Public urban transport in France: new trends and political ideology*

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Preliminary and incomplete

Abstract

Urban public transport services are delivered in France through the use of competitive tenderings, with firms participating in city-specific auctions. The market has been formerly described, based on pre-2005 data, as a failure of liberalization, with a large incumbency bias and little competition. This paper studies the recent trends in competition on this market by using a detailed database at the firm level. We find that, after 2005, competition significantly strengthened, with auctions attracting more bids and a decreasing rate of renewal for incumbents. In addition to this market overview, we study the determinants of participation and success in auctions. In particular, we investigate whether the city council's political ideology has an influence on auction outcomes. We find that turnover is higher under right-wing councils and so that incumbents face a lower probability of winning in these cities.

JEL Codes: L32, L91, H57

Keywords: transportation, auctions, public-private partnerships.

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1 Introduction

Private provision of public services has been on an upward trend, with many governments pushing for the introduction of competitive tendering in various sectors of the economy. The European Union itself is promoting public private partnerships as an efficient way of delivering public goods at a low cost. However, it is argued that these arrangements may fail to implement an efficient outcome. In particular, it is feared that auctions may not improve efficiency but rather foster collusion among a very small number of dominant firms. The French urban public transport market is thought to be a case in point.

Economists (see Yvrande-Billon (2006), Yvrande-Billon (2009), and Amaral et al. (2009)) repeatedly documented the remarkably stable market shares of a few operators and the large incumbent bias. These results strongly suggested market forces were not efficiently at play. On the other hand, these studies focused on a period that ends, at the latest, in 2006. Little is known about the later years, and that constitutes a first motivation for our paper. Various reasons may lead us to expect that the market has significantly evolved since 2005-2006. First, the French Council of Competition fined in 2005 the three main operators on this market for collusive strategies between 1994 and 1999.[1] Regardless of the final outcome of the legal procedure, it suggests the market in 2005 must have then been characterized by (at least) some inertia. Although collusion, according to competition authorities, stopped in 1999, the market equilibrium may still reflect it a few years later, given that contracts last many years. The 1990s and early 2000s may have been succeeded by greater dynamism, when new firms started to enter, or when existing firms started to become more aggressive towards their competitors.

A second motivation for our work relates to improved data collection. Former studies relied on datasets that, for each auction, identified the incumbent and the winner of the auction. However nothing was known about the number of firms that bid, or their identity, significantly restricting the analysis of competition on the market[2]. We overcome this constraint by collecting data on all the firms that

[1] See Autorité de la concurrence, decision n°05-D-38. This decision has been appealed by these firms and is still pending.

[2] Yvrande-Billon (2006) uses data about applications from the Autorité de la concurrence deci-

bid in each auction. We therefore obtain a more complete picture of the market which allows us to delve into its functioning.

A final motivation is to analyse the mechanisms at play in the urban public transport auctions. The data collected is exploited to study the determinants of participation in auctions, and of the probability of winning them. Taking into account selection bias in participation, we find insights, uncovered so far, on firms' behaviours on this market.

2 Data

The dataset spans the years 2004-2011. It combines various data sources. First, the research center CERTU[3] publishes a yearbook containing data about each city transportation service: size of the transport network (in km), number of trips per inhabitant, population size, duration of the contract, etc. It also identifies the current service provider but does not contain any information on past auctions or applicants. Second, we obtained from Veolia Transport, one of the main firm on the market, data about each auction run between 2004 and September 2011. It contains the identity of the incumbent, of the applicants, and of the winning firm for 260 auctions, that allocated contracts starting between 2004 and 2012. Data earlier than 2004 is available for the identity of the incumbent and of the winner, but not of the applicants. It adds 104 observations, bringing the total to 364. Third, data about local elections, party affiliation of the city council and of the mayor, are collected from the Wikipedia pages of the cities.[4] Table 1 presents the summary statistics of the variables used in the econometric analysis.

3 Descriptive statistics

Figure 1 reports the evolution of the replacement rate, i.e. the proportion of auctions where the incumbent is replaced by a competitor. In 2000, barely 6

sion but that only covers years 1996 to 1998.

