

# Tenure in Office and Public Procurement\*

Decio Coviello<sup>†</sup>

University of Rome Tor Vergata

Stefano Gagliarducci<sup>‡</sup>

University of Rome Tor Vergata, and IZA

April 19, 2011

## Abstract

We investigate how the functioning of public procurement is affected by the time politicians have stayed in office. We match a data set on public procurement auctions by Italian municipalities to a data set on the politics of municipal governments. For each municipality, we relate the mayor's tenure in office to several outcomes of the procurement process. The main result is that an increase in a mayor's tenure (the number of terms in office) is associated with "worse" outcomes: fewer bidders per auction, a higher cost of procurement, and a higher probability that the winner is local and that the same firm is awarded repeated auctions. We make use of a quasi-experimental change in the electoral law (the introduction of a two-term limit) to argue that the correlation is in fact causal. Finally, we provide a simple theoretical model of repeated auctions in which these findings are consistent with time in office progressively leading to collusion between government officials and a few favored bidders.

JEL Classification: D44, D72, D73, H57, H70.

Keywords: Tenure in office, Procurement auctions, Public works, Term limit.

---

\*We owe special thanks to Nicola Persico for his innumerable suggestions. We also thank seminar participants at Bocconi University, CONSIP, EIEF, Emory University, ICEE 2009, Applied IO School (CEPR/Toulouse) 2010, LAMES 2008, Université de Lausanne, LUISS, MIT, NEUDC 2008, NYU, University of Padua, Petralia Soprana Applied Economics Workshop 2009, RTN 2008, SIE 2009, and University of Virginia for their insightful comments. Finally, we are grateful to Fabio Albiani from the Italian Ministry of Interior for excellent assistance in the collection of the mayoral data, Augusto Leggio and Renato Oliva from the Italian Authority for the Surveillance of Public Procurement (*A.V.C.P.*) for making the auction data available, and Dan Barron for editorial assistance. This research is supported by the Einaudi Institute for Economics and Finance (EIEF) - Research Grant 2009. A previous version of this paper circulated under the title "Building Political Collusion: Evidence from Procurement Auctions". The usual caveats apply.

<sup>†</sup>E-mail: decio.coviello@gmail.com.

<sup>‡</sup>E-mail: stefano.gagliarducci@uniroma2.it.

# 1 Introduction

We investigate how the functioning of public procurement is affected by the time politicians have stayed in office. We match a data set on public procurement auctions by Italian municipalities to a data set on the politics of municipal governments. For each municipality, we relate the mayor's tenure in office to several outcomes of the procurement process. The main result is that an increase in a mayor's tenure (the number of terms in office) is associated with "worse" outcomes: fewer bidders per auction, a higher cost of procurement, and a higher probability that the winner is local and that the same firm is awarded repeated auctions. We make use of a quasi-experimental change in the electoral law (the introduction of a two-term limit) to argue that the correlation is in fact causal. Finally, we provide a simple theoretical model of repeated auctions in which these findings are consistent with time in office progressively leading to collusion between government officials and a few favored bidders.

The broader question addressed in this paper is how the length of an agency relationship (in this case, political agency) might progressively affect its functioning. In the Jacksonian view (Knott and Miller, 1987), frequent rotations of individuals increase accountability, since a politician who has been in power for a longer period of time is more likely to have a protected elite.<sup>1</sup> The same question arises in other contexts. For example, individuals in administrative offices are sometimes rotated in order to avoid capture of the government machinery. Law and consulting firms typically rotate associates across partners, in part to prevent the formation of cliques.<sup>2</sup> We focus on mayors' tenure in office and the provision of public goods through public procurement, which accounts for almost 14.5% (12%) of the GDP of all OECD (Italy) members (Audet, 2002).

To estimate the effect of time in office on public procurement, we compare the outcomes of auctions administrated by mayors with different tenure between 2000 and 2005.

---

<sup>1</sup>Progressives, on the other hand, state that the problem of accountability could be solved by highly professionalizing the bureaucracy and introducing political structures such as city managers and independent regulatory agencies.

<sup>2</sup>Recently, the U.S. approved the Sarbanes-Oxley Act, which imposes audit firms to change every five years the person who is the lead audit partner for each public company client. Moody's and S&P implemented a policy to systematically rotate analysts. Along the same line, several U.S. jurisdictions have district attorneys that are limited to serve for two consecutive terms, many hospitals have Board of Directors with term limit, and there is also a term limit in the office of the The Chairman of the Joint Chiefs of Staff and the Joint Staff itself in the Armed Forces, just to name few.

To identify a causal relationship, we exploit the variation in tenure induced by the introduction of a two-term limit on the mayoral office in March 1993. Since the reform was not retroactive (past terms did not count), and elections across Italian cities do not occur at the same time, the date of election created two groups of otherwise comparable mayors. Mayors appointed before the reform could be reelected for two additional terms, while those appointed after the reform for one only. We rule out the possibility that mayors attempted to resign early and pre-empt the regulation change by inspecting the timing distribution of elections and early terminations. We therefore use the date of first election (before or after March 1993) as an instrument for tenure.

