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20 years of competitive tendering in the Norwegian bus industry – An analysis of bidders and winning bids

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ABSTRACT

Our paper investigates the developments in the Norwegian bus industry following the ramp-up of competitive tendering since the early 2000s. We analyse a complete dataset of all 232 local bus contracts awarded through competitive tendering in Norway since 1995. We also utilize the Central Register of Establishments and Enterprises (CRE) for structural developments in the bus industry.

We first present some overall tendencies, including developments in number of bids per tender, contract size and cost developments. We use the cost implied by the winning bid as our cost indicator. The average cost per kilometre in the winning bid has increased substantially more than the general rate of inflation. At the same time, the average number of bidders per contract has fallen. Second, we build regression models to identify key drivers of cost developments in the bids. Contract sizes, in terms of vehicle-kilometres are found on average to be on the low side and an increase would reduce unit prices. We find as expected a significant effect of the number of bidders on unit prices. This leads us to a further investigation of factors explaining the number of bids per tender. We find that larger contracts tend to attract more bids, as do repeated tenders in the same area.

1. Introduction and background

Competitive tendering has been introduced on the local bus markets in Europe in response to increasing costs and, from the early 1990s, in anticipation of EU-regulation (1370/2009), according to which competitive tendering with a few exceptions has become mandatory. This has changed the structure and development of the industry. Introduction of competitive tendering has resulted in well documented effects in terms of reduced prices (Alexandersson, Hultén, and Fölster 1998; Amaral et al., 2009; Amaral, Saussier, & Yvrande-Billon, 2013; Bekken, Longva, Fearnley, & Osland, 2006; Cantillion & Pesendorfer, 2006, ch 22, 2007; Vigren, 2017). Aarhaug (2009) finds that although the price developments over time are similar under tendered and negotiated contracts, the introduction of competitive tendering has reduced the price level of tendered contracts – similar to the findings of Alexandersson and Pyddoke (2003) in Sweden and Amaral et al. (2009) comparing the London case with France. Vigren (2014) also applies data from Sweden and finds that competitive tendering can reduce cost, but that Swedish data is not sufficient to say that public provision of PT services is cheaper, as it is not a random selection of which contracts are provided by a municipality-owned operator, and which by a private company. He further finds that there is no evidence to support the claim that incentive payments result in higher cost. In a more recent study he finds, again, that competition improves cost efficiency but that areas with higher population densities present lower cost efficiency (Vigren, 2016).

Hensher (2007) points at challenges with competitive tendering in complex markets and argues against competitive tendering on area-based contracts. In particular, he points at the high transaction cost in re-tendering of already tendered contracts. He proposes instead to go in the direction of negotiated performance-based partnerships.

Hensher and Wallis (2005) discuss the impact of competitive tendering across Europe. They find that, for most countries, competitive tendering in the transport sector has reduced the cost compared with prices before the introduction of competitive tendering However, the cost reduction has been reversed to significant real cost increases in subsequent tendering rounds – associable with the oft-cited u-shaped subsidy (or cost) curve (Bekken et al., 2006; Hensher, 2003; Preston & Van de Velde, 2002). Among the explanation for the increased cost are more informed bidding, reduced competition, increased service quality, and wage increases (see, e.g., Alexandersson & Pyddoke, 2003; Hensher & Wallis, 2005).

Tendered contracts may be designed in different ways. A key distinction goes between net cost and gross cost contracts. The former implies that the operator takes a market (or ticket revenue) risk, whereas in gross contracts ticket revenues are kept by the procuring

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body (or PTA). Numerous hybrid arrangements between net and gross contracts exist. Most commonly, tendered contracts include a mixture of some quality measures and price (cost). In their theoretical model, Bergman and Lundberg (2013) discuss how one optimally should design tendering contracts, i.e. the mixture of cost and quality. They point out that the optimal design depends on the information in the market. If the cost of quality is well known and quality is observable the most optimal model would be to have price competition for a given quality, while "beauty contests may be preferred when purchasing budgets are inflexible", as they state it (p 73). They also point out that quality may be verifiable ex-post and ex-ante but if the quality is only observable ex-post the buyer of the service may be faced with moral hazard by the supplier. This implies that the supplier will take hidden action after the contract has been signed and thereby reduce quality. However, if the quality is only observable ex-post the suppliers that gives the lowest quality, provided that quality is costly, will win the tender contract. Hence, the suppliers will take hidden action, i.e. adverse selection.

The aim of this paper is to describe the developments in the tendered bus markets in Norway. In particular, it looks at the developments in competition and unit price as implied by winning bids, and seeks to identify policy-relevant drivers behind the observed developments.

This paper contributes to the already rich literature on the impact of competition on transport services by adding a case study of Norway, using and enriching the data on competitive tendering in Norway, by integrating 232 winning bids in a database. Some of the observations from the Norwegian case are similar to the findings in previous studies, such as price increases and reduction of the number of bidders over time. However, there are also some new insights, such as the U-shaped relationship between the size of the contract and the unit price per VKM and the effect on competition and price of the provision of garage facilities etc., which reduce costs and entry barriers including risk for new bidders.

