

**Maintaining Dynamic Competition in Procurement Contracts:
A case study on the London Bus Market¹**

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Abstract

This paper takes a case study approach to analyse the evolution of competition in the market for local bus services in London. With the aid of a public dataset made available by Transport for London, the paper makes a preliminary assessment of whether competition is being maintained over time and what factors are determining its alleged success.

Keywords: Dynamic Competition, Procurement and Incumbent advantage, Bus market.

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1. Introduction

In many sectors, procurement is repeated over time. In the road sector, for example, the Department of Transport, the Road Authority or private concessionaires repeatedly buy services from suppliers. The contracts cover road construction and paving projects, traffic signal projects, bridge construction and maintenance projects as well as smaller drainage and clearance type projects. These contracts are auctioned off repeatedly to individual contractors typically via sealed-bid actions where the lowest bid is awarded the contract. Different variants are also observed; (i) contracts may be awarded on best value for money criteria; (ii) contracts may be rotated among a set of qualified suppliers; (iii) bid preferences may be given to some of them.

Contrary to one-shot procurement, under recurrent procurement, procurers and firms need to recognize the elements of interdependency that exist across tenders, rather than thinking of each tender in isolation. The selection of the contractor in the current tender may indeed have an impact on the position of that contractor in future tenders, which in turn may affect how competition will evolve over time.

Consider firms participating in the auction. When bidding for the contract, firms anticipate that being awarded the current tender may affect their chance of winning future tenders. Depending on whether this effect is positive (i.e. the firm gains a competitive advantage) or negative (i.e. the firm loses a competitive advantage), firms will bid differently. Similarly, competitors of the current contractor will follow different bidding strategies, depending on whether they expect themselves to be facing an incumbent with a competitive advantage or not.

The implications of these effects are non-trivial. How will an incumbent take advantage of its position? If the firm has acquired superior knowledge on the project compared to competitors, will it bid more or less aggressively? And anticipating this strategy, how will competitors bid in the auction?

Consider now the procurers of recurrent auctions. Procurers are/should not be myopic. They should design sequential tenders so as to take into account the interdependency among them and the consequent strategic bidding behaviour of incumbents and competitors. Procurers should thus take into account that the design and outcome of the current tender may have an impact on subsequent tenders. Tenders should then be designed and adjudicated in order to minimize long term procurement cost rather than

the cost of each single tender. More generally, the impact of sunk costs on future tenders was first discussed informally but powerfully by Williamson in terms of transactions costs: "... the initial large numbers bidding competition will be *transformed* into one of bilateral exchange at the contract renewal interval *if* execution entails non-trivial transaction specific investments." (Williamson, 1981, p.571, emphasis in original).

The objective of the paper is to study this tender interdependency under recurrent tenders in the London bus market and identify the factors that affect the evolution of competition for tendered contracts over time: Under what conditions will competition be sustainable over time or alternatively lead to monopolization? The paper investigates in particular the impact on bidding behaviour and future competition of learning effects, sunk costs of entry, switching costs for the procurer and capacity constraints. The paper discusses how each of these factors affects the position of entrants and incumbents at tender stage, and thus their incentives to bid aggressively in order to secure the contract.

The market for local bus services in London has some useful features from the viewpoint of this analysis. Like the road sector, contracts for local transport services are auctioned off regularly, contracts are relatively standard and a limited number of pre-qualified firms bid to provide service over time. Sunk costs of entry exist but are not necessarily prohibitive. Many local authorities in cities all over the world contract out the operation of their local transportation, so the example is an important one.

Using a dataset of over 400 bus routes tendered at least twice by Transport for London (TfL) under essentially the same rules of competition, we obtained information on all tenders from 2003 to 2015, which enables us to investigate whether competition is being maintained over time, outcomes in terms of prices per mile, and what factors that are determining its success. The data were in part available through the TfL website and partly manually collected from various websites as discussed in more detail later.

Using a slightly modified dataset of all major routes, also drawn on London bus data, we then examine the specific role of the spread of garage ownership amongst the key firms in the market from the viewpoint that location of a garage may be a key element in being able to offer a competitive bid for a service. We find that proximity of a firm's garages to the routes it operates is indeed a major factor in predicting whether it will operate the route. However another key finding is that other competitors are commonly well placed to provide the service.

The paper is structured as follows. In Section 2, we focus on the repeated tender analysis of London bus services. In Section 3 we analyse the role of garages. Section 4 concludes.

2. The London Local Transport Market

2.1 Description

To gain insights we shall consider what is believed to be one of the most successful experiences of competitive tendering in Europe for the award of local transport services: the London bus market, a large market now serving nearly 9 million people, with nearly 9000 buses and a total of 675 routes (Verbich and El-Geneidy, 2016).

The familiar London bus is the subject of a complex and extensive operation in tendering. Despite the common red branding, London's bus services are run by several different operators, virtually all operating on gross cost contracts (subject to quality payments, which may go in either direction) lasting five years, with possible extensions to seven years. Service provision is dictated by Transport for London which is ultimately under control of the Mayor of London.

TfL organises tender competitions to choose operators. Start (and therefore termination) dates are widely spread, so that the contracts are put out to tender every two to three weeks, on a rotating basis. The contracts are for service on a particular route, where the route, timetable, vehicle quality and service quality have been specified by TfL.

For example, the so-called 2015-16 tendering programme, starting with tenders issued in April 2014, contains 40 separate sets of contracts, covering around 180 bus routes, with between 1 and 10 bus routes being the subject of tender returnable by a particular date. The choice of routes tendered on a particular date is not random; commonly for example routes in a similar area of London are issued together, so that for example (the largest) Tranche 490, issued on 1st September 2014, comprised 10 routes, covering routes focused on south-east/ south London a few miles from the centre. Tenders for these were due on 13th October 2014, with decisions to be announced in January 2015 and services to start operation from 29th August 2015. The lag between announcement and delivery is because the new operator, if the contract changes hands, will need to have crew and buses in place, together with a garage or similar accommodation for stabling and maintenance. Indeed, the tender may call for buses of a standard above that currently in operation on the route, for example to a tougher emissions standard,

so the existing operator who wins may also be forced to purchase new vehicles.⁴ Most tenders are for an initial five years, although it is quite common for the operator to be offered an extension of a further two years on the same terms, subject to performance.