We can also use the introduction of a two-term limit to separate the effects of tenure from the finite political horizon on mayoral behavior.<sup>3</sup> This is a major concern in several studies. Usually, politicians with a binding term limit (i.e., non reelected) share the same tenure in office, which makes it difficult to empirically separate the two effects (Besley and Case, 1995; and Ferraz and Finan, 2010).<sup>4</sup> In our setup, mayors elected for the first time around the reform would eventually face different limits to their tenure: those elected before the reform could remain for three terms, while those elected after the reform were required to leave office after their second term. We compare the two groups of mayors determined by the reform and identify the effect of tenure controlling for the effects of a finite political horizon.

Our main results show that longer tenure in office leads to “worse” outcomes of the procurement process. One additional term in office of the same mayor significantly reduces the number of bidders participating in the auctions (-23.28%) and, more importantly, the winning rebate (-12.68%), which implies a higher price paid by the municipality. A back of the envelope calculation suggests that the average public work costs, other things equal, about 8,000 euros more in municipalities with a third term mayor relative to municipalities with a second term mayor.<sup>5</sup> We also find that having the same mayor in power for an

---

<sup>3</sup>This is relevant in the debate on term limits. The literature identifies at least two forces: first, term limits introduce an “end game effect” which leads to reduced accountability. Second, term limits reduce average tenure, which may be good or bad depending on the value of a politician’s past experience.

<sup>4</sup>Alt et al. (2009) represent an exception. They use the non random variation in the length of gubernatorial term limits across USA states and estimate the two effects separately.

<sup>5</sup>This calculation computed using the estimate of the effect on the winning rebate, for a public work with an average starting value of 509,903 euros.

additional term increases the probability that the contract is awarded to a local firm (+3.20%, although not precisely estimated), or to the same firm repeatedly (+25.52%).

An important concern we need to deal with is that the reform also changed the mayoral electoral rule from party to individual ballot. This might have affected the composition of the treated and control group differently, and thus imperil our identification strategy. However, we find that mayors' characteristics are the same for elections taking place *shortly* before and after the reform, which suggests that any confounding effects due to the change in electoral rule take time to develop. This may be because it takes time for parties to adjust their recruitment policies following a legal change. Therefore, the estimates reported above are fuzzy Regression Discontinuity Design (RDD) estimates which include a function of the time from the reform.

To rationalize this evidence, we propose a simple theoretical model that highlights why the time politicians have stayed in office might affect procurement outcomes. The model, which builds on the literature of favoritism in procurement auction and repeated auctions, assumes that a mayor's time in office reduces asymmetric information between the mayor and the bidders and spurs the matching of collusive types. The model predicts that an increase in tenure is associated with "worse" outcomes, and supports the intuition that time in office progressively leads to collusion between government officials and a few favored bidders.

We discuss one alternative interpretation of our results. It could be that mayors learn the quality of contractors over time (which is not contractible in the procurement auctions under analysis), then favors the highest-quality contractors with work. We repeat our main analysis on a subsample of municipalities that we could match with the data on the purchase of goods and services used in Bandiera et al. (2009). Since these purchases are standardized across municipalities, the price paid is a more precise measure of the procurement costs. We find evidence of a positive and significant effect of time in office over prices, and conclude that this alternative interpretation is not supported by the data.

Finally, we consider a possible mechanism through which time in office "worsens" the outcomes of public procurement. To do so, we analyze the *ex-post* renegotiation of procurement contract terms, which is available for a subsample of municipalities. We consider the extra time to deliver the works and find that when tenure in office increases

there are higher delays. We argue that renegotiations could be one mechanism through which mayors favor preferred bidders, who can therefore bid more aggressively and win with a higher probability.

The rest of the paper is organized as follows. In Section 2, we review the related literature. In Section 3, we describe the Italian institutional background, and in Section 4 the data. In Section 5, we explain the identification strategy, and in Section 6 we present the main results. In Section 7 we outline the conceptual framework that we use to rationalize the evidence, discuss one alternative explanation and one possible mechanism of favoritism. We conclude with Section 8.

## 2 Related Literature

Several authors have emphasized the effect of experience on general measures of political productivity. For example, Padró i Miquel and Snyder (2006) find that productivity, measured by surveying legislators, lobbyists, and journalists in North Carolina about the effectiveness of legislators in the House of Representatives, rises sharply with tenure. More recently, Dal Bó and Rossi (2008) exploit a natural experiment in the Argentine House of Representatives, where term lengths (two or four years) were randomly assigned across members of parliament, to show that longer terms enhance legislative productivity, as measured by attendance, committee activity, and the number of legislative achievements. Our paper can be seen as part of this literature, although we document a deterioration of performance in public procurement auctions, rather than an increase in effectiveness.