The remainder of the paper is organized as follows. Section 2 reviews studies of competitive tendering in the Norwegian bus sector. Section 3 presents our data and how it has been collected in several rounds. Section 4 presents an overview of key developments in the Norwegian bus market in the period 1995–2017, as a warm-up to the analyses of variations in unit cost and competition performed in section 5. Section 6 rounds off with a discussion of the findings and by summing up main conclusions and their policy implications.

2. Competitive tendering in the Norwegian bus sector

Competitive tendering in the Norwegian bus sector has been analysed in several studies, motivated both by studying the bus sector, and competitive tendering as a phenomenon. Competitive tendering was first introduced for the local transport bus sector in Norway in 1994. However, the tenders conducted in the 1990s were mostly few and small scale. The large-scale implementation took place in the early 2000s. By 2005, 28 percent of all route production in Norway was based on tendered contracts, covering nearly 40 percent of the passengers (Bekken et al., 2006). As of 2017, most local public transport by bus is subject to competitive tendering. Gross cost contracts now dominate. Longva and Osland (2007) point out that the development from negotiated contracts to gross tendered contracts is connected to a change in thinking about service provision. In particular, they look at the trust relationship between the service provider and the public authorities. They find that the post-war negotiated contract regime was based upon long contracts with high levels of mutual trust. The new regime with shorter and tendered contracts is at odds with this. They raise the question of whether the removal of thick-trust relationships will reduce the downward pressure on cost caused by tendering.

Bekken et al. (2006) find that the introduction of competitive tendering in Norway reduced operating costs by approximately 10 percent in the bus sector and that this gain was primarily used to reduce subsidies to the bus sector. Both Bekken et al. (2006) and Mathisen and Solvoll (2008) used Norwegian bus sector data to show that the introduction of competitive tendering resulted in lower costs per vehicle kilometre and a restructuring of the bus industry from a dominance of many small actors to a structure of fewer and larger companies. Mathisen and Solvoll (2008) show that this restructuring is linked to the introduction of competitive tendering. Mathisen (2016) revisits these structural developments in the Norwegian local bus industry and point to the, at least potential, problems caused by cross ownership and continuing reduction of the number of firms, or groups of firms, involved in this sector. Aarhaug and Fearnley (2016) show that the number of companies involved in express coach service provision in Norway has dropped from 30 in 2003, when express coach services were deregulated, to 12 in 2015, and argue that this is mostly due to the restructuring of the local bus sector following competitive tendering, as this market is much larger and that most companies involved in express coach services see long distance coach routes as a side activity to their main activity, which is local bus services on tendered contracts.

Longva and Osland (2010) also use the introduction of competitive tendering in the Norwegian bus sector to investigate effects of competitive tendering, focusing on the change in the relation between public authorities and operators. The main observed difference is the introduction of a large number of publicly owned administration companies (or PTAs) which conduct planning of services and also purchase services from the operators. Longva and Osland (2010) point at transfer of knowledge from the public authorities and bus operators to these new entities. This transfer of know-how, competence and responsibilities results in a different principal – agent relation. This in turn affects the incentives faced by the different actors, which again has consequences for optimal contract design. They emphasise the point that the 'Scandinavian model', with central planning and tendering of the service (Van de Velde, 2004) is ill suited to handle net contracts. This is because net contracts typically have political involvement on both the strategic, operational and tactical levels, while the 'Scandinavian model' restricts political involvement to the strategic level and leaves the operational and tactical decisions to the PTAs. They conclude that the 'Scandinavian model' is better suited for gross contracts where operators compete to minimize costs. Along the same lines, Krogstad and Leiren (2016) show that local politicians favour re-integration of administration companies into county administration and the use of net contracts, in order to regain political control over operational decisions in local public transport.

Aarhaug et al. (2016) analysed 97 Norwegian bus contracts from 2008 to 2014. They found that contract prices fall with the number of bidders by on average NOK 2 per additional bidder. In accordance with Vigren (2016) they find that the country's largest city, Oslo is associated with higher unit costs. As to what drives the competition, Aarhaug et al. (2016) find that the city of Oslo attracts fewer number of bids per contract, all else being equal, and that competition increases moderately with the size of the contract in terms of bus-kilometres.

Røed and Skaug (2014) attempted to introduce increased vehicular requirements and environmental standards as explanatory factors for reduced competition and increased unit cost in bus contracts in Norway. They did not find any such significant results. Possible explanations for this include difficulties in coding such data into the analyses and the lack of variation. Technological standards, such as Euro V and VI, standards are often introduced simultaneously in different tenders, thereby reducing the variation necessary to study these effects on an aggregated level. Hagman, Amundsen, and Ranta ogNylund (2017) and Aarhaug et al. (2017) studied differences in the Norwegian bus industry and found that stricter environmental standards and factors such as changes in the school structure among others, have significant impacts on operating costs. However, the major cost increases identified, in the period 2010–2016, were from indexable externalities, such as wages, fuel costs etc. Together, these elements are included as the annual trend in this analyses.

3. Data

In this paper, we include more and newer data than was analysed in previous studies, notably in Aarhaug et al. (2016). To our knowledge, our data includes all tendered contracts in Norway from 1995 until 2017. Hence there is no risk of self-selection bias or other sources of biases, apart from the fact that different local authorities introduced competitive tendering at different points of time. Furthermore, we may include more details from the tendering contracts. This enables us to investigate changes in cost and competition over time.

