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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 auctions' results and the 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 services, transportation, franchise bidding, public-private partnerships, winner's curse, auctions.

JEL Codes: H0, H7, K00, L33

0. 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 public-private partnerships throughout the world is a good illustration of this trend. In order to foster competition, competitive tendering through the use of auctions is now common. The European Union is seeking to introduce directives for the use of competitive tendering procedures in member countries.

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 auctions results and the 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 found 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).

1. Auctions, number of bidders and prices: Propositions

1.1. 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. 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.

1.2. 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 more probably the winner's expected profit is 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).

1.3. 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), sometimes it is 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.

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

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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 $G_i = G \ \forall i$

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. non winner's curse due to prediction errors)*
>
> *(3) The bidders know that contracts will not be renegotiated (i.e. bidders commit to the bid)*

If conditions (1), (2) and (3) are respected, we should observe only a competition effect. This competition effect should increase winning bids.

The ratio theoretical developments over empirical tests is too high 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, opportunities for empirical work are restricted by the lack of suitable data on bidding behavior and the non-homogeneity of the products tendered. To go a step further, we use in this paper data concerning the auctions of local transportation routes in London. Such data have the advantage to concern a homogenous product. Furthermore, they are detailed enough to assess the impact of competition on prices. Lastly, we believe our three conditions for our proposition to hold are respected, permitting us to estimate a pure competition effect.

2. 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.

2.1. 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 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.

2.2. *The tendering process and the auction format*

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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.

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 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). The regulator then selects a set of prequalified bidders[6] who are authorized to submit sealed bids for individual routes and/or for route combinations. Since most of the contracts are gross cost contracts[7], 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.

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.

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[6] Prequalified operators are selected according to their financial and operational capacity.
[7] That is to say that the operator receives a fixed fee for the service, the revenues from fares accrueing to the regulator.

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.

2.3. 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.

In addition, 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.

-**Table 2: The market structure**-

Operator	Market share (% of routes operated)
Arriva	17,66%
Go-Ahead	17,66%
First	16,30%
Stagecoach	13,58%
Metroline	12,56%
Transdev	9,85%
Travel London	5,26%
East Thames Buses	1,70%
Blue Triangle	1,36%
Quality line	1,19%
Centra London	1,02%
CT Plus	0,51%
Docklands Buses	0,34%
Sullivan Buses	0,34%
Uno	0,34%
Dhillon of London	0,17%
Ealing Community Transport	0,17%
Total	*100,00%*

Table 2 indicates that the London bus market is fairly competitive. The Herfindahl index indeed equals 0.1364, which corresponds to a moderate concentration.

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*

What we observe at first 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 addition, 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 in 1-bidder auctions to less than £0.6 million in 9-bidder auctions. This preliminary statistical analysis therefore supports our proposition.

3. **Tests and Results**

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

3.1. Empirical strategy

Our empirical strategy is the following. In order to estimate the impact of a the competition effect 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 bidders, A is a vector of control variables and $\varepsilon \sim (0, \Sigma)$.

A series of dummy variables, $D_1, .., D_n$ might be included as explanatory variables to account for any non-linearity in the winning bid-competition relationships. The coefficients of D_i will allow us to compare the winning bids corresponding to various level of competition. This leads us to a different model:

$$R_i = \sum_{i=1}^{i=n-1} \beta_i D_i + \delta A_i + \varepsilon_i \qquad (2)$$

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 control for the size of the market the candidates are bidding for. Then, the following model is estimated:

$$R_i = \alpha C_i + \sum_{i=1}^{i=n-1} \beta_i D_i + \delta A_i + \varepsilon_i \qquad (3)$$

