.965^{+} (1.521)
N_{t-1}_Sup					-2.518 (1.906)
Ln $MILES_{it}$	-0.277*** (0.028)	-0.273*** (0.027)			
$MILES_{it}$			-3.180*** (0.430)	-3.120*** (0.419)	-3.038*** (0.426)
$MILES_{it}^2$			0.226*** (0.042)	0.228*** (0.039)	0.220*** (0.040)
$TREND_{it}$	-0.002 (0.002)	0.000 (0.009)	-0.009 (0.021)	0.011 (0.112)	0.008 (0.114)
$INCUMBENT_{it}$	0.008 (0.066)	0.000 (0.067)	-0.314 (0.868)	-0.468 (0.852)	-0.335 (0.851)
$PACKAGE_{it}^{a}$	0.073 (0.059)	0.104 (0.065)	0.094 (0.191)	0.170 (0.233)	0.148 (0.239)
$JOINTBID_{it}$	-0.048 (0.094)	-0.078 (0.102)	-0.671 (1.008)	-0.340 (1.133)	-0.327 (1.166)
$NB\_MONTH_{it}^{a}$	0.007 (0.042)	-0.010 (0.046)	-0.025 (0.049)	-0.091 (0.055)	-0.087 (0.055)
$NB\_MONTH\_WIN_{itn}^{a}$	-0.003 (0.047)	0.002 (0.047)	-0.032 (0.194)	0.164 (0.191)	0.165 (0.193)
OPERATOR Dummies		*Yes***		*Yes***	*Yes***
YEAR Dummies		*Yes*		*Yes*	*Yes*
INTERCEPT	5.152*** (0.395)	4.713*** (1.347)	16.704*** (3.267)	10.218 (17.567)	10.970 (17.825)
R^2	0.727	0.738	0.493	0.545	0.551
Obs.	194	194	194	194	194

[a]: the logarithm of the variable is used in models 6 and 7

*Huber/White/Sandwich standard errors in ()Significance levels: + 10% *5% ** 1% *** 0.1%.*

Figure 1: The London bus market structure in 2009

Source : TfL (2009)

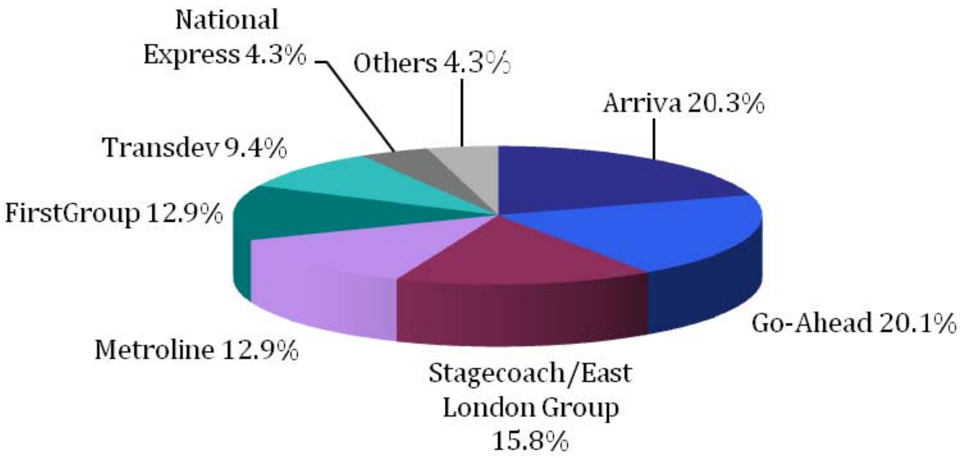

Figure 2: Expected and actual number of bidders and corresponding winning bid per mile