Does Competition for the Field Improve Cost Efficiency? Evidence from the London Bus Tendering Model *

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Abstract

In this paper we investigate the relationship between cost and number of bidders for local transportation contracts in London. Using an original database concerning 294 local transportation routes we find that a higher number of bidders is associated with a lower cost of service. This finding, in addition of being one of the first empirical test of a crucial and understudied theoretical issue, has important policy implications, especially for countries in which bids are organized such that only few bidders are allowed to answer (e.g. France).

Key Words: public transportation, competitive tendering, auctions.
JEL Codes: H0, H7, K00, L33.

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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 recent directives are to be implemented to make the use of competitive tendering in local public services compulsory.

The objective of using auction procedures is to replace competition in the field by competition for the field. The intuition is that an increase in competition (*i.e.* the number of bidders) should encourage more aggressive bidding, so that, in the limit, as the number of bidders becomes large, prices decrease toward efficiency prices. This is a *competition effect*. Nevertheless, theoretical developments, as it is often the case, taught us that this intuition is not completely correct as soon as you consider common-value auctions, in which the competing bidders are differentially (but incompletely) informed about the value of what is auctioned. As soon as buyer's estimate of an asset's value is affected by the perceptions of others, winner's curse pushes toward conservative bids (*i.e.* lower expected prices). Furthermore, this *winner's curse effect* is increasing with competition so that it is possible, when this effect is greater than the competition effect that prices decrease with the increase of competitors. Consequently, it often appears difficult to isolate the competition effect and estimate the impact of the number of bidders on prices. Moreover, opportunities for empirical works are restricted by the lack of suitable data on bidding behavior and the non-homogeneity of the products tendered. Some theoretical developments have nevertheless lead to several empirical tests concerning the effect of the number of bidders on prices (Thiel 1988; Brannman & al 1987; Hong and Shum 2002), on bids (Athias and Nunez 2006); on the effect of information disclosure on bids (De Silva & al 2005).

The size of the winner's curse effect compared to the competition effect is theoretically connected to the number of bidders and the importance of common value components in bidders' preference. At the same time, recent empirical works pointed out that it could be misleading to analyze public private contract as agreement without any renegotiation. Studying more than 1,000 concession contracts signed, often after a competitive bidding process in Latin America, Guasch (2004) showed that more than 50% of them are renegotiated two years after being started. Athias and Saussier (2005) obtained the same result concerning contracts signed in Europe. This empirical fact is crucial for studying the impact of the number of bidders on prices and might push to the background the traditional previous work considering the winner's curse effect versus competition effect trade-off. Indeed, even if theoretically a winner's curse effect might exist and be fostered by the number of bidders implicated in the bid, this effect might not exist empirically because contracting parties anticipate that they will be able to renegotiate the contract (*i.e.* because of this renegotiation effect, they do not have to bid carefully – see Guasch-Laffont-Straub 2006). The implication of this is that in order to assess the impact of the number of bidders on price, it is necessary to control for possible renegotiation in contracts. As far as we know, this has not been done in previous empirical studies.

In this paper we investigate the relationship between costs and number of bidders for local transportation contracts in London. This case is particularly interesting, because, contrary to previous empirical studies, we are quiet confident in the fact that such contracts are not renegotiated. Indeed, those contracts are short term contracts that are severely regulated. Thus we do not have any renegotiation effect in our results. In addition, following Cantillon and Pesendorfer (2006), we can reasonably support the hypothesis that auctions in the London bus routes market are private value auctions, that is to say that cost forecasts by competitors do not lead bidders to revise their own cost estimates. Thus, we should observe only a competition effect in our data.

Using an original database concerning 294 local transportation routes we find that a higher number of bids is associated with a lower cost of service. This finding, in addition of being one of the first empirical test of a crucial and understudied theoretical issue has important policy implications, especially for countries in which bids are organized such as only few bidders can answer (e.g. France).

2. Auctions, number of bidders and prices: Propositions

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

Auction theory predicts that an increased number of bidders might not always increase winning bids depending of the type of auction and the characteristics of the good being sold. More precisely, common-value auctions are characterized by the winner's curse effect, an adverse selection problem that arises because the winner tends to be the bidder with the most overly optimistic information concerning the object's value. If a bidder bids naively, with a bid based only on his private information, this would lead to negative expected profits. Consequently, in equilibrium, we might expect a rational bidder to internalize the winner's curse problem by bidding less aggressively (Milgrom 1989).