Tenderers must submit a compliant gross cost tender, which is a tender that fully meets the requirements set out in the tender document such as quality and adherence to timetable, to be provided for a defined annual payment. However, they are also free to propose alternatives which may modify some aspect of the service. One of the most common modifications is to offer a package price for a bundle of routes that is less costly than the sum of the tenders for individual routes. In other words, there is the possibility of mixed bundling. Subject to this qualification, it is normal for TfL to select the tenderer offering the lowest annual price, and if it does not it will provide a brief explanation. TfL publicises, on a route-by-route basis, the name of the winning tenderer, the number of tenderers, the total price of the lowest tender, the price of the accepted tender, the price offered by the highest tenderer, the constitution of the package and its price, if any, plus a breakdown by route, and a price per mile run figure for the lowest tender (which clearly facilitates comparisons across routes and time). Cases where no tender is deemed acceptable appear to be non-existent, or at least extremely rare.

The gross price specified in the contract is subject to a formula-driven annual increase over the life of the contract, with the formula based upon a few key cost elements. Within the formula, efficiencies over time are assumed, because the cost uplifts apply to only 85% of the price.⁵

This system of gross cost contracts, subject to quality payments which may go either to or from the operator (from the operator in the case of significantly below-tendered performance), has been in operation in essentially the same form since 2001 and results have been reported online since 2003. The routes themselves are largely static in nature, although more routes have been added over time and frequency enhancements have been built into the new contracts from time to time. For example, when the London congestion charge was inaugurated in February 2003, significant enhancements to bus services were introduced at the same time. Improvements in information technology, such as GPS location, have substantially enhanced monitoring of adherence to schedule

⁴ Except for the recently increasing number of routes where New Bus for London is specified, or Heritage routes, the particular vehicle is not specified, so that companies can and do purchase buses from any of a number of providers.

⁵ The formula is not well publicised, but a previous FoI request yielded a model tender. This may be accessed at <http://content.tfl.gov.uk/metroline-bus-contract.pdf>

as well as provision of customer-focused advance information of various types. Fares are no longer proffered to the driver but instead purchased through machines at the bus stop or, more commonly, by using the Oyster card, which was introduced on 30th June 2003, and more recently also by contactless debit card.⁶

Almost a quarter of all local bus miles run in England are in London, although of course the population of London is substantially less than $\frac{1}{4}$ of the population of England. Moreover, bus patronage has been growing in London, up 32% between 2004/5 and 2013/4, whereas it has been essentially static outside London,⁷ so that remarkably over $\frac{1}{2}$ of total English passenger bus journeys are now made inside London (Department for Transport statistics, 2014). Outside London, the bus services are organised substantially differently, with tendering taking place only for a small minority of marginal routes.

The data we have collected include 402 routes from 2003 to 2015, where data was only collected in those cases where the same bus service was tendered twice within the period. The information was partially obtained from the procurer, Transport for London (TfL)'s website, and partially manually collected from various other websites maintained by dedicated enthusiasts. In particular, from TfL website, we obtained information on number of bids, lowest and highest bids, number of firms, whether the bid was a joint bid or not, and the name of the company that won the contract. We then investigated, using websites such as londonbuses.co.uk and londonbusroutes.net, the peak vehicle requirement, the history of the company, and its garaging facilities, so as to see whether this company was an existing firm in the market, a new entrant or it was simply an incumbent with a different name and key elements in the history of the route and its garage. We also used the information from a sample contract provided under Freedom of Information request on the TfL website to calculate the updated contract price in the years after the initiation of the contract.

⁶ The Oyster card was an instant success, partly due to the low basic cost and substantial discounts it offers to the transport user, including capping of daily fares, etc. More than 60 million Oyster cards have been issued and in 2013, 85% of journeys in London were made using them, so their use extends much beyond the regular London traveller. From 2014, buses have also accepted "contactless" payment cards. Payments to the driver's cashbox are no longer accepted on any part of the system. Source: <http://www.digitalspy.co.uk/tech/news/a494731/londons-oyster-card-turns-10-years-old.html#~oTB9poLY3Aq4MU>

⁷ Secular decline in the numbers of bus travellers outside London was stemmed by the introduction of national free bus travel (commonly after 09.30) for people over 60, subject to possession of a free travel card, in 2006.

2.2 The Evidence: Stylised facts

Operator market shares in London have varied over time. The evidence collected shows that contracts have changed hands, new companies have entered the market and existing companies have exited it. The position as at October 2014 is given in table 1.

Table 1: Market share percentage calculated according to number of buses in operation on TfL routes.
<http://www.londonbusroutes.net/garages.htm>. Retrieved October 2015

Operator	Market share
Go-Ahead	24.68
Metroline	18.00
Arriva	17.75
Stagecoach	14.04
RATPDev	11.45
Abellio	7.60
Transit Systems	5.07
Others	1.41

Of the operators listed here, Go-Ahead, Arriva and Stagecoach are amongst the “big five” bus operators in Great Britain, with substantial operations outside London. Stagecoach left the London market in 2006 but returned in 2010. The other two of the “big five” national bus operators, First and National Express, have both operated in London but currently neither runs buses in London, for reasons connected more with overall company strategy than performance in the London market.⁸ Arriva is now a subsidiary of Deutsche Bahn. The remaining substantial operators are all subsidiaries of overseas transport groups; Metroline is a Singaporean company, RATPDev is a subsidiary of the company operating the Paris Metro, amongst other things, Abellio is a subsidiary of Ned Rail, the Netherlands operator and Transit Systems is an Australian company. In addition, it is noteworthy that very small operators (for example HCT and Sullivan Buses) are able to survive within the system. There have been various other operators active at one time or another, commonly on outer-London routes, and for a while TfL formed its own in-house operation, East Thames buses, following the collapse of a previous operator in 1999 (and another in 2002), but in 2009 this operation was sold to Go-Ahead.