Data on prices and other characteristics of each tender has been collected from the Norwegian regional county governments. This collection was conducted by e-mail and telephone requests to each local county government or administrative body which operates on behalf of the county. The data set used in this paper has been constructed by the authors by combining data collected in four rounds. For data from before 2005, data collected by Bekken et al. (2006) is applied. For the period 2005–2009 contracts and information collected as part of the Aarhaug (2009) study is used. For data from 2009 to 2014 we use the data collected by Røed and Skaug (2014). As part of the current study, we have collected data for contracts with start-up dates up till 2018, inclusive. These studies have used roughly the same forms and methods for data collection.

All prices are presented as fixed 2015 prices using the consumer price index adjusted for energy and charges. For 2015, €1 equals about NOK 9. Table 1 presents descriptive statistics of key indicators in the dataset. Our dataset includes more than 800 bids for 232 tendered contracts in the period with start-up year from 1995 to 2018. Unavailability of information on key variables, the use of mixed gross and net contracts and so on reduce the number of cases available for analysis of certain variables. When discussing price per km, for example, we are left with 180 observations. From the table, we observe that the contract duration varies from 1 to 10 years, with a mean value of 6.2 years, and that this information is available for all but one observation. Further, we observe that annual route production varies greatly, from 8000 to 10 931 000 route kilometres, a factor of 1367. The number of bidders for tenders that resulted in a contract, varies from 1 to 12. The calculated unit price per vehicle-kilometre (VKM) for the tenders varies from 9.16 NOK to 88.24 NOK, and our dataset includes this information for 180 contracts.

Table 2 presents some further key observations. From the table we see that although traffic within Oslo constitute 25 percent of total number annual bus passengers in 2016 (93 of 369 million; Statistics Norway, 2017; Ruter, 2017) only 8.2 percent of the observations are from Oslo. Local authorities provide garage facilities in 24 percent of the cases. Gross contracts are used in 87 percent of the cases. 46 percent of the observations are reported as the first tender in the area, 40 percent as the second, 11 percent as the third (two previous tenders in the same area) and only three observations indicate three or more previous tenders. Nettbuss is the dominant actor (see also Fig. 5), winning 21 percent of the observed tenders. Tide was established in 2006. Unibuss operated under different names till 2007. Similarly, Nobina changed to its current name in 2009. By ownership, private Norwegian owned companies have won more than half of the tenders. However, in this context the term private companies can include companies owned by a mixture of private and public authorities, provided that public entities are not majority owner. The difference between percentage of tenders won by Nettbuss (which is owned by the state railway company NSB, which again is owned by the Ministry of Transport and Communications) and central government-owned companies, is due to the fact that Nettbuss in some tenders have submitted bids through fully owned subsidiaries, and not under the Nettbuss name. International companies are defined as companies with non-Norwegian entities registered as majority owners.

We also utilize the Central Register of Establishments and Enterprises (CRE) to identify structural developments in the bus industry, and use the number of employees as an indicator of size. CRE data provides an overview of the sector, as all companies that operate in Norway are, per legal requirement, registered. However, the CRE's usefulness is limited by frequent mergers and reorganizations of major actors and also by the fact that some operators are registered with inaccurate industry codes. For example, bus operation may not be entered as the main activity of some publicly owned bus companies.

Table 1
Descriptive statistics of key indicators in the data set. N = 232.

	N	Min	Max	Mean
Contract duration, years	231	1	10	6.2
Possible extension of contract, years	196	0	5	2.2
Max total duration of contract, years	231	1	10	8.0
Annual route production, 1000 vehicle-kms	203	8	10 931	1801
Number of bidders	210	1	12	3.9
Startup year	232	1995	2018	2009
Winning price per VKM, fixed 2015 NOKs	180	9.16	88.24	31.40
Max allowed average age of bus fleet	109	4	10	7.6
Max allowed bus age	111	5	15	11.4

Table 2
Key indicators in the data. N and valid percent.

	N	Valid %
Oslo	232	8.2
Local authority provides garage/other facilities	115	23.5
Gross contract	232	87.1
No. of previous tenders in the same area	**136**	
●0		46.3
●1		40.4
●2		11
●3		1.5
●4		0.7
Winning company name	**232**	
●Other		64.7
●Nettbuss		20.7
●Tide		5.6
●Unibuss		5.2
●Nobina		3.9
Winning company ownership	**225**	
●Central government		23.1
●Local government		8.5
●Private Norwegian company		51.1
●International company		17.3

4. Market developments

Starting with a top-level look of the data, we see that the prices of winning bids on average have increased well above the rate of inflation. Fig. 1 illustrates the indexed average bid price, compared to economic growth using GDP, the price of consumer goods using the Norwegian consumer price index CPI, and the bus cost index (only calculated from 2010).[1]

Fig. 2 illustrates how the observed contracts are distributed in terms of unit prices (i.e. NOKs per vehicle-kilometre in fixed prices) and year of contract start. Fig. 2 covers all contracts and some of the variation is attributable to variations in circumstances (e.g., rural vs. urban). The figure also shows how the number of tendered contracts have increased over the years, as every dot represents an awarded contract.