In such 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: the more the bidders the more aggressive one bidder should be to maintain his chance of winning. On the other side, we might expect a winner's curse effect that becomes more severe as the number of bidders increases. 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.

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

Recent developments pointed out that even without any common-value dimension in auctions, but considering the possibility for bidders to make prediction errors (for example because bidders might be in some cases overconfident in the signal they receive about their costs or valuation of what is auctioned), competition induces a selection bias in favor of optimistic bidders, even in the case of pure private value auctions (Compte 2004). The winner's curse phenomenon is thus not specific to common value setting. The more numerous the 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 (mark-down their estimation of the value of what is auctioned), the size of this mark-up increasing with the level of competition (i.e. the number of bidders).

c. Number of bidders and winning bids in renegotiated contracts

In order to give a private operator the right to operate and provide a public service, auctions are usually used. As mentioned before, the idea is to generate a competition for the field when a competition in the field is impossible. Nevertheless, as pointed out by Guasch (2004), it is sometimes hard to "sanctify" the bid. Many (long term) auctioned contracts are renegotiated shortly after their signature. Depending of the belief of the bidders concerning the probability of a future renegotiation, competition and winner's curse effects might be affected or may be inexistent, simply because bidders are not committed with auction's results.

d. Number of bidders and competition effect: proposition

The common value vs. private value type of auction is clearly linked with 1/ the type of product that is auctioned and with 2/ the type of contract proposed when what is auctioned is a right to procure a public service. To see this, remind that a private value auction is characterized by the fact that all the bidders know perfectly the value for them[1] of what is auctioned (*i.e.* they know perfectly the cost they will support to produce the service and the gains that will be generated). A common value auction is characterized by the fact that the value of what is auctioned is the same for all the bidders but unknown for them.[2] It is thus straightforward to notice that auctions concerning good or services for which bidders are equally efficient (same costs) but differ in their valuation of what is auctioned are specific ones, characterized by uncertainties about costs and future gains (i.e. future demand). Those

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[1] Another way to put it is that if bidders' gains (G) are depending of an external signal x_i, we have $G_i = x_i \ \forall i$. Valuations or costs are drawn from independent distribution.

[2] Another way to put it is that if bidders' gains (G) are depending of a external signal x_i, we have $G_i = G \ \forall i$

uncertainties are not independent from the kind of contract signed by the winner. This leads us to the following proposition:

Proposition: The winning bids should increase with the number of bidders if

(1) The bidders know perfectly the value of what is auctioned (i.e. private-value auctions),

(2) The bidders do not make any errors concerning their costs (i.e. no winner's curse effect due to prediction errors),

(3) The bidders know that contracts will not be renegotiated (i.e. bidders commit to their bids).

If conditions (1), (2) and (3) are respected, we should observe only a competition effect which should decrease the buyer's costs. .

Surprisingly, although this issue is central in auction theory, the ratio empirical tests over theoretical developments remains too low to conclude, or even highlight the debate concerning the impact of the number of bidders on the price of public services that are auctioned. As mentioned before, the application of auction theory to data has been restricted by the lack of suitable data on bidding behavior and the non-homogeneity of the products tendered. However, bus transport services in London are relatively homogeneous and the imposition of compulsory competitive tendering in 1994 provides a natural experiment to assess the effect of bidding on costs. Furthermore, we believe that in this case the three conditions that are necessary for our proposition to hold are respected, allowing us to estimate a pure competition effect.

3. The London Bus Tendering Model – Description and Data

London's population, currently 7.17 million, and population density, currently 45 persons per hectare, are considerably greater than those for each of the other metropolitan areas in the UK and are greater than in most of the big European cities. With 800 routes serving an area of 1630 square kilometres and more than 3.5 millions passengers a day, 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 is valued at 600 millions Pounds per year, has deserved particular attention, especially since the reform of 1984.

a. 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 20 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, in London, the industry should remain regulated but that competitive forces should be introduced *via* a regime of bus route tendering[3] 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. In the same year, LT also set up the Tendered Bus Division to begin the process of competitive tendering. This required LBL's subsidiaries to compete against operators in the private sector for the opportunity to run individual bus routes. 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 sector have therefore been gradual. Indeed, 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[4]. 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 & 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[5] and, in the beginning of 2001, all the bus miles operated were supplied under tendered contracts.