⁸ None of the big 5, incidentally, is headquartered in London or the south east of England.

In the case of a company gaining or losing a contract which is not offset by losses or gains elsewhere, there will be implications for bus and driver requirements and possibly for garaging and maintenance facilities. With a total fleet in London of over 8,000 buses in operation, and even the largest route only having a peak vehicle requirement (PVR) of around 70 buses, there will be relatively limited implications for a medium to large operator. Smaller operators in particular may face the need to acquire or dispose of buses and possibly a need to acquire additional space. In this they benefit from TfL's policy of retiring buses from London after only between 7 to 12 years' use, when the economic lifetime of a bus is at least 15 years (SMMT, 2010). Hence retired buses retain some market value.

London bus routes commonly require new buses at start of a contract (presuming it has a potential extension to 7 years) and ex-London buses can be cascaded to locations outside London, through the second-hand market, although there are complaints from operators that London buses are "over-specified" and need to be "de-specified" for use elsewhere.⁹ Alternatively, buses can be leased rather than purchased. There are three British-based bus makers (SMMT, 2010) in addition to suppliers such as Volvo and Mercedes, who can supply buses to London specifications. Obtaining garaging facilities is potentially more problematic, although there are examples where companies share garage space. At most times of the economic cycle, recruiting bus drivers is not a significant issue and there is ample time for training new ones (from an existing operator's viewpoint) within the gap between contract award and commencement of operations.¹⁰

An important feature of the market is that competition appears to be maintained over time. Because the basic data on contract awards is public, and has remained essentially unchanged for over 10 years, we can make comparisons over time. At any one time, there are over 500 different bus routes within London. We have collected data on all the

⁹ The specifications for London buses are "tougher" than for those outside the capital, where responsibility for vehicle serviceability is in the hands of Traffic Commissioners, individuals with huge areas to oversee (Competition Commission, 2011). There are only eight of these individuals to cover the whole of Great Britain and they have responsibility for trucks as well as buses. Apart from average quality level, London buses are idiosyncratic in minor ways and so need adaptation for use outside London. One of the most obvious differences is that London buses normally have two doors, one for entry and one for exit, whilst outside London it is usual to have only one. The introduction of the New Bus for London (NBfL) 0 on several routes has modified the arrangement somewhat. These buses are not obviously adaptable for use outside London and are substantially more expensive than other buses. As a result, they are leased from TfL rather than being purchased by the operator. Given our sample time frame, we need not be too concerned about the (growing) influence of NBfL.

¹⁰ This is implied by comments on, for example, the Arriva website.

contracts awarded between mid-2003 and the middle of 2015. Within this period, most of the contracts have been let twice, some three times, so that we can compare the contract outcome for bus service 2 (for example) at two distinct time points. Not all services are covered by this, because some exist only for a period and a very small number appear to involve different contract arrangements.¹¹ In total, we have collected 402 instances of routes for which the contracts have been let again within our sample.

Our analysis of these contracts provides the following findings:

The existing company quite frequently wins the contract. Of the 402 contracts, on a narrow definition there are 194 that are won by a company with the same name. Further, names change, and including routes that are won by the same underlying company but a different division, or under a name that has changed following reorganisation, there are approximately 300 contracts won by the same company when the contract is re-tendered.¹² In other words almost 75% of the routes go to the same company in two successive tender rounds. The incidence of this is somewhat higher on average for the “letters” routes (e.g. E8) which operate within particular small areas of outer London.

Table 2: Winning Company

1. Second tender winner company	N. of contracts awarded	Percentage
Same Company	194	48.26
Different division/name	106	26.37
Different Company	102	25.37
Total	402	100.00

The average number of competitors per contract has decreased slightly, although at 2.85 per re-tendered contract route, there are almost as many as for the first contract

¹¹ We decided against including bus services with numbers in the 600s, and these figures ignore that particular category of contract. These are almost all school travel services, so are run once in the morning and then again late afternoon, to coincide with the school day, rather than being a regularly timed service. In addition, some services run on a 24 hour basis whilst others have a separate “night” element (so maybe four or five services on a typical day, between 1am and 5am). In the latter case, we do not include the night route as a separate route in our analysis.

¹² By constructing company histories from various sources including the companies themselves, we attempted to discover whether, at the time of the tender being awarded, the winning company was in fact essentially the same company as previously held the contract. This is occasionally difficult, because companies have left and re-entered the market, for example.

we observe (3.03 per route). Nevertheless, there are only 16 instances in which the re-tendered route has only one participant, which is lower than on the first occasion that we observe the contract for that route being tendered. Of the 402 routes, 120 have more competitors on the later occasion compared with the earlier one and 150 have fewer.

There is relatively little evidence for the possibility that a semblance of competition is being maintained by companies putting in “sham” bids. Bids are in the lower millions of pounds for a year’s service, but the bid is normally specified to a particular number of pounds rather than being rounded. There are some round-number bid amounts, but these do not constitute a high proportion of the total bids that are revealed.

Table 3: Number of Competitors

Tender	Average Number of Bidders	N. of Contracts with higher competition
First Tender	3.03	
Retendered	2.85	120 have more competitors 150 have fewer competitors

The award cost (price) per mile increases over time. We compared the cost per mile implied by the contract on the second occasion of tendering that route, with the cost per mile on the first occasion, uprated to the second date according to the formula for cost increases. There is some tendency for the cost per mile to increase when the contract is let for a second time. Of the 402 cases, 253 show a rise in cost per mile above what might be anticipated if the price were generated by the cost-based formula, the remainder below that. On average in our sample, price rises by 3.8% above what might be expected from the cost-based formula. The distribution is illustrated in Figure 1 below.