Fig. 2 has some outliers. The observations with the highest prices are typically small tenders on service routes, while the lowest are typically relatively small contracts with existing long-distance coach lines, or net contracts. This figure illustrates that there is a weak correlation between time and unit cost, since a lot of other factors than

[1] For the Bus Cost Index, Q1 is used, and 2017 omitted due to known error in the index. Other indexes uses annual average.

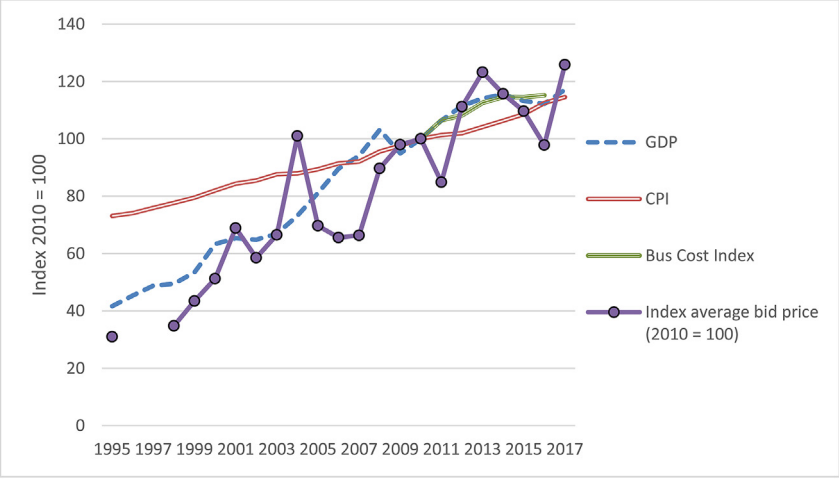

Fig. 1. Index of annual average bid price, GDP, CPI and Bus Cost Index (index 2010 100, Statics Norway).

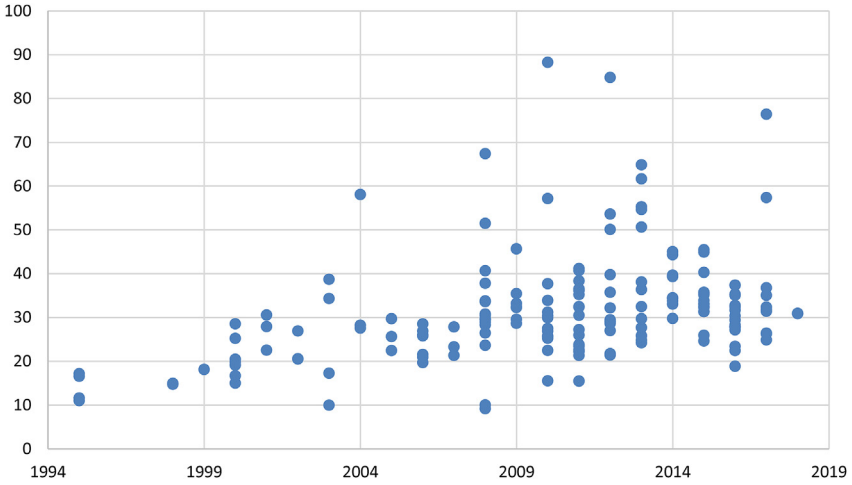

Fig. 2. Price per kilometre of winning bid, inflation-adjusted to 2015.

time are explaining the variance.

Fig. 3 presents developments in the number of bidders per contract as an indication of the presence and intensity of competition. Note that there is a discrete number of bidders for each tender, which means that each dot in Fig. 3 may represent more than one observation. There is a clear indication that net cost contracts attract very few bids. For gross cost contracts, up until 2009, there were, with two exceptions, an average of four or more bidders for each contract. From 2010 on, the average number of bidders has tended to be well below four. The trend line for gross cost contracts in 4.3 suggests a steady decline in the

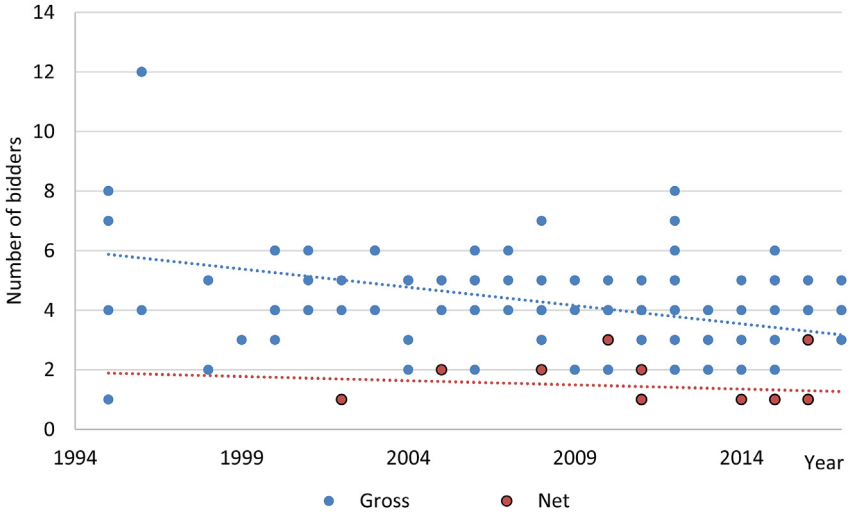

Fig. 3. Number of bidders over time by gross cost and net cost tenders.