[3] Centre d'étude sur les réseaux, les transports, l'urbanisme et les constructions publiques.

[4] Official sources from the Ministry of Interior do not report election outcomes earlier than 2001 and not the name of the mayor. As explained below, our goal is to have a complete history of mayor names and elections in each city and for this reason we rely on Wikipedia.

Table 1: Summary statistics

Variable	Mean	Standard deviation
Duration	6.60	2.63
Log kilometers	6.84	1.45
Log population	4.10	1.01
Trips per inhabitant	0.04	0.04
Right-wing mayor	0.56	0.50
Veolia incumbent	0.27	0.45
Keolis incumbent	0.34	0.48
Transdev incumbent	0.10	0.30

percent of incumbents failed to win an auction. In 2000-2005, the incumbent virtually always won the auction. This is much less the case in more recent years when the probability of being replaced is close to 30-40 percent. Figure 1 does not present data for contracts starting in 2012, as it is still highly incomplete. However for these contracts, the replacement rate is 75 percent, which suggests the observed trend may be confirmed in 2012.

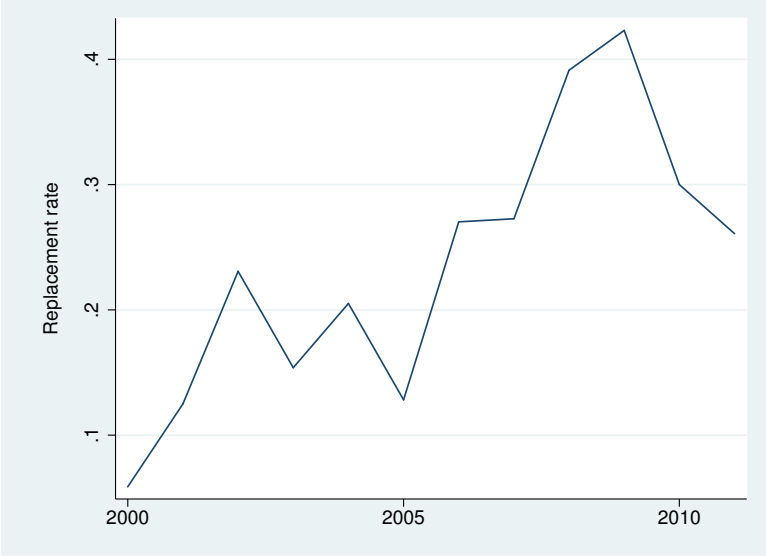

Figure 1: Replacement rate, 2000-2011

Figure 2 plots the average number of bids per auction. Auctions have attracted more bids over time. While in 2004, the average number of bids was slightly lower than 1.5, it reached 2.3 in 2011.