Although our question of interest differs, this topic is also related to a number of papers studying the relationship between political stability, horizon, and corruption. Gamboa-Cavazos et al. (2008) use firm-level data for Mexico on extra-official payments made to public authorities. They show that corruption is more intense over long and short political horizons, and less intense over intermediate ones, because of a combination of “horizon” and “capture” effects. Using cross-country data, Campante et al. (2008) find a similar U-shaped relationship between corruption and political stability. Recently, Ferraz and Finan (2010) made two important contributions to the literature. First, they use randomized audit reports on public procurement, from an anti-corruption program in Brazilian

municipalities, to construct new measures of political corruption. Second, they use the Lee (2008) close race election causal framework and report significantly less corruption in municipalities where mayors can get reelected (longer horizon) controlling for pre-office political experience. While these papers study the effect of the remaining time in office (the political horizon) on unlawful behaviors, we focus instead on the elapsed time in office (tenure) and partial out the political horizon effects of the mayors. In this respect, we support the evidence of Besley and Prat (2004), who find a positive correlation between a measure of political longevity and some cross-country measures of corruption.

Finally, our results contributes to a recent literature that looks at the effect of political connections on the allocation of procurement contracts (Goldman et al. 2009a; Hyytinen et al., 2009). While focusing on similar collusive behaviors, we highlight the possibility that political connections may grow with time in office, as it takes time for politicians and firms to reveal their collusive intentions. We also rationalize these findings in a simple but novel theoretical model of repeated auctions where time in office progressively leads to collusion between government officials and a few favored bidders.

### 3 The Institutional Background

The Italian municipal administration (*Comune*) consists of a mayor (*Sindaco*) who supervises an executive committee (*Giunta*), and a council (*Consiglio Comunale*) that endorses the policies proposed by the mayor with majority rule. In addition to contracting for public works, a municipal administration provides public transportation, some welfare programs, and utilities to the community. On March 27, 1993, the mayoral electoral system was changed from party to individual ballot, with a majority premium for the winning candidate of at least two-thirds of the seats in the council (60% in cities with more than 15,000 inhabitants).<sup>6</sup> The same reform also introduced a two-term limit for the mayor, which only applied to the terms elected after the reform (i.e., past terms in office did not

---

<sup>6</sup>The reform was a response to the political crisis that originated on February 1992 from a judicial investigation (so called “*Mani Pulite*”) on the corruption of national and local administrators. This investigation led to the dissolution of the Christian Democratic Party (*Democrazia Cristiana*), which had ruled the country for over forty years, and to the end of the so called “*Prima Repubblica*” (First Republic).

count).<sup>7</sup> After comparing different legislative sources and checking with the Ministry of Internal Affairs, we can confidently rule out the presence of other relevant institutional changes over the same period.

Municipalities are required to outsource public works, and select contractors through public tenders. Tenders are regulated by the *Legge 109/94* (so called “*Legge Merloni*”), and several amendments ( “*Merloni-bis*” in 1995, “*Merloni-ter*” in 1998), which specify all the proceedings of the procurement process.<sup>8</sup> The auctions in our sample are sealed-bid and single-attribute (i.e., the technical and quality components of the offers play no role in the assignment, provided that the winner satisfies some minimum quality standards which are set by the contracting authority). Each auction is administered by a manager, who is directly appointed by the mayor from the bureaucrats of the municipality. The manager supervises the whole procurement process, preparing the preliminary project, advertising and administering the auction, paying the winning firm, and monitoring the realization of the work. In our sample, the manager is replaced 88% of the times if a new mayor is elected, versus 33% if the same mayor is reelected.

Participation to the auctions can be of three types: the *Pubblico incanto*, where participation is open to any firm satisfying some minimum technical requirements; the *Licitazione privata*, which is similar to *Pubblico incanto* except that the contracting authority invites all firms satisfying some technical requirements; or the *Trattativa privata*, where the contracting authority only invites a restricted number of firms, with a minimum of 15.<sup>9</sup> The choice of a particular participation mechanism depends on the starting value of the auction, plus some other technical components.

Firms bid the price at which they are willing to do the work, in the form of a percentage reduction (a rebate) with respect to the auction’s starting value (also called the reserve price).<sup>10</sup> An engineer employed by the municipal administration sets the reserve price,

---

<sup>7</sup>The term limit only applies to terms that last more than two years. In September 2000 the duration of the legislature was extended from four to five years, as it was before March 1993.

<sup>8</sup>Other legislative changes were introduced in 2006, but they did not concern our sample (2000-2005).

<sup>9</sup>The technical requirements for participation must be certified by an external private agency. Other formats include the *Licitazione privata semplificata*, which is substantially similar to the *Licitazione privata*, and the *Appalto concorso*, which is only used for works with a high architectural content starting from 300,000 euros.