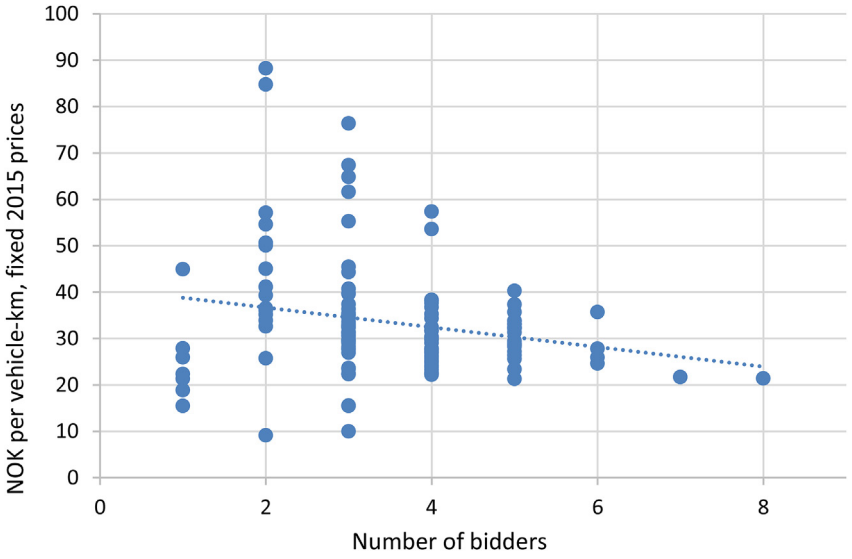

Fig. 4. Contract price per kilometre, in fixed 2014 NOKs, by number of bidders for the contract. Dotted line is linear trend.

number of bidders.

However, a closer look at the data reveals that the number of bidders per contract per year has been relatively stable over the last part of the period (2008–2017). There were more bidders in the early period (1995–2007) and so the overall trend is for a reduction in the number of bidders. This is partially contrary to the findings in Aarhaug (2009), who only observed a continuous drop in the number of competitors over time.

Fig. 4 crosstabs the number of bidders by contract price per vehicle kilometre in fixed 2015 prices. There appears to be a fairly strong relation between the two, such that the contract price tends to be lower the more bidders there are. This suggests the importance of competition for reaching an efficient market outcome with competitive tendering. Interestingly, from this simple crosstab, the additional gain from an additional bidder does not, on average, appear to flatten out. Rather, an additional bidder puts downward pressure on costs, even in instances where there already are many bidders. This is in line with the findings of Toner (2001) for tendered bus services in London, as presented at Thredbo 7 in Molde, Norway.

Fig. 5 is constructed by combining prices on tenders conducted in what we have found to be identical areas. These are fewer than the number of areas that were reported with repeated tenders (Table 2). The reasons for the discrepancy are many and include changes in geographical definition of a route or route package. For commercial reasons, the areas have been anonymised.

While Fig. 5 shows a few spectacular leaps in unit prices between repeated tender rounds, it is not easy to use the figure for further analytical purposes. Table 3 therefore extracts some interesting trends and facts from Fig. 5. It shows that, on average, real prices per vehicle-kilometre have increased from one tender to the next, in the same area, by 18 percent. However, a third of the observations are in fact of real price *reductions*, which bring this average value down. Between the first and the third round of tenders, the average real price increase is 40 percent. Table 3 and Fig. 5 also show that although the overall trend is for prices to increase over time from one tender to the next, there is substantial variation.

Looking at the industry structure we find, in line with Mathisen and Solvoll (2008) and Aarhaug (2009; 2016), that the number of

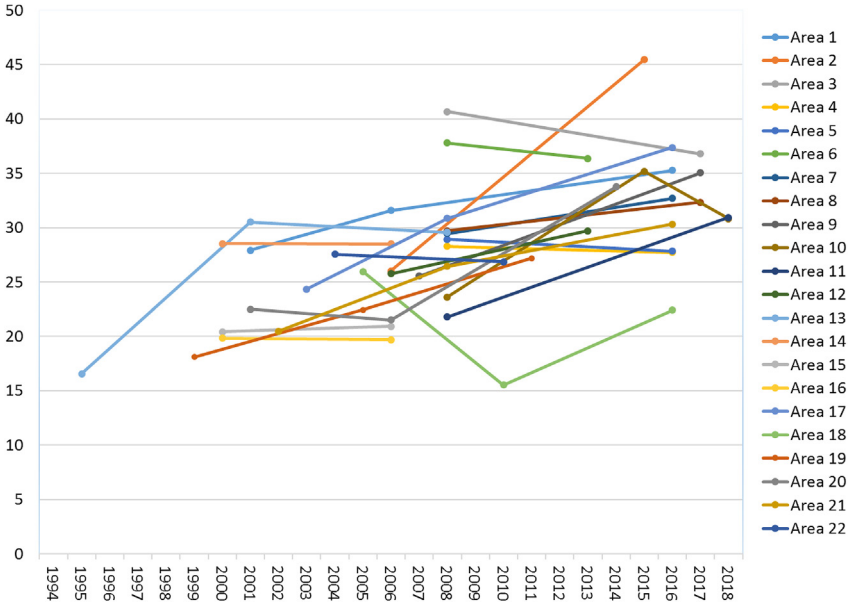

Fig. 5. Price developments in areas with repeated bids. NOK per VKM.