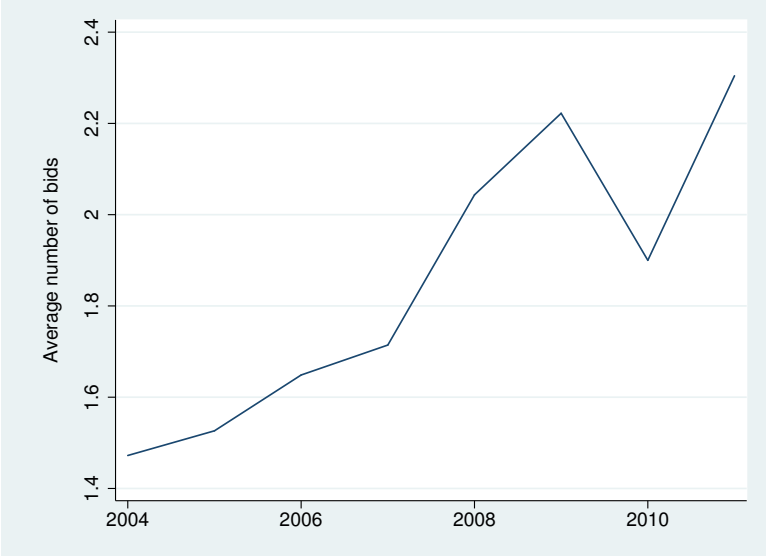

Figure 2: Number of bids, 2004-2011

Figure 3 also confirms the trend in competition. It reports the proportion of auctions that did not attract any bid other than the incumbent's. In 2004, 72 percent of the auctions occurred without any competition among operators. In 2011, this proportion was 0.13 percent. Incumbents used to win auctions because they very often did not face any competition. This dramatic drop reflects a complete change of strategy by the urban transport firms on the French market.

Figure 4 dwells on that particular point by showing the proportion of auctions where the firm is not the incumbent and participates to the auction. As is apparent from Figure 4, the leading firms (Keolis, Transdev, Veolia) became more aggressive after 2004. They started to bid for many more public transport markets than they did in 2004-2005, when they essentially focused on renewing incumbent contracts. On the other hand, Keolis significantly decreased its participation in recent years. Whether this is due to a change of strategy or to fewer attractive contracts in recent years remains to be seen. the lower participation

rate of Transdev in 2010-2011 is explained by its merger with Veolia Transport in December 2010. Apart from the market leaders, more intense competition is due to new entrants and independent operators[5]. Independent operators enter auctions that they used to neglect. Ratp Dev. is a new entrant on the market, and has publicly expressed its willingness to challenge the main operators. Its increasing participation rate confirms its intentions. Carpostal and Vectalia are two smaller firms on the French market, but Vectalia also followed the trend in higher offensive applications.

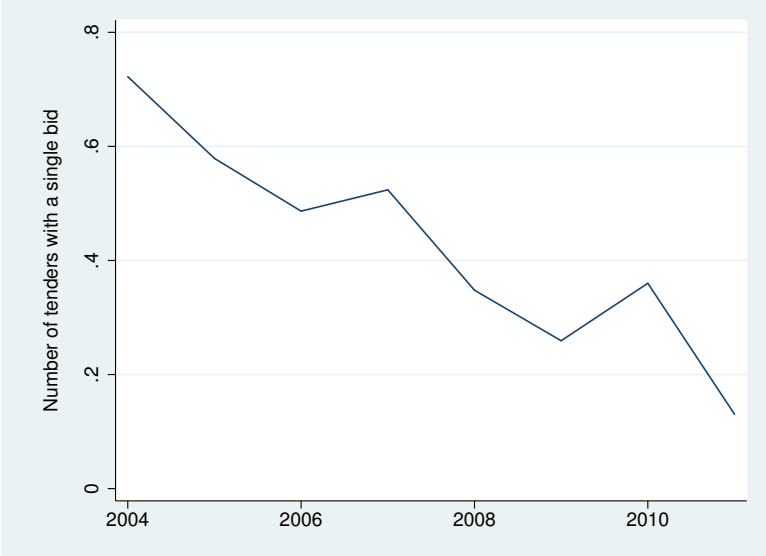

Figure 3: Proportion of auctions with a single bid, 2004-2011

These descriptive results point at a significant evolution towards more competition on the French public urban transport markets. Existing operators have become more aggressive by bidding in many cities. At the same time, smaller operators also started to challenge the dominance of the largest firms.

[5]These are city-specific, but grouped together in Figure 4.