b. The tendering process and the auction format

Since 1995, an invitation to tender is issued by the regulator (Transport for London –TfL-, the former LRT) every two or three weeks so that about 20% of the London bus network is tendered each year. The tenders are open to all licensed operators and the invitation covers several routes, usually in the same area of London, and provides a detailed description of the service to deliver (e.g. 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 2006). Since most of the contracts are gross cost contracts[6], 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 that 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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[3] The reform was more radical outside the greater London since bus operations throughout Great Britain were completely privatised and deregulated.
[4] National Bus Company operators, municipal operators and other private operators.
[5] Non-tendered routes remained operated by the subsidiaries of LBL under a negotiated block grant.
[6] That is to say that the operator receives a fixed fee for the service and the revenues from fares accrue to the regulator.

As already suggested, 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. Thus, 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 says 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 and scope 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 and scope.

At last, in accordance with Cantillon and Pesendorfer (2006), we argue that auctions in the London bus market are auctions with private values. 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 20 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.

c. Data and summary statistics

We collected a dataset of all the bids submitted in bus service contract auctions conducted between March, 1st 2003 and May, 5th 2006. Over this period, 294 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 (http://www.tfl.gov.uk/buses/bus-tender/default.asp). Thanks to this source we have at our disposal data on:

- the number of tenderers 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 tenderer;
- the type of bid submitted by the winner, i.e. 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 mileage.

In addition, for each route, we were able to complete the database with the following variables:

– the peak vehicle requirement, which determines how many buses the winning operator needs to commit to the contract;
– the minimum and maximum journey times for the basic service;
– the average distance from the garage to both end points of the route;
– the boroughs crossed by each route;
– the length of each route in miles.

At last, we were able to collect aggregated data on the average number of bidders per route and the proportion of route tenders which received only one bid for the periods January 1995-December 1996 and April 1999-December 2000 (Competition Commission 1997, Toner 2001). Descriptive summary statistics on the evolution of the number of bidders per route are reported in table 1 and illustrated in figure 1.

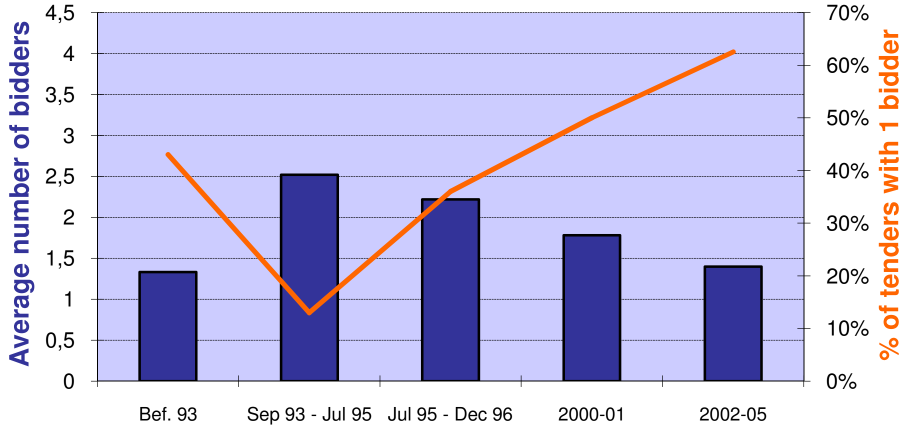
-Table 1: Evolution of the average number of bidders-

Source: TfL (2006), Toner (2001), Competition Commission (1997)

Period	***1/1/1995-12/31/1996***	***4/1/1999-12/31/2000***	***3/1/2003-12/31/2003***	***1/1/2004-12/31/2004***	***1/1/2005-12/31/2005***	***1/1/2006-5/5/2006***
Number of routes put out to tender	130	145	69	88	96	39
% of route tenders with one bidder	NA	14,5%	30,43%	13,64%	9,38%	15,38%
Average number of bidders per route	4,2	2,8	2,35	3,01	3,14	2,95

On average, over the period covered by our database (March 2003- May 2006), 2.88 tenderers submitted a bid for an individual route and 17% of the routes put out to tender received only one bid. In addition, since 1999, the average number of bidders appears to be rather constant. At least, it did not decrease. This contrasts with the level of competition intensity observed in other countries like France where local authorities organize larger size auctions. As illustrated by the following figure, the French case is indeed characterized by few bidders and a decreasing number of bidders through time.