Table 3
Key real price developments from areas with multiple (repeated) tenders.

Average real price change from one tender to the next	+18%	
Proportion with real increase	67%	
Proportion with real decrease	33%	
Highest real increase	+84%	+
Biggest real decrease	- 40%	++
Average real change between 1st and 3rd round	+40%	
Largest real increase between 1st and 3rd round	+79%	
Biggest real decrease between 1st and 3rd round	- 14%	

+ followed by a 3% real reduction in next round.
++ followed by a 44% real increase in next round.

companies involved in scheduled bus transport is falling. Fig. 6 is constructed by grouping enterprises into companies based on their ownership structure in 2015. This means, for example, that every 100 percent owned subsidiaries of Nettbuss in 2015, and all the companies acquired by Nettbuss during the period, are included in the figures for Nettbuss. This is a simplification, since most of these companies have been gradually acquired by Nettbuss during the period. The number of employees is used as indicator for size and the size of the companies is presented as a percentage of total at the given year. The figure illustrates that the market share of smaller and independent companies has dropped. The growth of Unibuss is also somewhat misleading, as this in part is due to the restructuring of Oslo Sporveier, a multimodal publicly owned transport company, into several separate companies, including Unibuss, dedicated to bus operation. The increase is a result of employees that were gradually transferred from Oslo Sporveier, which were responsible for non-tendered production, to Unibuss (for a period called Nexus trafikk), which operated tendered production.

Overall, when studying the general trends and market developments, we observe that bus contract prices per vehicle-kilometre have increased faster than inflation during the period 1995–2017. This coincides with a trend of fewer bids per tender, especially in the early 2000s, and with a drop in the number of independent bus operators. We also observe that in 2015, there were four companies with a market share of more than 10 percent, as measured by the number of employees. Using data from Eide et al. (2018), on vehicle kilometres from 31 bus companies, we have calculated a *Herfindahl-Hirschmann index* (HHI) for 2016. This stands at 0,148. If we correct for known cross-shareholding, the HHI increases to 0,156 (cf. Mathisen, 2016). This places the Norwegian bus industry as moderately concentrated, at national level. Since some of the companies are predominantly operating in one or a few regions, the local situation can be that of a highly-concentrated industry.

5. Data analysis

5.1. Method

Our primary goal is to identify and quantify key drivers of unit costs in local bus operations. To this end, we prepare the data and run ordinary least squares (OLS) regressions. The scope for analysis is limited by the available information in the database of bus contracts. The procedure to reach our final model specifications starts with standard economic theory of competition and production and combines this with available empirical evidence, as outlined in section 1.

The procedure also includes some experimenting with variables and functional forms. For example, we tested several different dummy specifications in order to capture rural vs. urban areas and we tested specifications that allowed for potential correlations between dependent variables and ownership of winning bus companies. In order to capture variation over time, we included a variable for time (year).

5.2. Analysis

When we exclude all incomplete cases from the data set, we are left with 121 observations for the unit cost model. Most of the exclusions are due to missing data for explanatory variables, e.g. total kilometres have not been reported, or the tender used net contracts, which leave us without a total cost, and so on. Some exclusions are due to the fact that definitions have changed. Information about tender criteria, like environmental standards, have been difficult to trace in the earlier contracts.

Table 4 presents the model estimate. We see that prices per kilometre in Norway's capital Oslo are significantly higher than in the rest of the country. This is in line with expectations for several reasons. One is that much of the traffic is conducted with articulated buses, which are more expensive both to purchase and to maintain than smaller unarticulated busses. Second, much of the bus kilometres are produced within the city, resulting in a low average speed, and therefore higher cost per kilometre. Third, Oslo has more passengers and therefore more crowding, which slow down boarding and alighting. In addition to the model presented in Table 4 we have tested several different models, including using wages and fuel prices, instead of start-up year. As wages are set centrally, and fuel prices follow world market fluctuations and

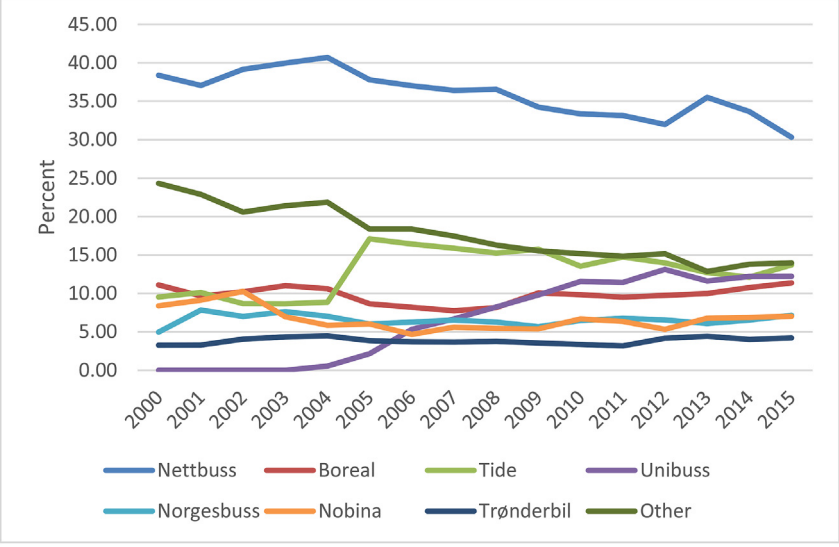

Fig. 6. Percent market share of various bus companies in Norway, using employees as an indicator. Calculations based on CRE data.