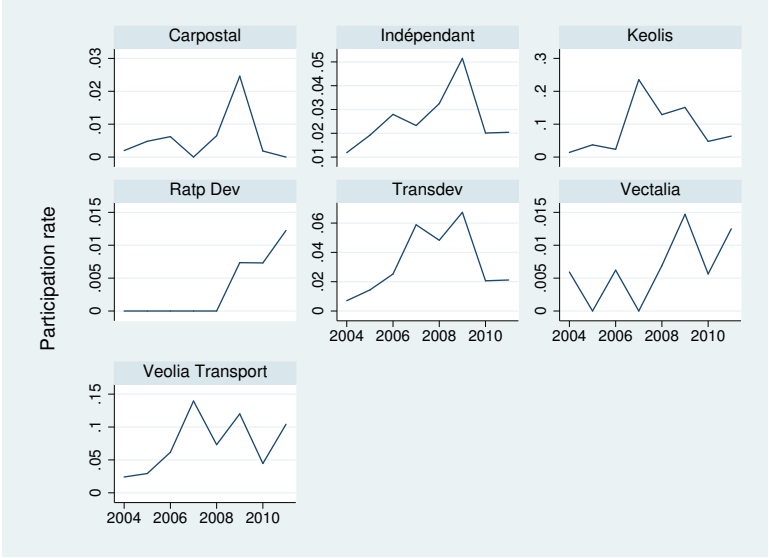

Figure 4: Participation rates as an offensive bidder, by firm, 2004-2011

4 Participation and success in auctions

4.1 Estimation strategy

Section 3 describes a strengthening of competition on the French urban transport market. This conclusion remains preliminary at this stage as it is unclear what determines participation and success in auctions. For instance, firms may compete more fiercely for large cities. If these contracts were auctioned in the later years of our sample, then the observed trend may be due more to city size than to competition in itself. Such hidden characteristics are likely to influence descriptive results as on average only 32 auctions are run each year. It is therefore difficult to argue that characteristics are homogeneous across years.

This section quantifies the effects of these determinants not only to avoid erroneous conclusions, but also to better understand the mechanisms at work on the market. Little is known about the factors that affect participation in auctions, and this section contributes to this goal.

Having information on firms' participations to auctions allows us to estimate the determinants of their participation to auctions. We can evaluate the effects

on participation of the characteristics of the contract, the city, including political ideology, and of the identity of the incumbent. A probit model with a discrete indicator of participation as the dependent variable is estimated. In a similar fashion, a Poisson regression is used to find the determinants of the number of bids in an auction. We do not expect results from these two specifications do differ but the Poisson regression offers a useful robustness check.

The second step of our analysis looks at the variables that influence success to an auction. Because participation to an auction is not random, it is important to take into account the potential selection bias that affects estimation at this stage. The participation equation therefore serves as the first step of a Heckman probit in order to control for selection bias. There is however a slight difference between a traditional Heckman probit estimation and ours: because incumbents always apply to their own succession, there is no selection equation for these observations.

More specifically, two equations are estimated. The first one is the participation equation, of interest in itself, and the second one is the success equation, estimated jointly with the participation equation. When only participation is investigated, equation (1) is estimated:

$$p_{ij} = 1\left[\mathbf{x_{ij}}\boldsymbol{\beta} + u_{ij} > 0\right] \tag{1}$$

where p_{ij} takes the value 1 if firm j bids in auction i and $\mathbf{x_{ij}}$ is a vector of independent variables. Estimation of the success equation uses the participation equation as a sample selection equation.

$$\begin{aligned} p_{ij} &= 1\left[\mathbf{x_{ij}}\boldsymbol{\beta} + u_{ij} > 0\right] \\ s_{ij} &= 1\left[\mathbf{z_{ij}}\boldsymbol{\delta} + v_{ij} > 0\right] \end{aligned} \tag{2}$$

where

$$\begin{aligned} u_{ij} &\sim N(0,1) \\ v_{ij} &\sim N(0,1) \\ \text{corr}(u_{ij}, v_{ij}) &= \rho \end{aligned}$$

The first equation is the sample selection equation and success s_{ij} is observed only when $p_{ij} = 1$. In addition, p_{ij} is always equal to 1 for incumbents, regardless

of $\mathbf{x_{ij}}$. This binary response model with sample selection provides consistent estimates of success determinants. Variables in $\mathbf{z_{ij}}$ include incumbency, number of competitors, but not the city/contract characteristics: conditional on participating, the duration of the contract, for example, does not affect the probability of winning the auction. That provides the exclusion restrictions necessary to estimate (2).