<sup>10</sup>The terms of the procurement contract (the time of the work delivery, and the cost of the work) might be renegotiated in cases of unforeseen natural events (like floods, storms, earthquakes, landslides, etc.).

following a price-list of the standardized cost for each type of work. Accordingly, it is plausible to assume that the starting value cannot be adjusted to favor, for example, bidders with a capacity constraint.<sup>11</sup>

Because of a complex awarding criterion, the highest rebate is not necessarily the winning rebate. To prevent firms from over-bidding (that is, bidding a price which does not allow to recoup works' expenses) a complex mechanism is implemented (see Figure 1). After a preliminary trimming of the top/bottom 10% of the collected bids, the bids exceeding the average by more than the average deviation are further excluded, and the winning bid is the highest among the remaining bids, i.e., the one just below this “anomaly threshold”.<sup>12</sup>

The efficiency properties of the adjudication mechanism are derived in Decarolis (2010) and Conley and Decarolis (2010). The former paper characterizes the properties of the Italian method and shows that in this class of auctions there is no role for competition as the number of bidders is uncorrelated with the winning rebate. However, once the possibility of collusion between some of the bidders is taken into consideration (for instance when members of a local cartel compete against non local bidders), the latter paper shows that the “anomaly thresholds” induces competition between the bidders and partially restores some of the properties of first price auctions. We will therefore interpret the evidence as the outcome of a generic first price auction.<sup>13</sup>

## 4 The Data

We use an administrative data set that includes all Italian mayoral terms elected between 1985 and 2008, provided by the Italian Ministry of Interiors (*Ministero degli Interni*). The data set contains information on the identity, gender, age, highest educational attainment, political affiliation, and previous job of the elected mayor. It also contains information

---

<sup>11</sup>Work-safety costs are not subject to rebate.

<sup>12</sup>As for illustration, consider this simple example. In a hypothetical auction, after the trimming of the tails there are three participants placing the following bids (in the form of a rebate over the starting value): 10, 14 and 16. The average bid is thus 13.33. The average difference of the bids above this average bid is 1.12. Thus the “anomaly threshold” is 14.44. It turns out that in this case the winning bid is 14, which is above the average, even if 16% is the highest bidden rebate.

<sup>13</sup>This intuition is also supported by the positive and statistically significant correlation between the number of bidders and the winning rebate (0.424).

about the legislature, including the exact duration of service and the reasons of any eventual early termination, and the electoral results. Finally, we also have yearly information at municipality level about the size of the resident population, the total revenues and expenditure, plus some demographic characteristics as of 2005, like the disposable income per capita, the labor force participation rate, the number of productive units per capita, the elderly index, the population density, and the resident population.

We combine this mayoral information with a data set about the procurement auctions administered by each municipality between 2000 and 2005. This is provided by the Italian Authority for the Surveillance of Public Procurement (*Autorità per la Vigilanza sui Contratti Pubblici di Lavori, Servizi e Forniture, A.V.C.P.*), which collects data on all procurement auctions for public works with starting value greater or equal to 150,000 euros. The data set includes auction-level information about the number of bidding firms, the starting value, the identity of the winning bidder, and the type of the work. Each procurement auction is matched with the corresponding mayoral term, according to the date that the bid was delivered.

## 4.1 Descriptive Statistics

The initial sample consists of all the cities for which we observe at least one auction between 2000 and 2005, and without missing information on the most relevant variables (the number of bidders, the starting value, the winning rebate, the identity of the winning bidder, and the time the mayor has been in office).<sup>14</sup> To maximize sample size, we assign the sample mean (or the mode, if a dummy variable) to other variables with missing data (namely, the budget deficit, the average income per capita, whether the mayor was born in the city/province/region, the mayor's previous job and highest education level, the number of parties in the mayor's coalition, and the fraction of seats in the mayor's coalition), and include a dummy for missing status for these variables. These procedure increases our sample size by about 8.5% and allows us to obtain more precise estimates.<sup>15</sup> We further excluded cities with less than 500 inhabitants to avoid small city effects, and cities in which there had been an early termination in the past for political reasons, to

---

<sup>14</sup>Of the 8,104 existing Italian municipalities, 4,279 had no auctions between 2000 and 2005.

<sup>15</sup>All the results are qualitatively and quantitatively robust to the exclusion of the observations with any missing data.

avoid endogenous electoral cycles. In Table 1 we present summary statistics for the sample of municipalities over which we run the estimation analysis.

The final sample includes 3,825 cities, representatively distributed across the country: 40% located in the North-West of Italy, 20% in the North-East, 14% in the Center, 22% in the South and only 4% in the Islands. The average municipality is fairly large, with 11,668 inhabitants. Only 8% of the observed mayors (5,219, see Table 2) are women and 52% were born in the same municipality they run (85% in the same province, 94% in the same region). About 52% have a college degree, while 47% have a secondary school degree, and the remaining 1% have only an elementary degree.<sup>16</sup> Almost 11% were not employed before being appointed (either unemployed or out of the labor force). Among those employed, the majority worked in high-skilled occupations (77%, including managers, self-employed and entrepreneurs), followed by medium-skilled (9%, including clerks), and low-skilled (3%, including blue-collars).

With respect to political characteristics, 30% of the mayors had been elected with a center-left party, only 11% with a center-right party, and all the rest with a center-wing, separatist or unidentified party (many parties were local). 58% of the mayors are in the first term at the time of the sample, 35% in the second term, and only 7% in the third or fourth term, with 39% facing a term limit. Interestingly, the mayor's party tenure is slightly lower than the mayor's, mostly because some mayors changed party between terms, or because some parties changed their name and could not be matched between terms. Mayoral coalitions are fairly homogeneous (1.31 parties) and stable (67.79% of the seats in the council), as a result of the majority premium awarded to the winning coalition (60% in cities with more than 15,000 inhabitants, 67% in small cities).