Table 4
Regression 1. Dependent variable: Fixed price per VKM (in NOKs).

	B	t	Sig.
(Constant)	23.762	4.438	.000
Dummy, Oslo	16.783	4.287	.000
Annual VKMs (in 1000s)	-.008	−3.019	.003
VKM x VKM	1.716E-6	2.416	.017
VKM x VKM x VKM	−9.763E-11	−2.026	.045
Start-up year, 1995 = 0	.586	2.467	.015
Dummy, gross cost contract	17.281	5.005	.000
Dummy, Previous tender in same area	−4.661	−2.668	.009
Dummy, winner is private company	−2.489	−1.444	.151
Number of bidders	−1.923	−2.663	.009
Adjusted Rsq	.376		
Observations	121		

Table 5
Regression 2. Dependent variable: Number of bidders.

	B	t	Sig.
(Constant)	5.520	3.752	.000
Dummy, Oslo	−1.235	−2.552	.013
Dummy, Previous tender(s) in same area	1.145	3.844	.000
Dummy, Gross cost contract	1.817	4.583	.000
Annual VKMs (in 1000s)	.00024	2.765	.008
Max. allowed average age of bus fleet	-.367	−3.341	.001
Dummy, local authority provides garage and other facilities	.640	2.368	.021
Start-up year, 1995 = 0	-.112	−1.906	.061
Adjusted Rsq	.490		
Observations	67		

national taxes, these are factors outside the control of the operating companies. Also, these factors are well indexed in the contracts. Placing the risk at PTA-level rather than the operators. We find that the year variable, which is strongly correlated with wage, provide more explanatory power as it also includes other indexed cost developments (see Aarhaug et al., 2017).

In terms of contract size, i.e. annual vehicle revenue kilometres, there is also a tendency for larger contracts to be associated with lower unit costs. The model specification allows for a closer look at the effects on contract price of contract size, as measured by the annual number of vehicle-kilometres (VKMs). Differentiating the parameter estimates presented in Table 3, we find that the marginal effect of contract size is to reduce the unit cost up till its minimum point at 3 222 000 VKMs annually. Fig. 7 illustrates the marginal effect of VKM on unit prices, as a continuous function.

Also, when controlling for other factors, the model confirms the pattern identified in the previous section of significant real price increases over time. We observe gross contracts have higher prices than net contracts. This is as expected, since net contracts allow the bus operator to keep passenger revenue as part of their revenues. In terms of previous tenders, we observe that in areas where there have been previous tenders, prices are lower than in areas where this is not the case. The model suggests, although at a poor significance level, that private companies win tenders with lower prices than companies owned by the public sector or international actors.

Interestingly, although as expected, the model finds that contract prices fall with the number of bidders for that contract. On average, the effect is almost NOK 2 per kilometre per extra operator who competes for the contract.

The policy-relevant question is therefore: what determines number of bidders?.

This calls for a second analysis, of variations in the intensity of competition, measured in terms of number of bids received per tender. Table 5 presents the estimation results. Unfortunately, there is not enough variation in the dataset on contract duration to indicate its potential effect on competition. Almost all contracts have the maximum length allowed. Therefore, we have omitted contract length as a variable in the model.

The model suggests contracts awarded in Oslo attract fewer bidders than contracts elsewhere in Norway. This is somewhat surprising, since we also find that the number bidders increase when there has been a previous tender in the area and if there is a gross contract. Both have been the case in Oslo.

The number of operators that submit a bid for a tender increase significantly with the size of the contract. There may be a link here with small contracts mostly being located in remote areas, attracting limited interest from the national actors (cf. Vigren, 2017). However, observing that some of the rural areas have opted for rather large contracts, we recognise that there is more to this relationship than the rural-urban dimension and that our data is insufficient to study this in detail. On the other side, we find that allowing higher maximum average age of the bus fleet significantly reduces the number of bids for a contract. Our interpretation of this is that the market for used busses is imperfect and that allowing a high maximum age of busses therefore favours the incumbent. Similarly, we find that if garages and similar facilities are provided by the local authority, this increase the number of bidders – again, probably because it reduces incumbent's advantage.