4.2 Results

4.2.1 Participation in an auction

Table 2 presents the results of three probit regressions in the first three columns, where the participation dummy is the dependent variable.The fourth column reports the results of a Poisson regression with the number of bids as the dependent variable. In column (1), only contract specific variables are included. Duration of the contract does not affect participation. City network size, measured by the number of kilometers driven in a year, and the number of trips per inhabitants do. More characteristics could be added (city population, number of staff, of buses) but these are highly correlated with network size, which tend to make the coefficients on these variables insignificant. These preliminary results are partly consistent with our expectations: firms are attracted by larger networks but not by longer contracts. The number of trips per inhabitant also influences participation, with a high ratio discouraging participation. It could signal a well-managed transportation network, with relatively little room for improvements, and so little chance for an outsider to win the auction. Finally, we present the coefficients on year-fixed effects to show that the pattern of increasing participation is robust to controlling for city characteristics. Participation in 2008-2011 is higher, other things being equal, than in 2004-2005.[6]

In column (2), the number of networks operated by a firm the year before the auction is added as an independent variable. It captures economies of scales, but also the credibility of a well-known operators. On the other hand, it may be

[6]Coefficients for the 2008, 2009, 2010, and 2011 year dummies are all statistically different from the 2004 coefficients. The 2009 and 2011 coefficients are different from the 2005 coefficient at the 1 percent level, and at the 5.3 and 6.7 percent levels for 2010 and 2008 respectively.

Table 2: Participation determinants

	(1) Probit	(2) Probit	(3) Probit	(4) Poisson	(5) Poisson
Duration	0.020	0.023	0.022	0.015	0.015*
	(0.016)	(0.018)	(0.018)	(0.0095)	(0.0088)
Log kilometers	0.17***	0.24***	0.22***	0.15***	0.14***
	(0.046)	(0.057)	(0.058)	(0.038)	(0.036)
Trips per inhabitant	-3.12*	-5.31**	-4.75*	-3.75**	-3.07*
	(1.71)	(2.65)	(2.66)	(1.68)	(1.59)
Right-wing mayor		0.32***	0.34***	0.18**	0.18**
		(0.11)	(0.11)	(0.076)	(0.072)
Number of networks, lagged		0.019***	0.018***		
		(0.0018)	(0.0018)		
Keolis incumbent			-0.17		-0.22**
			(0.14)		(0.100)
Transdev incumbent			-0.26		-0.13
			(0.19)		(0.11)
Veolia incumbent			-0.42***		-0.37***
			(0.15)		(0.096)
2005	0.097	0.15	0.13	0.082	0.059
	(0.20)	(0.23)	(0.23)	(0.16)	(0.16)
2006	0.42**	0.43*	0.37*	0.25*	0.19
	(0.19)	(0.22)	(0.22)	(0.15)	(0.14)
2007	0.38*	0.41	0.36	0.23	0.19
	(0.22)	(0.26)	(0.26)	(0.17)	(0.16)
2008	0.45**	0.56***	0.45**	0.43***	0.33**
	(0.19)	(0.21)	(0.22)	(0.14)	(0.15)
2009	0.58***	0.69***	0.63***	0.48***	0.41***
	(0.19)	(0.21)	(0.21)	(0.16)	(0.15)
2010	0.43**	0.60***	0.58***	0.41***	0.37***
	(0.17)	(0.20)	(0.20)	(0.13)	(0.13)
2011	0.63***				
	(0.20)				
Constant	-2.63***	-3.80***	-3.47***	-0.72***	-0.42
	(0.33)	(0.42)	(0.43)	(0.27)	(0.28)
Observations	1226	1041	1041	160	160
Pseudo R^2	0.033	0.16	0.17	0.036	0.047

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

interpreted as a sign of dominance. We also include the political affiliation of the mayor, and so of the majority seating in the city council. Both variables are statistically highly significant. The effect of political ideology is relatively large:

Political ideology seems to be taken into account and the effect is economically relatively large: a change from a left wing to a right wing mayor increases the participation probability by 5.9 percentage points.[7] Given that this probability is 14.1 percent in our sample, this is a sizable effect. The coefficient on the number of networks run by the firm is statistically very significant. An additional network only increases the participation probability by 0.35 percentage points. However a one standard deviation increase (21 additional contracts) increases participation by 7.3 percentage points, an effect similar to political ideology.