Figure 1: Price Changes over Time

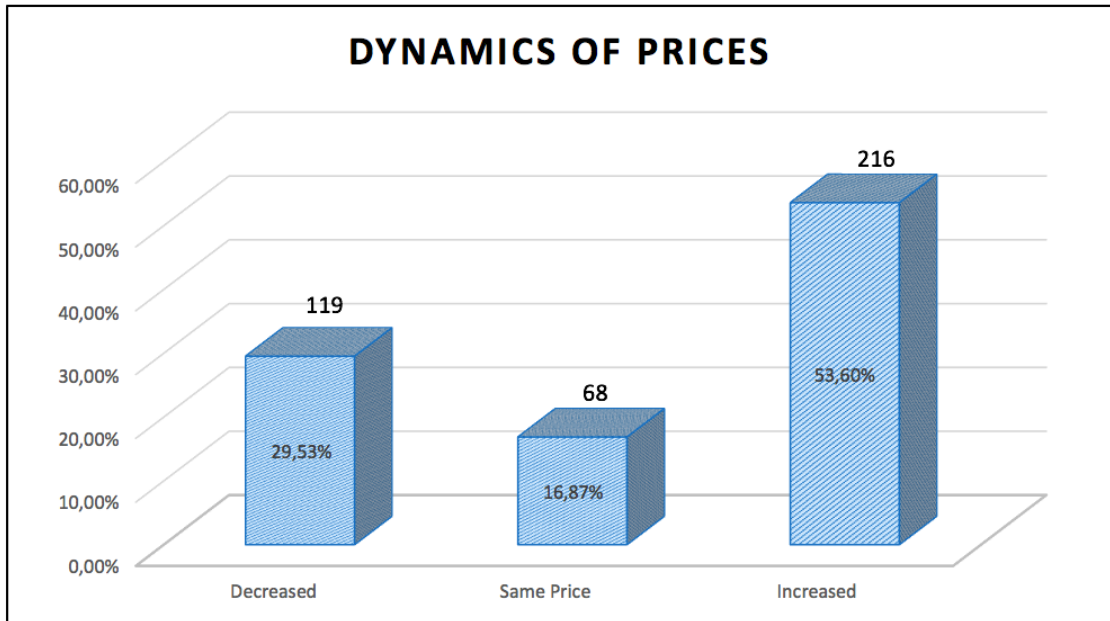
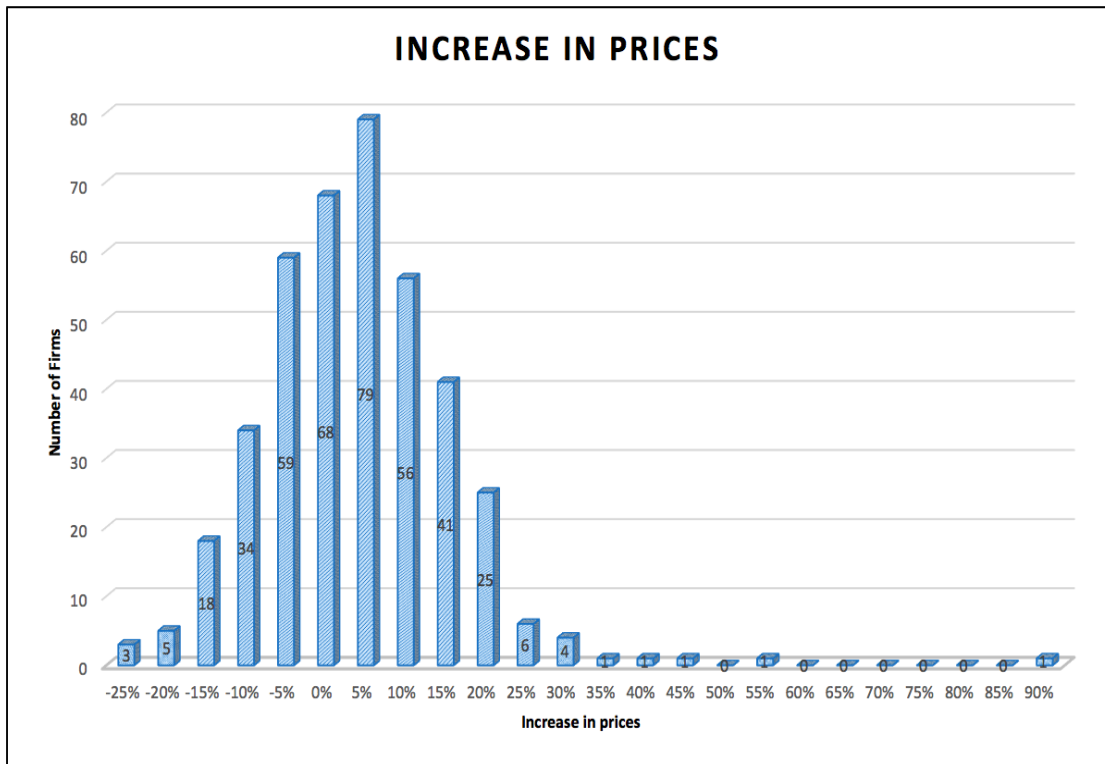


Figure 2 shows the range of outcomes within our sample. Discounting outliers, which probably correspond to special cases of greatly changed services, the modal increase is in the tenth percentile range.

The most obvious explanation for this price increase is that either competition is weakening over time or that quality is rising. Our data do not allow us to capture the increase in price that may result from quality standards being more demanding in recent times. Therefore, we cannot yet disentangle these effects.