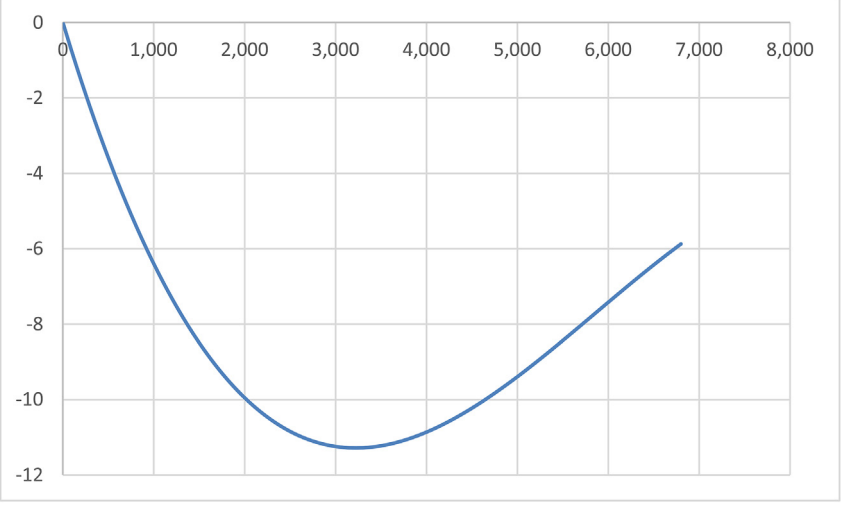

Fig. 7. Marginal effect of VKM based on the regressions in Table 3.

Also, here we find a negative time trend regarding the number of bidders per tender although the effect is not strictly significant. A time trend suggests that there are other factors not included in the model, like industry structure, which cause the reduction in number of bidders per contract.

6. Discussion and conclusions

This paper has documented all Norwegian local bus contracts since 1995. Over time, we observe substantial unit cost increases which lie well above inflation rates. Indeed, when comparing repeated tenders for identical contracts, we find that on average, the real cost increase, implied by the contract, between two rounds of tenders is 18 percent. The observed trend of cost increases appears in parallel with reduced competition for bus contracts, although the average number of bids per contract seems to have stabilised at just over three bids.

Our finding that the real cost per vehicle-kilometre, implied by the cotracts, increases over time is in accordance with what is observed and theorised in other literature, which suggests that increasing prices are a result of learning, reduced competition over time and increased quality requirements over time (Bekken et al., 2006; Hensher & Wallis, 2005; Longva & Osland, 2007; Preston & Van de Velde, 2002). It also reflects the realities behind Statistics Norway's Bus Cost Index, which show that, since 2010, the cost of input factors for the bus industry, and indeed of labour, has increased faster than the rate of inflation.

The real annual unit price increase in our data is found to be around NOK 0.586 per vehicle-kilometre when controlling for several other aspects of the contract. While this is significant, it should be viewed in light of the very substantial domestic wage increases that have materialised in Norway during the period, as well as the establishment of a national labour agreement which guarantees all bus drivers a certain salary level. Adding to that, the Norwegian inflation rate has been kept artificially low for many years due to a strong currency and falling prices on imported manufactured goods. Since we do not have a bus cost index for the entire period, it is difficult to estimate the contribution of external factors, such as capital and fuel cost.

An interesting and, for Norway, new finding in this paper is the way contract size (in vehicle-kilometres) affects unit prices. Earlier studies, like that of Aarhaug et al. (2016), suggest small but constant returns to scale. The current model allows for a more thorough analysis. We find that a contract size of approximately 3.2 million VKMs annually would minimize unit prices. In contrast to this, the average contract size in Norway is only 1.8 million vehicle-kilometres, and the median contract size of 1.2 million VKMs is even smaller. This suggests that there is a potentially substantial efficiency gain of increasing Norwegian bus contract sizes. A caveat in this respect is the possibility for contract size to be correlated with contract area – and hence by systematic differences in bus speeds.

Despite the cost increases, local governments should not be discouraged and avoid competitive tendering. Our models suggest that repeated rounds of tenders (i.e. there having been previous tenders in the same area) attract significantly more bids and achieve significantly lower unit prices.

A competitive bidding process is found to have significant impact on the unit price achieved. One additional bidder is associated with a NOK 1.92 reduction in price per VKM. We see clear indications that the number of bidders for each contract is influenced by the design of the contracts. Important contract elements in this respect include its size in terms of annual vehicle kilometre production, having a gross rather than a net contract, and providing facilities such as garages and parking areas. We also find that an increase in the maximum average age allowed for buses decreases competition. These findings, together with the findings in Aarhaug et al. (2016), suggest the importance of a well-functioning second-hand market for buses. Aarhaug et al. (2016) also point to the importance of common technical specifications of bus fleets across regional authorities, as it will enable bus operators to move their bus fleet across geographical borders.

The overall picture painted of the Norwegian bus industry is one where the industry structure has changed quite fast during the last decade. These changes pose important challenges to maintaining a competitive outcome. The number of independent companies is falling steadily and rapidly. Still, the highest market share of a single operator was approximately 30 percent in 2015, while three other companies had market shares of above 10 percent. Using the Herfindahl-Hirschmann index for 2016, the industry is found to be in the lower range of moderately concentrated. This means that at present, it is still possible to receive bids from independent operators and there is in general no urgent problem with competition. However, there can be issues on small contracts, which don't attract attention from national or international actors, and on regional level.

In general, our model results have to be treated with some degree of caution. While there are 232 contracts in our database, due to missing observations, in particular in the data collected before 2010, the cost model relies only on 121 observations and the model for number of bidders per tender relies only on 67 observations. While this paper has analysed bus contracts and winning bids, we acknowledge the fact that actual cost outcomes may turn out to be higher than the winning bid price, due, e.g., to changes in service or staffing requirements during the contract period. The results should be treated with this in mind.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.retrec.2018.05.012.

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