Table 3 describes the characteristics of the auctions in the sample, where we excluded few outliers with zero or more than 100 bidders. The data include a total of 27,537 auctions, with an average of 21.34 bidders per auction and a mean winning rebate of 12.97%. The winner was a firm registered in the same city about 12 % of the time (52% in the same province, and 70% in the same region), and on average the highest percentage of auctions within a term awarded to the same firm is 24%. In only 9% of the cases the selection criterion was the private invitation (*Trattativa privata*), the rest being with open

---

<sup>16</sup>All mayors' characteristics computed at the beginning of the term.

participation (*Pubblico incanto* or *Licitazione privata*). The average size of a public work is relatively small, with an average starting value of 540,000 euros.<sup>17</sup> The majority of the public works concern the construction of roads (23%), schools (13%), public building (5%), public housing (1%), or art-related constructions (4%). It is also interesting to note that the number of auctions per year was constant over the period 2000 and 2004 (between 15% and 20% per year), although there are fewer auctions in 2005 when the sample was originally collected.

## 5 Identification Strategy

We want to test whether a mayor's tenure affects the outcomes of procurement auctions administered in the city. We assume that the outcome of an auction  $i$ , managed by a mayor  $m$ , can be specified in the following linear form:

$$y_{im} = \alpha + \beta T_{im} + \delta_1 X_i + \delta_2 X_m + \nu_{im}, \quad (1)$$

where  $y_{im}$  is the outcome of the auction;  $T_{im}$  denotes the mayor's tenure in office at the time of the bids' delivery;  $X_i$  is a vector of auction characteristics;  $X_m$  is a vector of mayor and city characteristics; and  $\nu_{im}$  represents the disturbance term, which includes a mayor specific fixed effect  $\eta_m$  and the usual white noise component  $\epsilon_{im}$ . The main coefficient of interest is  $\beta$ . We perform the analysis at auction level, using for  $T_{im}$  both the exact time in office at the date of the bids' delivery and the term in office.<sup>18</sup>

In equation (1), we specify  $X_i$  and  $X_m$  using the following sets of characteristics. To control for geographical and municipal effects we include: the resident population in the municipality at the beginning of the term, to proxy for the number of potential competitors and any other size effect; a full set of dummies for all the 20 Italian regions, to control for time invariant characteristics at the local level; an indicator for the judicial efficiency at year-region level, to control for differences in the quality of local institutions;<sup>19</sup> the budget percentage deficit over the total revenues, to control for the efficiency of the

---

<sup>17</sup>Monetary values in 2000 equivalents, using the OECD CPI index.

<sup>18</sup>We compute cluster adjusted standard errors to allow for a generic mayor-level error component.

<sup>19</sup>This is computed as the ratio between settled and incoming cases for each regional administrative court (*TAR*), and for public works related disputes.

municipal administration; and a set of indicators for the year of the delivery of the bid, to control for possible time effects. To address the heterogeneity of the projects, we include: a second order polynomial in the starting value of the auction (i.e., the reservation price of the contracting authority) in 100 thousand Euro increments and deflated to the 2000 price level; an indicator of whether the selection mechanism of the auction was by public participation or by private invitation; and five project type dummies (road, school, building, housing, art). To control for the characteristics of the mayors, we include: gender; age; four education dummies; four previous occupation dummies; an indicator for whether the mayor had been appointed before in any other municipal elective office; and whether the mayor was born in the same region. Finally, to control for the electoral characteristics of the mayoral term, we include: an indicator for whether the mayor faces a term limit; the number of parties in the mayor's coalition; the number of majority seats belonging to the mayoral coalition; two dummies for the mayor's party (center-left and center-right); the tenure in office of the mayor's party, measured in terms; and a dummy for whether the bid was delivered in the last year before the next scheduled election, to capture electoral cycles within terms, and address the censoring of terms that starting before 2000 or to be concluded after 2005.

With respect to  $y_{im}$ , the data set contains a large number of outcomes that could measure how effectively the procurement process is working. We divide these measures in two sets: the *level of competition*, and the *nature of competition*. The *level of competition* set includes the number of bidders and the final percentage rebate over the reservation price. The *nature of competition* set includes an indicator for whether the winning firm is registered in the same region of the contracting authority, and the maximum percentage of adjudications to the same firm per year (weighted by the number of auctions), the latter being term invariant.<sup>20</sup>

## 5.1 The Electoral Reform: Instrumental Variables

In this section we address the endogeneity of the time in office ( $T_{im}$ ). Mayors who are willing to collude might be able to survive longer if the rents produced by collusive be-

---

<sup>20</sup>Since we do not observe all the auctions within a term, but only those between 2000 and 2005, we could not compute other measures of tenure in office, like the probability that the winning firm had already been awarded, or the number of times that the same firm had been awarded in the past.

haviors help them to be reelected. Conversely, mayors who collude might find it difficult to get reelected if voters punish their unlawful behavior on the ballot.