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

3.2. 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
$NBBIDDERS_i$	Number of bidders for route i	294	2.881	1.381	1	9
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
$JOINT_i$	Dummy variable taking the value 1 if the winning bid is a joint bid	294	0.646	0.478	0	1
$LARGEOP_i$	Dummy variable taking the value 1 if the winning bidder is a large operator[9]	294	0.955	0.205	0	1
$PACKAGE_i$	Number of routes attributed at the same time as route i (route i included)	294	3.33	2.47	1	10
$NBWIN_i$	Number of routes already attributed to the winning bidder of route i	294	20.69	15.21	0	62
$NBBIDDERS_i=2$	Dummy variable taking the value 1 if the number of bidders for route i = 2	294	0.26	0.44	0	1
$NBBIDDERS_i=3$	Dummy variable taking the value 1 if the number of bidders for route i = 3	294	0.26	0.44	0	1
$NBBIDDERS_i=4$	Dummy variable taking the value 1 if the number of bidders for route i = 4	294	0.19	0.39	0	1
$NBBIDDERS_i=5$	Dummy variable taking the value 1 if the number of bidders for route i = 5	294	0.07	0.26	0	1
$NBBIDDERS_i>5$	Dummy variable taking the value 1 if the number of bidders for route i >5	294	0.03	0.18	0	1

In our case, the result of the auction is the unit operating cost of the winner (COST). The characteristic of the line put out to tender we are interested in is the number of bus-miles to be supplied on the line (VKM). This leads us to the following general models to estimate:

$$COST_i = \alpha VKM_i + \beta NBBIDDER_i + \delta A_i + \varepsilon_i \qquad (4)$$

$$COST_i = \alpha VKM_i + \sum_{x=2}^{9} (\beta_x \cdot NBBIDDER_i = x) + \delta A_i + \varepsilon_i \quad (5)$$

with the vector A including the control variables LARGEOP (which allows us to control for the size of the winner), JOINT (which controls for the fact that the winning bid is a joint bid), PACKAGE (which controls or the size of the joint bid) and NBWIN (which controls for the experience and the market power of the winner).

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[9] An operator with a market share superior to 5% is considered as a large operator in our database.

We expect β, the coefficient of the variable NBBIDDER, to be negative. In other words, we expect the unit operating cost to decrease as the number of tenderers increases because of the competition effect.

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 α, the coefficient of the variable *VKM*, to be negative. [10]

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)	OLS COST (9)	OLS COST (10)	OLS COST (11)
NBBIDDERS	-0.674** (-2.678)	-0.478* (-2.254)	-0.452* (-2.116)	-0.466* (-1.971)							
VKM		-0.238*** (-10.300)	-0.246*** (-10.090)	-0.248*** (-10.063)		-0.239*** (-10.100)	-0.246*** (-9.909)	-0.251*** (-9.829)			
VKM²		0.015*** (7.980)	0.001*** (7.909)	0.001*** (7.794)		0.001*** (7.861)	0.001*** (7.818)	0.001*** (7.678)			
JOINT		0.240 (0.353)	0.060 (0.085)				0.216 (0.316)	0.082 (0.116)			0.012 (0.178)
PACKAGE		0.000 (0.860)	0.000 (1.052)				0.000 (0.926)	0.000 (1.087)			
LARGEOP		1.913 (1.303)					2.053 (1.386)				0.294+ (1.909)
NBWIN		0.009 (0.433)	0.010 (0.408)				0.012 (0.574)	0.012 (0.506)			
NBBIDDERS = 2					-3.829*** (-3.539)	-1.268 (-1.398)	-1.194 (-1.305)	-1.082 (-1.154)			
NBBIDDERS = 3					-2.907** (-2.694)	-1.693+ (-1.844)	-1.691+ (-1.820)	-1.694+ (-1.777)			
NBBIDDERS = 4					-3.385** (-2.949)	-1.028 (-1.044)	-0.803 (-0.802)	-0.935 (-0.874)			
NBBIDDERS = 5					-5.106*** (-3.371)	-2.840* (-2.235)	-2.730* (-2.132)	-2.422+ (-1.763)			
NBBIDDERS > 5					-3.661+ (-1.790)	-3.433* (-2.035)	-3.423* (-2.028)	-3.294+ (-1.860)			
ln (NBBIDDERS)									-0.233*** (-4.002)	-0.160*** (-4.114)	-0.148*** (-3.658)
ln (VKM)										-0.236*** (-18.217)	-0.259*** (-14.326)
ln (PACKAGE)											0.030 (1.270)
ln (NBWIN)											0.026 (1.112)
Operators dummies	No	No	No	Yes	No	No	No	Yes	No	No	No
Intercept	7.912*** (9.838)	13.641*** (15.122)	11.429*** (7.420)	11.637* (2.446)	8.928*** (10.514)	13.612*** (14.822)	11.224*** (7.203)	11.229* (2.353)	1.792*** (28.720)	4.667*** (27.834)	4.169*** (16.326)
r2	0.024	0.313	0.324	0.355	0.057	0.320	0.332	0.360	0.052	0.550	0.580
N	293	289	289	289	293	289	289	289	293	289	274