In column (3), incumbency fixed effects for the three main firms are controlled for. The omitted category is incumbents that are neither Keolis, nor Transdev, nor Veolia Transport. The three fixed effect coefficients are negative, but only a Veolia Transport incumbency is significantly associated with lower participation. The fact that the coefficients are negative was expected: when the incumbent is none of the three largest firms, participation is likely to be high because the challengers are firms that participate very often. If, on the contrary, Veolia Transport is the incumbent, the potential challengers are firms that, as a group, rarely participate. As a consequence, the coefficients hardly say anything about firms being discouraged by Veolia Tranport, but rather underline that it has a higher participation probability than other firms. The absolute coefficients have little interest in themselves, but their relative sizes are more instructive. In particular, Keolis and Veolia are of a similar size and the coefficients on their incumbency variables are only statistically different with a p-value of 8.3 percent. That suggests Veolia Transport is slightly more aggressive than Keolis is, but only with a somewhat low confidence level. Finally, the year dummies in columns (2) and (3) confirm that firms became more likely to participate to auctions over time.

In column (4), the dependent variable is the number of applicants and the estimation method is a Poisson regression. Unlike columns (1) to (3), data is at the auction level, and not at the firm level, in column (4). Results from the

[7] All presented marginal effects are average marginal effects.

probit regressions are broadly confirmed. The Poisson regression implies that right-wing municipalities receive 1.2 times more applications than left-wing cities do. In column (5), incumbency dummies are added to the regression. They confirm that participation is lower when the incumbent is either Keolis or Veolia Transport. Compared to a situation where the incumbent is none of three main firms, a Keolis incumbency attracts 0.19 fewer applicants, a Veolia Transport incumbency 0.31 fewer. These negative coefficients suggest that a network operated by a smaller firm attracts more competition, as large operators try to get it. Consistently with our description of the market trends, these disparities are much more nuanced in recent years. Using the group of firms excluding Keolis, Transdev, and Veolia Transport, and using a Poisson regression with incumbency dummies interacted with year fixed effects yields the incidence rate ratios presented on Figure 5. The three ratios tend to increase towards 1, such that, in recent years, the numbers of bidders are similar regardless of the incumbent being one of the three largest firms or not. Figure 5 confirms that firms on the urban transport market today participates in more auctions than they used to, and that established market players are challenged in their own cities.

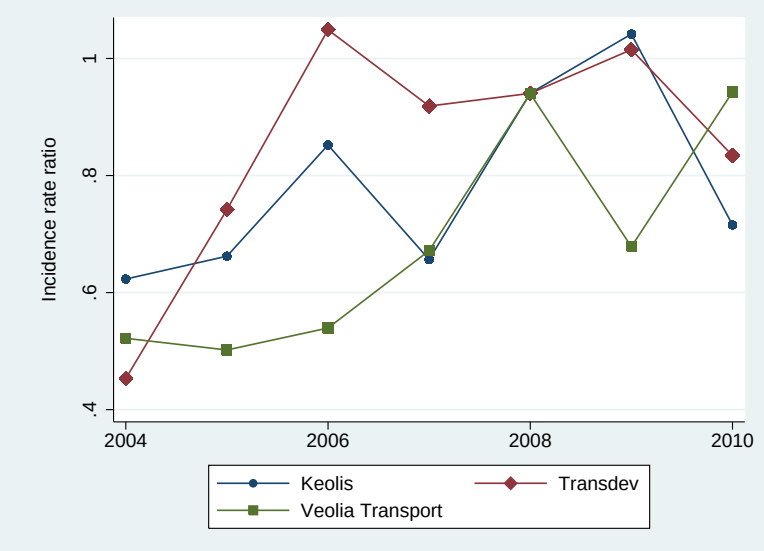

Figure 5: Incidence rate ratio of number of bids, by firm, 2004-2011

4.2.2 Success

Participation and success are not independent decisions. Shocks to participation, or hidden factors, are likely to also affect success, such that one cannot estimate the success probability while ignoring the decision to participate. This amounts to a selection bias, that must be taken care of. The participation equation estimated in Section 4.2.1 provides a selection equation that is now used as a first step in the estimation.