We deal with this problem by taking advantage of an electoral reform, approved on March 1993, which induced variation in the potential time in office of a randomly chosen group of mayors. As explained in Section 3, the reform introduced a two-term limit for mayors. Interestingly, the limit only applied to the terms elected after the reform, leading to two groups of mayors: those elected for the first time within five years before the reform (the treatment group) could stay in office for at most three terms, as the first term was not included in the computation of the term limit, while those elected for the first time after the reform (the control group) for at most two terms. In Figure 3 we graphically illustrate the potential effect of the reform on these two groups. Here, the continuous lines denote the first term around the reform, while the shaded lines the potential additional terms faced by each two group of mayors.

The institutional framework offers a unique natural experiment, because the timing of local elections is not completely synchronized between nor within regions (to a certain degree, any city has its own scheduling, depending on region/province/city-specific past events). These differences provide a source of heterogeneous variation across the country. For our identification strategy to hold, however, what really matters is that mayors could not anticipate the introduction of the term limit, in which case we could treat the potential time in office “as if randomly” assigned. Since the bill of the reform was first submitted to the national parliament on July 4, 1992, and finally approved on March 27, 1993, we can confidently assume that the reform was indeed unexpected. To rule out the possibility that some mayors systematically resigned before the natural termination of the term to take advantage of a potential extra term, we will further inspect the frequency distribution of the election timing around March 1993 and look for any suspicious density jump.

As a by-product of the reform, Figure 3 shows that some mayors would then face the term limit when in the second term, while others would face it only in the third term. Thus, comparing second term mayors with and without a term limit, and second term and third term mayors with a term limit, will allow us to separate the effect of the time in office from the effect of the lack of electoral accountability (i.e., finite political horizon). In other words, we can estimate an empirical model which includes an indicator for the

number of terms in office and one for the presence of a term limit.<sup>21</sup>

Following the above discussion, we re-estimate equation (1) within a two-stage least squares framework. As an exclusion restriction in the first-stage, we use an indicator for whether the mayor was elected for the first time before March 1993, and then add the full set of available regressors considered in the baseline specification. The resulting first-stage is:

$$T_{im} = a + bPR_m + c_1X_i + c_2X_m + e_{im} \quad (2)$$

where, because of the term invariant nature of the instrument,  $T_{im}$  is the number of terms in office, and  $PR_m$  indicates whether the date of the first election was before March 27, 1993.<sup>22</sup> This estimate is calculated for the sample of mayors elected for the first time between five years before and four years after the electoral reform (i.e., between March 27, 1988 and March 27, 1997, as the duration of the legislature before and after the reform was 4 and 5 years, respectively), to be sure that no one in the sample could be reelected for a second term before the implementation of the reform. This procedure delivers a final sample of mayors in the second term (with or without a binding term limit) and in the third term.

## 5.2 Multidimensionality of the Reform

One threat to our identification strategy comes from the validity of the exclusion restriction. The 1993 reform, in fact, also introduced another change in the institutional setting that might have had a direct effect on the way public procurement auctions were administered.<sup>23</sup> In particular, the reform changed the mayor's electoral rule from party to individual ballot. This may have induced a different selection of candidates, because the

---

<sup>21</sup>The same argument applies in the estimation of equation (1).

<sup>22</sup>Other estimation strategies could have been implemented. With repeated observations per mayor, over terms and auctions, we could exploit the longitudinal structure of the data. Under the assumption that unobserved collusion is time/auction invariant, and in presence of enough within-mayor variability, the fixed-effect estimator is a powerful solution for the omission of any time/auction invariant characteristic, like the propensity to collude. However, we decided not follow this strategy for two reasons. First, because the assumption of time/auction invariance of collusion is not reasonable in our context, as unlawful behaviors may grow with time in office. Second, because in our data the within-mayor variation in the number of terms is much smaller than the between-mayor variation, which makes it difficult to deliver precise fixed-effect estimates.

<sup>23</sup>The reform also introduced a majority premium for the mayor's coalition of at least two-thirds of the seats in the council (see Section 3). This feature is not relevant for our analysis, except for the effect on the probability of early termination. We will discuss this point in Section 6.2.1.

new electoral system encouraged competition between candidate and reduced party interference with voting.<sup>24</sup> Although this is a major concern, it is worth recognizing two things. First, this selection bias is minimal within the 2SLS sample, since between 2000-2005 all the mayors had gone through at least one individual ballot election. Second, while the term limit applied sharply after the reform, the introduction of individual ballot elections probably had a delayed effect on candidate selection, since it was initially difficult for parties to recruit suitable candidates for the new system. If this is true, we can reduce the bias from the changing electoral rule by focusing on mayors elected immediately before and after the 1993 reform.