The first striking result concerns the impact of the number of bidders on costs. As expected, our proposition is corroborated. The unit operating cost proposed by the winner of the auction is decreasing with the number of bidders. This result holds whatever the specification we retain, introducing or not fixed effect for each operator, and might be non-linear as suggested by estimates 9 to 11. If we introduce a series of dummy variables, to account for any non-linearity in the winning bid-competition relationships (estimates (5 to 8)), we observe that whatever the number of bidders,

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[10] Obviously, multicollinearity between this variable and the number of bidders might lessen the significance of the number of bidders coefficient estimates. This is only a minor problem, however, since our primary concern is with unbiased estimates.

there is a negative impact on unit operating cost proposed by the winning bid, compared to the omitted case when there is only one bidder (*i.e.* no competition). The estimates also suggest that the optimal number of bidders is 5. This result is consistent with our proposition.

A second interesting result is that we observe that the unit operating costs are mainly driven by the number of bus miles to be supplied by the bidder. This suggests (non-linear) economies of scale. We also obtain this result whatever the specification of the model.

At last, none of our control variables (JOINT, PACKAGE, LARGEOP, NBWIN) are significant in our estimates. Surprisingly, to make a joint bid seems to have no impact on the unit costs of operation whereas we could have expected combination bids to allow bidders to lower costs due to cost synergies. As already mentioned, in the London bus operation market, bidders are allowed to make combination bids but the rule of the auction imposes that bids on a combination of routes must not be superior to the sum of the constituent stand-alone bids. This implies that stand-alone bids implicitly define a combination bid with value equals to the sum of the stand-alone 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. It is therefore surprising to find that the variables JOINT and PACKAGE are non significant. Further work is to be done to understand this result.

As for the variable LARGEOP, the positive but not significant coefficient we find suggests that the size of the operator has a little influence on the unit cost of operation. This is consistent with the result obtained for the variable NBWIN (not significant either), which indicates that the market share of the bidders does not impact on their costs, and hence on their probability of winning the auctions.

A possible limit of our estimates comes from the fact that the number of bidders might not be an exogenous variable. In fact, it seems natural to believe that the more tractable a route, or the fewer the vehicles required to operate a route, the more numerous the bidders for this route. The fact that a route is easy to operate should be logically correlated with the size of the market corresponding to the

auctioned route. In other words, as already suggested by table 3, the higher VKM, the fewer the bidders able to operate the line.[11] This multicolinearity problem introduces an interesting trade off between a competition effect and a scale economies effects. In order to benefit from economies of scale (which implies auctioning large routes), public authorities might be obliged to sacrifice part of the competition effect, i.e. accept to reduce the number of potential bidders.

4. Conclusion

The introduction of competitive tendering in utilities industries is the subject of large debates among theoreticians and practitioners. In the London bus market in 1985 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. Our results indicate that tendering reduces bid prices as the number of bidders exceeds 2 but that price bids are minimized when the number of bidders equals 5. They also point out the existence of a trade-off between economies of scale and competition since the increase in the size of the contracts put out to tender significantly reduces the bid prices but at the same time reduces the number of bidders able to participate to the auction.

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[11] The result of this estimate is the following: $NBBIDDERS = 0,011*.VKM - 0,00017***.VKM^2 + 2,95***$, $R^2 = 0,09$.

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