Figure 2 Price Increase over Time



Price Increase and Entry. We investigated whether the greatest price increases were observed when a new firm won the market rather than when the contract was allocated to the incumbent firm. This initial evidence goes against some previous work showing that entrants typically win auctions at lower costs than incumbents. Indeed, we find that the greatest price increase was observed when new entrants win the tender (4.20% price increase rather than 3.41%). However, we caution against putting much weight on this finding, since the differences are insignificant at normal levels on a t-test (see Table 4). Rather, there is no evidence that new entrants winning was associated with a materially different cost value. Figure 3 shows the raw percentages.

Figure 3: Price Increase and Entry AGGIUNGI QUANTE IMPRESE SONO (TIPO 100 CASI)

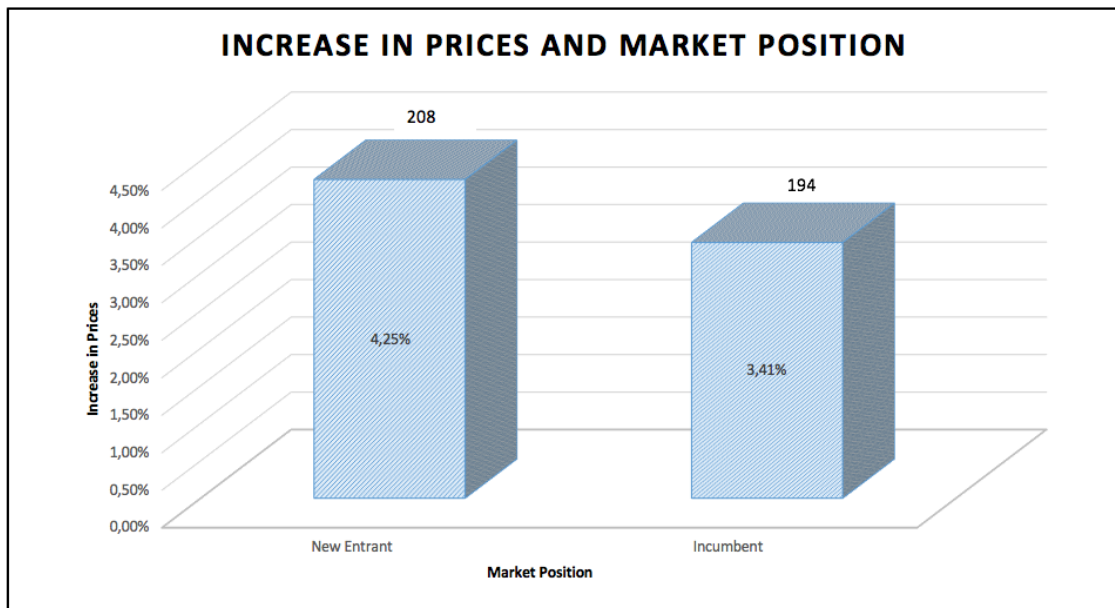
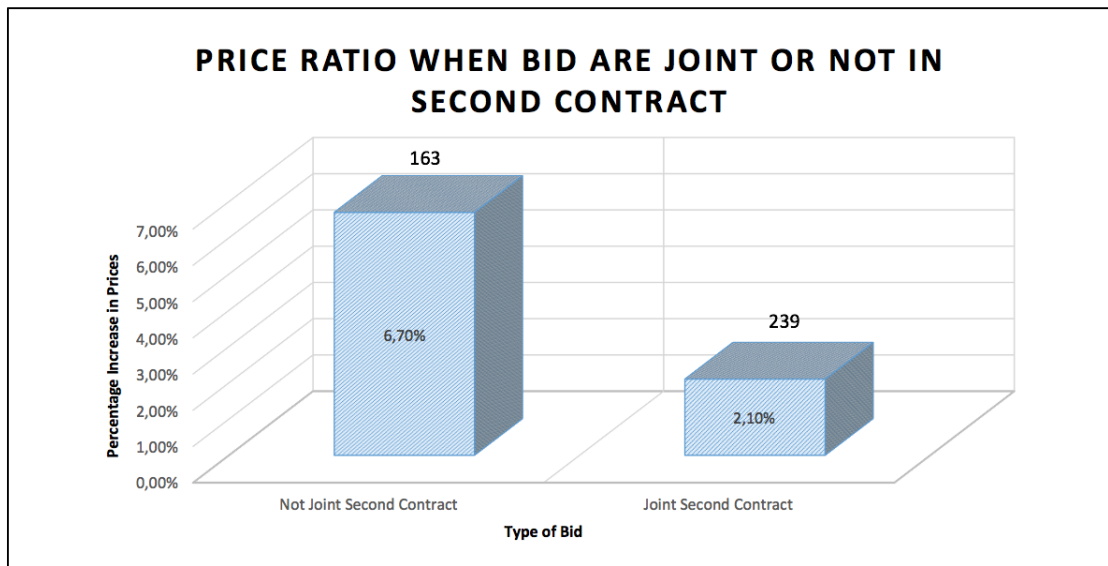


Table 4: t-test, Comparing price increase when the incumbent wins and when it does not.