Following a fuzzy Regression Discontinuity Design (fuzzy-RDD) approach, we augment equation (1) and (2) with a function of the distance of the first election from the discontinuity threshold as follows:

$$y_{im} = \alpha + \beta_1 T_{im} + \beta_2 f(dist_m) + \delta_1 X_i + \delta_2 X_m + \nu_{im} \quad (3)$$

and,

$$T_{im} = a + b_1 PR_m + b_2 g(dist_m) + c_1 X_i + c_2 X_m + e_{im} \quad (4)$$

where  $dist_m$  is the time distance of the first election from the March 1993 reform, and  $f(\cdot)$  and  $g(\cdot)$  are flexible functions. Since the running variable is not continuous, as elections are held at few points in time (see Figure 4), we specify  $f(\cdot)$  and  $g(\cdot)$  as a series of time dummies. As discussed in Lee (2008), the fuzzy RDD framework also allows us to test for the validity of the exogeneity assumption by comparing a set of pre-intervention characteristics for the treated and the control group. If there were nonrandom selection around the 1993 reform, we should expect some of these characteristics to differ systematically.

## 6 Empirical Evidence

In Figure 2, we plot the term average of six variables that characterize the procurement process, for the case of a first term mayor who is reelected for a second term, and does not face a term limit. We report the total number of auctions per term and the starting value per auction, as well as the number of bidders, the winning rebate and the geographical

---

<sup>24</sup>See Section 3 for more details.

identity of the winner per auction, plus the highest percentage of auctions awarded to the same firm within the term.<sup>25</sup> Looking at the figure, we do not detect any significant variation in the number and the size of the public works over terms, except for a slightly higher number of auctions in the first term. This is evidence that the amount of construction works is independent from the electoral cycle, and simply follows the necessities of the municipality.<sup>26</sup> We find instead some preliminary evidence that a higher tenure leads to deteriorating auction outcomes, with a clear drop in both the number of bidders and in the winning rebate when a mayor is elected for a second time, and a positive jump in the probability that the winning firm is local and in the highest percentage of auctions awarded to the same firm.<sup>27</sup> Therefore, we focus the empirical analysis on the auction outcomes (the number of bidders, the winning rebate, and the identity of the winner), and treat the number and the size of public works as if exogenously pre-determined.

## 6.1 OLS Estimates

In Table 4 and Table 5 we report the OLS results from fitting equation (1) to the data. Estimates in columns 1 and 4 are computed controlling for the exact time in office (cumulative and consecutive) at the time of the bids' delivery. We first include only an indicator for whether the term limit is binding or not, while in columns 2 and 5 we also include the full set of observable characteristics discussed in Section 5. Finally, in columns 3 and 6 we report the same estimates, but replacing the number of years with the number of terms in office.

In Panel A and B of Table 4 we report estimates of the effect of tenure on the number of bidders and the winning rebate (the *level of competition*). Estimates confirm the presence of a negative relationship between mayors' tenure in office and the level of competition in

---

<sup>25</sup>The total number of auctions and the highest percentage of auctions awarded to the same bidder are computed on the mayoral terms elected between 1998 and 2003, to provide at least three observed years per term.

<sup>26</sup>The construction of public infrastructures is usually determined in advance in accordance with the central government, which allocates the transfers.

<sup>27</sup>The *p-values* of the test for the difference in the means over terms are 0.263 for the number of auctions, 0.417 for the starting value of the projects, 0.001 for the number of bidders, 0.002 for the winning rebate, 0.017 for the likelihood that winning firm is local, and 0.02 for the highest percentage of auctions awarded to the same firm. We find similar figures for the case of a mayor reelected for a second term, but facing a term limit. The only difference is that the drop in the number of bidders and in the winning rebate is smaller.

the procurement auctions. A one standard deviation increase in the years in office (3.24 years) is associated with a decrease in the number of bidders by about 6.6% (with respect to a sample mean of 21.33 bidders), and with a decrease in the winning rebate by 3.7% (with respect to a sample mean of 12.97%). Similarly, one additional term in office is associated with a decrease in the number of bidders and in the winning rebate by about 10.1% and 5.7%, respectively. The invariance of the estimates with respect to the measurement unit (years or terms) is also reassuring, since theoretically the different duration of the terms elected before and after September 2000 (4 and 5 years) could influence our results.

The coefficient on the term limit is statistically significant over the number of bidders, showing higher participation when a mayor is about to leave the office, but with no effects on the final adjudication price. The estimated coefficients on the resident population are all positive and statistically different from zero for both outcomes at the 1% level, suggesting remarkable size effects: the bigger the market, the higher the number of potential competitors. The coefficient on the starting value is also positive and statistically different from zero for both outcomes, which is evidence that the bigger the size of the public work, the more potential bidders are willing to enter.<sup>28</sup> We do not find instead any effect of the mayor's party tenure on both outcomes, which makes us think that, because of the increased power of the mayor following the 1993 reform, political parties might have become less important in the procurement assignment. We also do not find any effect on the percent of seats belonging to the mayor's coalition, but we do find some positive effect for the number of parties in the mayor's coalition on the winning rebate, which is statistically significant at the 10% level. The latter is evidence that a high level of heterogeneity within the government coalition reduces the possibility of coordination in shaping the auction process.