Estimation of models with sample selection typically requires exclusion restrictions, *i.e.* some independent variables of the participation equation should not enter into the success equation. Our assumption is that once a firm has chosen to participate in an auction, the characteristics of the contract should not matter for its success. Exclusion of duration, network size and trips per inhabitant are therefore natural choice and allow estimating the model.

Table 3 first estimates the success equation without accounting for sample selection. Only three variables are included: the inverse of the number of bids, which mechanically affects the probability of winning, an incumbency dummy variable taking the value 1 if the bidding firm is the incumbent, and the size of the firm. Results indicate that incumbents are more likely to win auctions, and that, unsurprisingly, fewer bids increase the probability of success. Firm size does not affect success probability.

The effect is being the incumbent is quite large: it increases success probability by 23 percent. Column (2) reports the results of the estimation of the system of equations (2), which takes sample selection into account.[8] Results are very little changed. In column (3), the identity of the incumbent matters little for the probability of success, suggesting that competition is equally effective across firms. Table 3 shows that the urban transportation market is still characterized by an incumbency bias, despite the increased competition pressure documented above. Figure 1 in Section3 suggests incumbents fared better in 2010-2011 than in 2008-2009. That could indicate they reacted to higher competition and fewer successes in 2008-2009 by making more competitive offers in 2010-2011 and as a consequence managed to renew more contracts. This trend reversal in in-

[8]The participation equation is not reported as it has already been in Section 4.2.1.

cumbency bias would therefore signal a higher quality in the offers they made, or lower prices, and would be a benefit of competition. On the contrary, the lower bias in 2008-2009 could be due to mere luck, and 2010-2011 would be more representative of the market. It is not possible to distinguish between these two interpretations so far.

Table 3: Success determinants

	(1) No sample selection	(2) Sample selection	(3) Sample selection
Incumbent	0.74***	0.79**	0.95**
	(0.16)	(0.35)	(0.37)
Number of bidders, inversed	3.10***	3.09***	3.13***
	(0.37)	(0.38)	(0.39)
Number of networks, lagged	0.0030	0.0034	0.0050
	(0.0032)	(0.0037)	(0.0041)
Keolis incumbent			-0.17
			(0.21)
Transdev incumbent			-0.13
			(0.29)
Veolia incumbent			-0.19
			(0.24)
Constant	-1.91***	-1.98***	-2.11***
	(0.23)	(0.44)	(0.44)
ρ		0.044	0.17
		(0.25)	(0.28)
Observations	360	360	360
χ^2, p-value	6.8e-30	8.7e-20	1.3e-19

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Table 4, we investigate the effect of political ideology on success probability. In particular, we are interested in knowing whether incumbency bias is different in right and left-wing municipalities. This effect is captured through three variables: incumbent, right-wing mayor, and the interaction between these two variables. Columns (1) to (3) show that political ideology plays a strong role in incumbency bias.

Marginal effects[9] are such that when the mayor is from a left-wing party,

[9]Marginal effects are very similar across specifications.

Table 4: Success determinants and political ideology

	(1) No sample selection	(2) Sample selection	(3) Sample selection
Incumbent	1.90***	1.67***	1.67***
	(0.35)	(0.49)	(0.52)
Number of bidders, inversed	3.57***	3.58***	3.66***
	(0.45)	(0.44)	(0.46)
Number of networks, lagged	0.0048	0.0031	0.0031
	(0.0036)	(0.0040)	(0.0045)
Right-wing mayor	0.90***	0.87***	0.88***
	(0.27)	(0.28)	(0.28)
Interaction incumbent*right wing	-1.97***	-1.93***	-1.93***
	(0.41)	(0.41)	(0.41)
Keolis incumbent			-0.057
			(0.24)
Transdev incumbent			-0.12
			(0.33)
Veolia incumbent			-0.089
			(0.27)
Constant	-2.74***	-2.44***	-2.42***
	(0.33)	(0.55)	(0.58)
ρ		-0.16	-0.16
		(0.24)	(0.26)
Observations	301	301	301
χ^2, p-value	2.0e-22	6.6e-16	1.4e-14