	<i>New supplier</i>	<i>Old supplier</i>
Mean value new to old contract price	1.04	1.03
Variance	0.016	0.011
Observations	208	194
Hypotesized difference in means	0	
df	395	
t Stat	0.71	
P(T<=t) one tail	0.24	
t critical one tail	1.65	
P(T<=t) two tail	0.48	
t critical two tail	1.97	

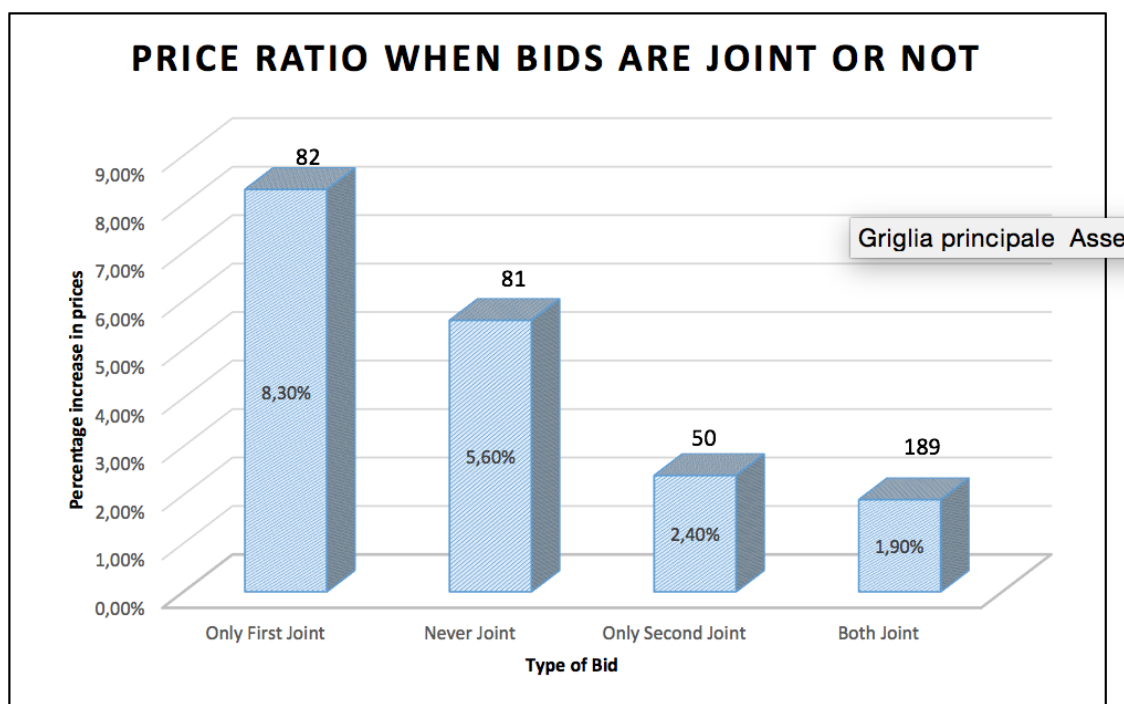
Joint bidding is associated with a lower price increase. We note that the price increase when bids are awarded jointly to the same company tends to be lower than the price ratio when bids are allocated to individual companies. This suggests that there may be some economies of scale/scope in the market, which make it efficient to manage more than one route in the package at the time. (Cantillon and Pesendorfer, 2006, explore this issue to some extent.). This is illustrated in figure 4.

Figure 4: Price Ratio and joint Bidding



When investigated further, the analysis confirms that greatest price increases are observed when there was joint bidding initially but the contract was allocated to different firms subsequently, and that the lowest price increase are observed when there joint bidding both initially and subsequently, as seen on the basis of raw percentages in figure 5.

Figure 5: Price Ratio and Joint Bidding



Price Ratio and Contract Length. We investigated whether the price change was somehow associated with the contract duration. A contract duration of 7 years normally implies that new buses are bought at the beginning of the contract, so this should be associated to the greatest level of symmetry between the entry cost of incumbents (i.e. firms who were previously serving that route) and entrants. From Section 2.4, we should then observe that it is easier to maintain competition over time. With a 7 year contract of the sort described above, both the entrants and the incumbents will need to buy new buses to be able to provide the service.

We are only able to investigate this phenomenon to some extent because we have completed lengths only for the first contract. The raw percentages are given in figure 6. Note that contracts lasting for fewer than five years are unusual, and often are associated with particular circumstances, such as when a firm decides for strategic reasons to exit the London market. The evidence in Figure 6 suggests that contract duration is associated with different levels of price increases. However, when we run a t-test, we found that the observed difference between the sample means is not enough to say that the average price increase is significantly different (see Table 5).

Figure 6: Price Ratio and Contract Duration

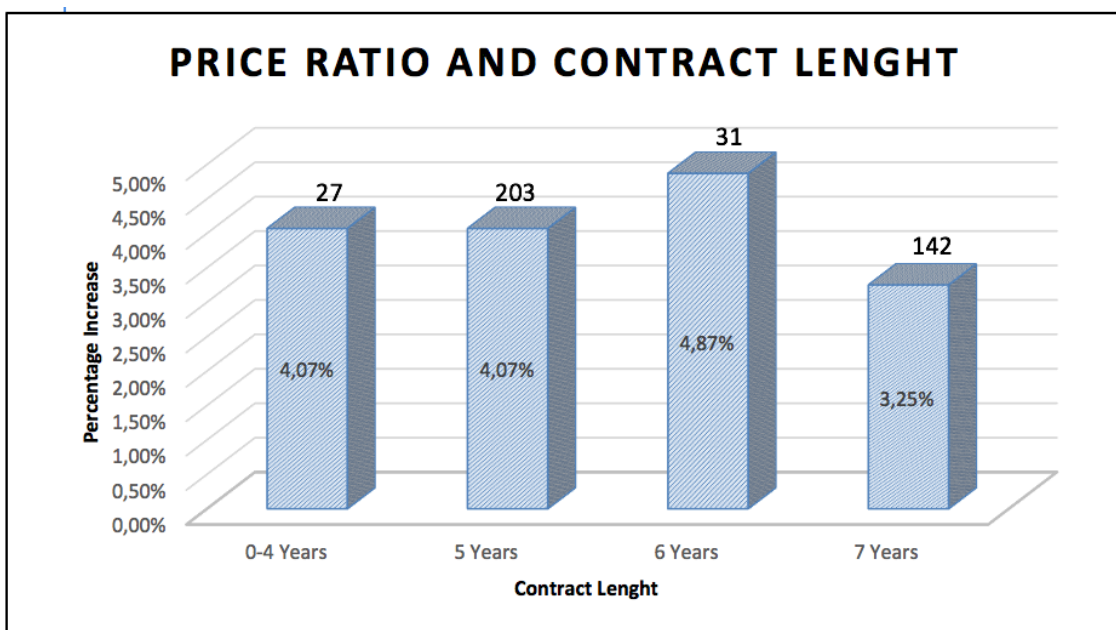


Table 5: t-test, comparing 7 year sample with less than seven years

	Variable 1	Variable 2
Mean value seven year to other price	1.03	1.04
Variance	0.018	0.012
Observations	142	260
Hypothesized difference in means	0	
df	239	
T Stat	-0.74	
P(T<=t) one tail	0.23	
t critical one tail	1.65	
P(T<=t) two tail	0.46	
t critical two tail	1.97	