Figure 1. Number of bidders in France[7]



Regarding the market structure, table 2 indicates that the London bus market is fairly competitive. The Herfindahl index indeed equals 0.1364, which corresponds to a moderate concentration. It is to be noted that a public company (East Thames Buses) is still operating bus routes in London. It allows the regulator (TfL) to benchmark private operators with their public competitor. Furthermore, bidders can be automatically disqualified if, should they win the bid, their market share exceeds 20% of the total scheduled vehicle kilometres.

-<u>Table 2: The market structure</u>-

Operator	*Total Scheduled vehicle kilometres*	*Market share (% of scheduled kilometres at 01 April 2005)*
Arriva	88,376,057	19.1
Go-Ahead	81,120,829	17.5
Stagecoach	73,459,265	15.9
First	70,600,639	15.3
Metroline	62,605,995	13.6
Transdev	44,341,515	9.6
National Express	21,477,267	4.6
Other operators (including East Thames Buses)	20,794,828	4.4

Source: London Buses

[7] Source : GART (2005)

Table 3 focuses on the period covered by our database (3/1/2003-5/1/2006) and presents statistics on the observed bids broken down according to the number of actual bidders who participated in the auction.

-Table 3: Summary statistics on bids[8]-

Number of bidders per route	Number of auctions	Average bus.miles (10,000)	Average winning bid (£)	Average cost per mile of the awarded contract (£)
1	48	59.40	2,929,957	4.75
2	78	59.14	2,657,679	4.40
3	78	40.65	1,736,130	4.34
4	58	45.59	1,872,719	4.07
5	22	42.98	1,567,920	3.82
6	6	27.35	1,265,025	3.82
7	2	13.27	512,203	4.02
8	1	57.96	1,797,000	3.10
9	1	21.53	645,878	3.00
>5	*10*	*27.01*	*1,105,743*	*4.20*

The evidence presented in this table supports the view that, in the London bus market, auctions are with private values, hence the increased competition effect (which leads to less cautious, i.e. lower bids) dominates the winner's curse effect (which leads to less aggressive, i.e. higher bids). Indeed, as opposed to what was found by Hong and Shum (2002), we do not observe an increasing trend between the number of bidders and the winning bids. On the contrary, the average winning bid decreases from about £3 million (4.75 £ per mile) in 1-bidder auctions to less than £0.6 million (3 £ per mile) in 9-bidder auctions.

What we also observe is 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). This suggests the existence of asymmetries among bidders, some bidders being unable to participate to large auctions. Despite the moderate concentration of the market (see table 2 above), 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 regressing the operating costs proposed by the winner on the number

[8] In column 5, several observations have been excluded because the reported cost per mile was apparently erroneous.

of bidders might be misleading unless this endogeneity problem is solved. For that purpose, the econometric strategy we adopt consists in estimating the impact of the number of potential bidders on winning bids. Since we define the number of potential bidders for route i as the average number of bidders that participated to the previous auctions organized in the boroughs crossed by route i, this variable can reasonably be considered as exogenous. In addition, it seems more realistic to use the number of potential bidders as a covariate instead of the number of effective bidders. Indeed, as mentioned by De Silva et al. (2008) or Tukiainen (2008), although a vast majority of studies on auctions assume that bidders always know the number of actual bidders, in many procurement auctions bidders do not know how many rivals they face at the time they incur the cost of preparing their bids so that the assumption of exogenous entry is not plausible. The degree of competition bidders anticipate is therefore more likely to be a determinant of their bidding strategy. More precisely, as suggested by table 4, bidders seem to be even more aggressive that the number of rivals they anticipate is high. Descriptive statistics provided in table 4 indeed clearly indicate that the operating costs proposed by the winners are decreasing with the number of potential bidders. .