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

being the incumbent increases success probability by 50 percentage points. On the contrary, when the mayor is from a right-wing party, being the incumbent decreases this probability by 2 percentage points. Another way to look at this result is by calculating the marginal effect of political ideology on the success probability. For an incumbent, switching from a left-wing to a right-wing mayor, other things being equal, decreases its probability of success by 29 percentage points. These are large effects that emphasize the importance of political ideology. Quite interestingly, results on participation determinants suggest firms anticipate these effects and are more likely to challenge an incumbent when the mayor is from a right-wing party.

While these effects are sizable, we are left wondering why political ideology has such a strong effect. It may only be a proxy for other unobserved factors, or parties could really have a different stance towards procurement auctions.

5 Majority changes

If political factors play in role in incumbency bias and do not capture some unobserved characteristics at the municipality level, then changes brought about by elections should result in variations of this bias. In order to verify this prediction, we reported for each auction whether the political party in charge was already in place during the last election. We created the dummy variable "Change" that takes the value 1 if there was a majority change.

Our intuition is that if a urban transport firm was chosen by a different majority, the new political party running the municipality may be prone to removing it when it runs the next auction. To evaluate this effect, a probit equation for success, with all interaction terms between the incumbent, right-wing, and change dummies, is estimated.

Interaction terms Incumbent*Right-wing and Incumbent*Right-wing*Change in Table 5 show that majority changes do affect renewal probability for incumbents. Coefficients show that there is a significant incumbency bias, but that this is lower in right-wing cities. In addition, majority changes blur the distinction between right and left-wing city councils.

Marginal effects help interpreting Table 5. Introducing political change re-

Table 5: Incumbency bias and majority changes

	(1)
Incumbent	2.40***
	(0.48)
Number of bidders, inversed	3.59***
	(0.46)
Number of networks, lagged	0.0073
	(0.0039)
Right-wing mayor	1.22***
	(0.37)
Incumbent*Right-wing	-1.52***
	(0.55)
Change	0.83*
	(0.49)
Right-wing*change	-0.96
	(0.62)
Incumbent*Right-wing*Change	1.87**
	(0.91)
Constant	-3.17***
	(0.41)
Observations	271
χ^2, p-value	5.0e-20

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

veals some subtle effects. In a left-wing city with no majority change between two subsequent auctions, incumbency raises the probability of success by 59 percentage points. In a right-wing city, this effect is slightly negative, and not significant at all. Left-wing city councils are very likely to renew a partnership they initiated, while this effect is absent in right-wing cities. On the contrary, majority changes annihilate these effects. Incumbency is not a significant advantage with a left-wing city council newly elected. It is neither with a new right-wing city council.

These results suggest, while not constituting a formal proof, that political ideology may influence auction outcomes in itself, and not as a proxy for other variables. They also reveal that the incumbency bias is mostly due to left-wing municipalities that favor incumbents, and especially incumbents they chose in a past auction. Incumbency bias in right-wing cities is non-existent.

6 Conclusion

This paper, though preliminary, uncovers a number of insights on the French urban transport market. Previous studies underlined the low competition levels that characterized this market. Our study shows that dramatic changes have occurred in the last few years, and that competition is now stronger. An important contribution of the paper is its use of a dataset at the firm level, which allows examination of competition beyond the simple incumbency bias. We find that increased competition occurred through higher participation to auctions, but that an incumbency bias is still present. Using data about political majorities in French city council, we show that this bias results from a higher probability success for incumbents in left-wing cities and particularly if they were chosen by a city council of the same political stripe in the past.

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