2.3 A summary regression

The discussion above can be crystallised through a descriptive regression analysis in which the dependent variable is the price per mile in the new contract as a ratio of the inflation formula updated price per mile in the old. Two alternative formulations, both incorporating the same set of right hand side variables, were tried and one of these is listed in Table 6. One formulation examines the influences on the ratio, the other captures the factors that lead to the ratio exceeding 1, but the results are very similar. The rhs variables are: the ratio of the number of competitors in the new contract to the number in the year in which the contract was previously let; whether the first contract was extended to seven years; whether the contract was joint with other routes (there are three cases, joint first time not second time, joint second time not first, and joint both times); whether the same company won the route on both occasions; the year in which the contract was let the second time.

The reasoning behind these variables is as follows. (i) Clearly, we would expect from auction theory that if the number of bidders goes down, the price would be relatively high. It might be objected that the number of bidders is endogenous, but here we are not doing a cross section of number of bidders but rather a cross section of differences in the number of bidders for the same route over time. (ii) Companies are commonly offered the choice of whether to extend a five year contract to seven years, on the same

terms (but updated according to the formula). We might expect that if the company chooses to extend the contract, they must think it a good deal, so the likelihood is that the rebid price when the contract comes up for renewal after seven years will be lower. (iii) Presumably the purpose of allowing joint bids is to generate possibilities for lower average procurement costs. However, it is not clear whether companies will always be in a position to take advantage of this. We would expect that if the previous bid was not joint, then the new bid will tend to be relatively low priced if it is joint. Whether or not the other two cases will have an impact is unclear, but we might expect that if the previous bid was joint and the current one is not, the price is unlikely to be lower in the new bid. (iv) If the same company wins a second time then there are several reasons why the price is likely to be lower than otherwise. One is that the company may be able to reuse current fleet and garage location most easily. Another is that the company is keen to hold on to the contract. On the other hand, there are also reasons why the price might be higher, for example the company may feel confident it can win again, or may believe it faces little or no opposition,¹³ (v) Finally, the contract regime can change from time to time for many reasons- it may become less or more competitive overall, specifications for buses may be updated, new legislation may affect costs of operation, compensation formulae may be too generous, or not generous enough. Therefore we include a year counter to capture these various effects over time.

Table 6 contains the results for a representative case; the regression alternatives all led to very similar results. Here the dependent variable is whether or not the price in the second contract was higher, after allowing for the inflation formula, than in the first. A probit regression is employed and the coefficients reported are the marginal effects (or, in the case of dummies, the discrete change). The key variables where we anticipated a definite sign yield the expected results- more competitors lead to a lower price, the contract following a seven year contract leads to a lower price and moving from non-joint to joint bid leads to a lower price per mile. All these are comfortably significant. On the other hand, it is somewhat surprising that having joint bids on both occasions leads to a lower price on average in the second case. Of more concern from the policy point of view are the findings that if the same company wins on both occasions, the price is higher on average, and that prices are on average rising over time, all other variables equal. As said, there are several reasons for the latter finding, and it would be useful to investigate this more deeply.

¹³ There is even the possibility of collusion to keep to particular routes, but the evidence for this is slight.

Table 6: Regression to investigate the determinants of whether contract prices rise or fall over time

Probit regression: Dependent is probability that the second contract is at a higher price per mile than the first.

Variable	Marginal effect	z statistic	Sig level
Bidders-			
new/bidders-old	-0.105	-2.45	5%
Contract 7	-0.151	-2.63	1%
Non-joint, joint	-0.225	-2.28	5%
Joint, non-joint	-0.078	-0.9	Non
Joint, joint	-0.188	-2.64	1%
Same company	0.112	2.13	5%
Year variable	0.097	5.76	1%

398 observations

3 The Role of Garages

One of the key issues in examining the continuing role of a number of companies competing in the London bus market alongside the high proportion of incumbent winners is the role of the spread of their garages in ensuring this. Specifically, each of 7 companies has several garages in the London area where buses can be stabled, cleaned and light maintenance carried out when the buses are not running. There are almost 100 garages used for TfL bus services and given pressure on land in the London area, obtaining planning permission for and quickly constructing a new garage would be a major proposition. New companies that have entered the market in a significant way have done so by (amongst other things) purchasing existing garage facilities from exiting or downsizing operators.

How important is garage proximity to the routes operated? To examine this issue empirically takes a number of steps, facilitated by the use of compete postcodes. These are a convenient and very accurate means of fixing geo-locations, since each postcode refers to only a very small number of physical addresses; in the case of medium sized commercial premises a single address and in the case of residential premises perhaps 10 properties. Hence, garages' geo-locations can be determined by obtaining their postcodes. It is apparent from this exercise that different companies in the London market have different strategies- some have garages spread over the entire area whilst

others confine their garages to a part of London, for example RATP's garages are all in the North Western quadrant of Greater London.

The next step is to obtain postcodes for the routes themselves. In doing this, we obtained postcodes for the start and end of each route in London, covering the whole set of routes. It is possible that in the course of a route, it passes nearer to a garage than at either end, but it would be an impossible task to evaluate this empirically.