-Table 4: Summary statistics on bids-

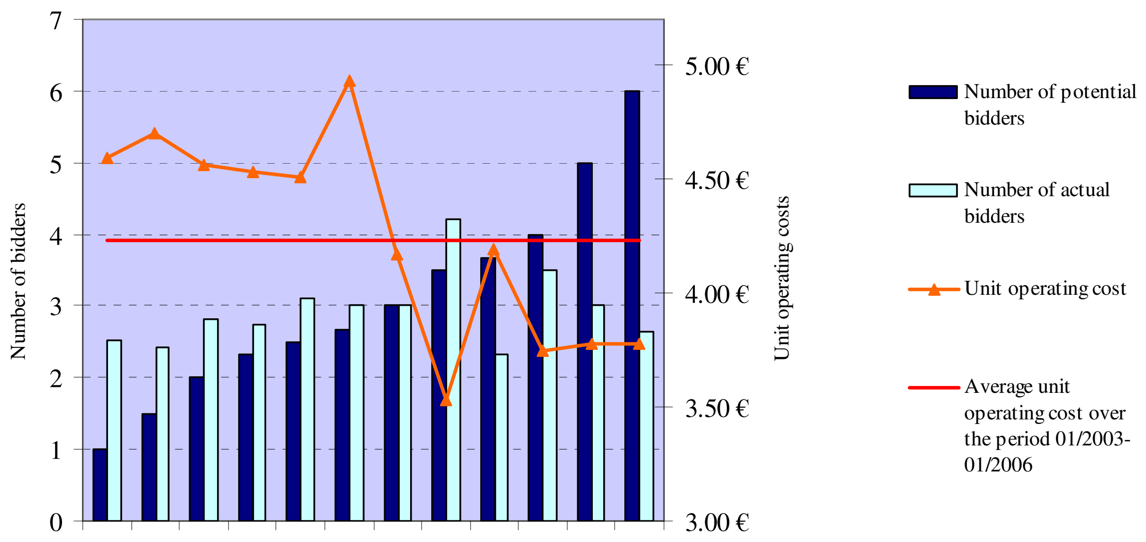
Number of potential bidders per route (x)	Number of auctions	Average bus.miles (10,000)	Average cost per mile of the awarded contract (£)
0<x≤1	17	60.06	4.59
1<x≤2	52	60.37	4.65
2<x≤3	70	58.60	4.40
3<x≤4	50	55.69	3.87
4<x≤5	7	32.53	3.78
5<x≤6	8	56.90	3.78

What is even more interesting and reinforces our conviction that the number of potential bidders is a more relevant explanatory variable than the number of effective bidders is what figure 2 reveals. Indeed, when we compare the number of potential bidders with the number of effective participants to auctions and then link this ratio with the winning bids, it first appears that the number of effective bidders does not coincide with the number of potential bidders. More precisely, the number of effective bidders seems to exceed the number of potential bidders when the former is low. On the contrary, the number of effective bidders seems to be systematically inferior to the number of expected candidates when the former is high. In addition, we observe that winning bids are less aggressive (i.e.

superior to the average) when the number of effective bidders exceeds the number of potential ones, but are very low (i.e. under the average) when the number of effective bidders is inferior to the number of expected 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 of the empirical evidence provided in figure 2 are consistent with the theoretical results obtained by De Silva et al (2008). Indeed, they show that in pure private value settings an increase in the number of potential bidders has a direct beneficial effect on bidding, leading to lower cost to the procuring agency (this is the competition effect). However, as a result of lower profit margins for the winners of the auctions, the incentive to go through the costly bid preparation process is diminished, which depressed the number of bids submitted (this is the entry effect). As the latter effect can offset the initial beneficial effect of an increased number of potential bidders, the net effect of an increase in the number of potential 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.

-Figure 2: Number of potential and effective bidders and corresponding unit operating costs-



4. **Tests and Results**

a. Empirical strategy

Our empirical strategy is the following. In order to estimate the impact of the number of potential bidders on auction's results, we estimate the following model:

$$R_i = \beta N_i + \delta A_i + \varepsilon_i \qquad (1)$$

Where R is the result of the auction, N is the number of potential bidders, A is a vector of bidders specific control variables and $\varepsilon \sim (0, \Sigma)$.

In many auctions, the winning bids and the number of bidders may increase together because they are both correlated to a third variable – the characteristics of what bidders are bidding for (for example the size of the contract). One way to take care of this would be to adjust for this correlation by including variables, which, for instance, control for the size of the market the candidates are bidding for. Then, the following model is estimated:

$$R_i = \alpha C_i + \beta N_i + \delta A_i + \varepsilon_i \qquad (2)$$

Where C is a vector of variables appreciating the characteristics of what is auctioned.

b. Data and results

In the following table we present the variables we used in our econometric test.