Using a package based upon Google Maps, we then obtained driving distances and time estimates from the start and end of each route to each garage in the London area.¹⁴ Based upon the times, we then calculated the most advantageous garage for each company to use for each route and from this the minimum time to travel from one of their garages to the start or end of the route. Of course we accept that the timings are for car drivers rather than bus drivers transiting between garage and start point, but the two should be highly correlated. Recalling that a particular route may require at peak up to 60 buses in service at one time, the dead transfer time is likely to be a significant determinant of the ease of operating the service.

Our key hypothesis is that this minimum time to start or end is a powerful influence on whether the company will bid for the right to operate the route and whether its bid is successful because it incorporates less dead time transiting between garage and route. In other words, if the company is ranked as the closest to the route amongst the companies we investigate, it is much more likely to be the operator of that route than if it is not well placed.

The identities of the bidders for each route are not revealed in the reporting process, save of course for the winner, who becomes the operator. Therefore we test the key hypothesis by examining the identities of the operators by comparison with their rank in the set of companies in terms of proximity to the route. We focused on operators as at October 2015; clearly identities change from time to time.¹⁵

The test is a significant success. Table 7 below lists the count of ranks of the winners for the routes involved. The table lists a total of 557 routes where we calculated the value. Of these, 47% are operated by the company whose garage is nearest in time to either

¹⁴ We used the site doogal.co.uk. Using this however is a tedious business, since the package is designed to restrict commercial use, and therefore chokes the display of results considerably once the first few hundred are obtained. Hence we obtained them in blocks of a few hundred. The total number of distances and times involved is approximately 200,000 over the first 100 routes, for example.

¹⁵ This includes both routes in the first sample which were tendered at least twice, and other routes, not including the 600s, night routes and X routes.

the start or end of the route. Most of the others are operated by a company that is either next nearest or third nearest, so that over 4/5 of the routes are covered by one of these firms. The probability of this happening by chance is infinitesimally small. This provides a clear demonstration that proximity of one of your garages to a route is a major consideration in being able to generate a competitive bid for that route.

At the same time, this suggests a concern. If most routes are operated by the company most favourably placed in terms of its garage locations, is there much possibility of competition in the market? We examine this by looking at the time proximity of the winner and of the other operators in Table 8. The meaning of the entries is as follows. The first column shows the percentage of routes for which the operator on the route is within 10 minutes, 15 minutes or 20 minutes as between their nearest garage and the start or end of the route. So, over half of the time, the operator is within 10 minutes of the route. There are 84% of the routes for which one of the firms, not necessarily the operator, is within 10 minutes (second column). There are over 30% of routes for which two operators are within 10 minutes (third column) but there are only a few routes (final column) for which three or more operators are within 10 minutes. Yet still nearly half of the routes have three operators within 15 minutes of the route.

Clearly, time of nearest garage to the location of the route is not the only criterion a bidder will bear in mind. It will also be, for example, a question of whether they have spare capacity in the relevant garage(s), either directly or by switching around routes between garages. However, it is evident that there are many routes for which several operators are well placed to bid, when the route comes up for re-tendering.

Table 7: Listing over 557 numbered TfL bus routes, ranked by minimum distance from garage of operator to start or end of route, compared with other operators.

Winner's		
Rank	Count	Percentage
1	262	47.0
2	123	22.1
3	77	13.8
4	49	8.8
5 or greater	46	8.3

Table 8: Number of operators which are proximate by time to the routes

Percentages	Winner's time	Min time	Second min	Third min
Number < 10 min	53.1	84.2	31.4	6.8
Number < 15 min	77.6	99.3	83.3	46.5
Number < 20 min	89.0	99.8	96.8	75.6

4 Conclusions

Our analysis of the evolution of competition in the market for bus services in London suggests that the bus service procurer, TFL, seems to have thought very carefully how to design tenders so as to maintain competition over time. It has chosen relatively small contracts, high tender frequency, small lot sizes compared with the size of the market, and a large degree of transparency, which has certainly helped to achieve common knowledge about the key cost drivers behind the staggered nature of the contracts. Coupled with a market that was competitive to start with due to the nature of the break-up from the previous public operators, with the geographically dispersed nature of the operators, this may have helped in maintaining competition over time. More specifically, the dispersed nature of garage ownership seems to have been a major factor in this.

Our preliminary analysis generally confirms the predictions of economic theory: there may be learning effects as the incumbents win significantly more often than entrants, sunk cost asymmetries, activism and contract duration may be relevant and reflected in the effect of contract duration, and all these factors together may push for some reduction in competition over time, as signalled by the slightly declining number of firms and increasing contractual price.

However, the differences across time that we observed were shown not to be statistically significant according to standard t-tests and small also in the regression framework. Thus, it is difficult to reject the null hypothesis that tender performance and outcomes are not significantly changing. In many respects, competition in the London bus market appears to have been maintained reasonably well for a number of years. Costs are rising, but then so too is average quality, with later generations of buses being better equipped than earlier ones.

5 References

Cantillon E. and M Pesendorfer (2006). Auctioning Bus Routes: The London Experience, Ch. 23 in Cramton, Shoham and Steinberg (eds), *Combinatorial Auctions*, MIT Press, 2006.

Competition Commission (2011), *Local Bus Services Market Investigation*, London: HMSO.

Saussier, S. (2013), Expected Number of Bidders and Winning Bids: Evidence from the London Bus Tendering Model, *Journal of Transport Economics and Policy (JTEP)*, Volume 47 (1): 17-34(18)

SMMT, (2010). *Bus longevity report*.

Verbich, D. and El-Geneidy, A. (2016), The pursuit of satisfaction: Variation in satisfaction with bus transit service among riders with encumbrances and riders with disabilities using a large-scale survey from London, UK, *Transport Policy*, Volume 47(1), 64-71.

Williamson, O.E. (1981) The economics of organization: The transaction cost approach, *American Journal of Sociology*, 87: 548-577.