-Table 4. Checklist of our variables-

Variable	Description	Obs.	Mean	Std	Min.	Max.
$COST_i$	Unit operating cost proposed by the winner in £/mile	293	5.969	6.004	1.94	43.02
$NBPOTBIDDERS_i$	Number of potential bidders defined as the average number of bidders in the boroughs crossed by route i at the previous auctions	204	2.86	1.64	1	6
$NBBIDDERS_i$	Number of bidders for route i	294	2.881	1.381	1	9
$NBPOTLARGE_i$	Dummy taking the value 1 if the number of potential bidders is higher than 3.6	287	0.470	0.499	0	1
$NBPOTSMALL_i$	Dummy taking the value 1 if the number of potential bidders is smaller than 3.6	287	0.530	0.499	0	1
VKM_i	Number of bus.miles to be supplied each year on route i / 10,000	290	49.165	33.747	0.039	171.348
PVR_i	Peak vehicle requirement for route i	278	12.77	7.29	1	43
$JOINT_i$	Dummy variable taking the value 1 if the winning bid is a joint bid	294	0.646	0.478	0	1
$PACKAGE_i$	Number of routes attributed at the same time as route i (route i included)	284	3.299	2.432	0	10
$UNCERT_i$	(Difference between the maximum and the minimum journey time) / minimum journey time	278	0.710	0.242	0.042	1.478
$THAMES_i$	Dummy taking the value 1 if route i crosses the Thames or if the operator has to cross the Thames during the transfer from garage to route	286	0.178	0.383	0	1
$LARGEOP_i$	Dummy taking the value 1 if the winner is a large operator (*i.e.* operates more than 5% of the number of routes in 2002)	286	0.951	0.216	0	1
$LONGMILES_i$	Length of the route (in miles)	283	12.713	4.029	3	22
$DISTPRO_i$	Average distance from the garage to both end points of route i	286	2.093	2.056	0	11.747
ENTRYRATIO	Actual bidders / Potential bidders	204	1.211	0.709	0.25	5

In our case, the result of the auction is the unit operating cost of the winner (*COST*) and we are interested in assessing the impact of the number of potential bidders (*NBPOTBIDDERS*) on this variable. More precisely, we expect β, the coefficient of the variable *NBPOTBIDDERS*, to be negative if the competition effect predominates but positive if the entry effect offsets the competition effect.

Vector C includes several route specific variables, namely the number of bus-miles to be supplied on the line (*VKM*), the length of the route (*LONGMILES*), the peak vehicle requirement (*PVR*) and the level of uncertainty (*UNCERT*). It also includes 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 costs of operation should decrease as the volume of service to supply, that is the number of vehicle miles to deliver, increases. We therefore expect the coefficient of the variable *VKM*, and the coefficient of the variable *LONGMILES* to be negative. We also expect the coefficient of the variable *PVR* to be positive since an increase in the number of buses needed to commit to the contract should logically increase the operating costs. The variable *UNCERT*, which measures the standard deviation of journey time, is our proxy for the level of traffic uncertainty as we consider that a fluctuating journey time may be a consequence of various hazards (e.g. congestion). Hence *UNCERT* is supposed to have a positive impact on unit operating cost as an increase in the level of uncertainty leads rational bidders to bid less aggressively. At last, we expect *JOINT* and *PACKAGE* to have a negative impact on *COST*. Indeed, as already mentioned, a central motivation of the London Transportation authority for allowing combination bids was that they would 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), the discount of a combination bid relative to the sum of stand-alone bids equals 4.9% on average in our sample. That is why we expect joint bids to allow bidders to lower costs due to cost synergies.

As for the vector A of control variables, it includes the variable *LARGEOP*, which allows us to control for the size of the winner, and the variables *THAMES* and *DISTPRO*, which control for the location of the garage used to operate the route. As we conjecture that large operators may have fewer financial constraints than small ones, we expect *LARGEOP* to have a negative impact on *COST*. We also expect the coefficient of the variable *THAMES* to have a positive impact on cost because the existing congestion on the London's Thames bridges lowers the commercial speed and consequently should increase operating costs (in particular fuel costs). In the same vein, we conjecture that operators whose garages are close to the contracted bus routes might have lower operating costs than operators with garages further away. Thus, the variable *DISTPRO* is supposed to have a positive impact on *COST*.

Results are presented in the following table.

-**Table 6. Econometric Results**-

	OLS COST (1)	OLS COST (2)	OLS COST (3)	OLS COST (4)	OLS COST (5)	OLS COST (6)	OLS COST (7)	OLS COST (8)
NBPOTBID	-0.278***	-0.283***	-0.167**	-0.169***	-0.143**	-0.146**	-0.099*	-
NBPOTLARGE NBPOTBID*	-	-	-	-	-	-	-	-0.16**
NBPOTSMALL NBPOTBID*	-	-	-	-	-	-	-	-0.15*
VKM	-	-2.122e-06**	-5.087e-06***	-5.086e-06***	-4.483e-06***	-4.676e-06***	-4.752e-06***	-5.23e-06***
VKM²	-	1.840e-12***	2.088e-12***	2.094e-06***	1.844e-12***	1.972e-12***	2.020e612***	2.179e-12***
PVR	-	-	0.113***	0.114***	0.114***	0.111***	0.107***	0.112***
JOINT	-	-	0.296**	0.311**	0.239*	0.347**	0.369*	0.300**
PACKAGE	-	-	-	-	-	-0.033	-0.010	-
UNCERT	-	-	0.681**	0.698**	0.492*	0.498*	0.751**	0.686**
THAMES	-	-	0.308**	0.304**	0.267*	0.248*	0.314**	0.302**
LARGEOP	-	-	-	-0.139	-	-	-	-
LONGMILES	-	-	-	-	-0.043**	-0.042**	-0.043**	-
DISTPRO	-	-	-	-	-	-0.027	-0.025	-0.024
Operator dummies	No	No	No	No	No	No	Yes	No
Intercept	5.103***	5.552***	5.502***	4.613***	4.925***	5.094***	4.568***	4.570***
N	204	203	199	199	199	199	199	199
R²	0.101	0.184	0.438	0.439	0.458	0.463	0.490	0.440

$p<0.10$; $**p<0.05$; $*** p <0.001$

The first interesting result concerns the impact of the number of potential bidders on costs. As in De Silva *et al*. (2008), in these private value auctions, the positive cost reducing overall effect of entry is present meaning that the unit operating cost proposed by the winner of the auction is decreasing with the number of potential bidders. This result holds whatever the specification we retain, introducing or not fixed effect for each operator. Hence, in the London bus market, the "discouraging" effect of additional entry seems to be more than compensated by the competitive effect of an increase number of potential bidders.

Secondly, the coefficients of nearly all the route specific variables included in the vector C have the expected sign. Indeed, we observe that the unit operating costs are largely driven by the number of bus miles to be supplied by the bidder. More precisely, our result suggest non-linear economies of scale as unit operating costs decrease with *VKM* (the number of vehicle miles) but increase with VKM^2. We also obtain this result whatever the specification of the model. Consistently with this result, the route length (*LONGMILES*) is found to have a significant negative impact on costs while the peak vehicle requirement (*PVR*) impacts positively on unit operating costs, as expected. The results of our estimations also reveal that the less "reliable" routes, that is the routes with the highest degree of traffic uncertainty, are more costly to operate as the variable *UNCERT* has a significant and positive impact on operating costs. As opposed to our predictions, *JOINT* impacts positively on *COST*, suggesting that joint bids increase procurement costs.

At last, as regard the bidders specific variables included in vector A, results are less convincing. Indeed, our estimates indicate that the fact that the winning operator has a garage located across the Thames (*THAMES*) clearly increases his offer. But, surprisingly, the average distance between the winner's garage and both end points of the route does not appear as a significant determinant of the operating costs. Similarly, the size of the winning operator (*LARGEOP)* is found to have no significant impact on costs. In other words, the market share of the winning bidders does not seem to impact on their costs.

5. 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 (London Transport Buses 1999). In this article, our aim was to confront this assertion with recent data. Thus, we have analysed bids for operation contracts in the London Regional Transport bus market between 2003 and 2006 to test hypotheses about bidding under competition. More precisely, our econometric strategy has consisted in estimating the impact of the number of potential bidders on the winner's offer. 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 face at the time they incur the cost of preparing their bids so that the assumption of exogenous entry is not plausible. By using the number of expected 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 number of potential bidders increases but we also provide empirical evidence suggesting that bidders' strategies are more influenced by the number of potential bidders than by the number of actual rivals.

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