In Panel A and B of Table 5 we report parameter estimates when the dependent variable is an indicator of whether the winning firm is registered in the same region or the highest percentage of auctions awarded to the same firm within the term (the *nature of competition*). In both of these regressions, the effect is both statistically and economically

---

<sup>28</sup>Interestingly, the trend is reverted when the size of the work is too high (the square term, not reported, is in fact negative and significant), probably because of some production and financial constraints. Note also that the law shapes the admission requirements as a function of the starting value of the auctions (increasing, concave, and discontinuous).

significant. A one standard deviation increase in time in office is associated with an increase in the probability that the winner is a local firm by about 2.2% (with respect to a sample mean of 70.46%), and with an increase in the maximum percentage of auctions assigned to the same firm by 10.3% (with respect to a sample mean of 24.41%).<sup>29</sup> Similarly, one additional term in office is associated with an increase in the probability that the winner is local by about 3.8% and 14.7%, respectively. The estimated coefficient on the resident population is positive for the first outcome, but not for the second, while the coefficient on the starting value is always negative and statistically different from zero for both outcomes, which is compatible with the idea that other agents (either citizens or competing firms) are more likely to closely monitor large public projects. We also find a positive and statistically significant effect of the mayor's party's tenure on the maximum percentage of auctions assigned to the same firm, but not on the probability that the winner is local. The same is true for the percentage of seats belonging to the mayor's coalition, and for the number of parties in the mayor's coalition, which are both negative and statistically significant.

## 6.2 2SLS Estimates

Although the OLS estimates included a large number of observable characteristics, it could still be that hidden collusive behavior might aid a mayor's reelection campaign, or that informed voters might punish collusion. Either of these effects, would severely bias the OLS estimates. To take care of the potential reverse causality between  $T_{im}$  and  $y_{im}$ , we present the results of a 2SLS estimation, where we use the shift in the mayor's tenure induced by the March 1993 reform as an excluded instrument.

### 6.2.1 Validity Tests

Before presenting the 2SLS results, we discuss the quality of the instrument. We first report evidence that the election timing was independent from the reform by graphically

---

<sup>29</sup>We run the same estimation on the probability that the winning firm is registered in the same province/city. Results are quantitatively and qualitatively the same, although less statistically significant. We also included in all the estimates a quadratic term for the time in office to capture any eventual non-linearity, but this was never statistically significant. Finally, we excluded from the sample the auctions with a restricted participation procedure (*Trattativa Privata*), and did not find any difference in the results.

inspecting the distribution of elections around March 1993. Figure 4, compares the frequency of elections (in brown) and early terminations (in green) for any political reason over time.<sup>30</sup> Between 1985 and 2008 elections were held regularly, up to a certain degree of asynchronism. Early terminations, however, were more frequent before March 1993, because the winning coalition did not receive a majority premium at that time. To check more carefully whether there is a mass point of early resignations around March 1993, we focus the graphical inspection on a closer neighborhood of the reform, i.e., on the elections held between March 1992 and March 1994 only (see Figure 5). In this interval there are a few anticipated elections (red full rectangles) and also a few delayed elections (blue full rectangles). Most importantly, the majority of anticipated elections did not serve the purpose of avoiding the reform (red empty rectangles), and few of the mayors who postponed the election were then appointed for another term (blue empty rectangles).

As discussed in Section 5, another potential threat to the validity of the 1993 reform as an instrument comes from the multi-dimensionality of the reform itself, which also introduced individual ballot elections. If so, mayors elected before and after the reform might differ in their observable and unobservable characteristics because of the different selection process. However, if individual ballot elections did not immediately affect mayoral elections, because of the initial difficulty for parties to recruit candidates suitable to the new system, we should not observe significant differences between mayors elected immediately before and after the 1993 reform.

In Table 6, we report the sample averages of mayors' characteristics by treatment status for the entire sample of mayors. We consider five different time windows, and test for statistical difference in the following characteristics: gender, age, whether born in the same region, whether employed at a low occupational level, whether a college graduate, whether previously appointed to any other municipal office, and whether reelected for a second term.<sup>31</sup> These variables should not be affected by the electoral reform, although they

---

<sup>30</sup>An early termination is any anticipated conclusion of the term for one of the following reasons: a) the resignation of the mayor; or b) the resignation of the majority of the council or a no-confidence vote in the council. At 2008, we do not know whether the terms elected after 2002 terminated earlier. The variable is therefore missing after 2002.

<sup>31</sup>We also compared a set of dummies for whether the mayor was born in the same province/region, and for other levels of occupation/education, but results were qualitatively the same. Other city-level characteristics, like the resident population or the geographical location, would not be balanced if the election timing was to a certain degree coordinated, as it actually was, across regions. Accordingly, we

might depend on the same unobservable characteristics that are likely to affect the auction mechanism. Numbers in Panel A show that the differences for a one-year symmetric window (March 1992-March 1994) are never statistically different from zero. The same is true when we use a two-years symmetric window (Panel B). Three or four years after the reform, there were systematically more female elected (see Panel C and D), mayors were more educated, more experienced, and had a higher reelection probability compared to three or four years before the reform. In Panel E we present the same tests over the largest asymmetric window (March 1988-March 1997) that we use in the estimation of equation (4). As expected, almost all the differences are statistically significant, including the occupational level.<sup>32</sup> Numbers are consistent with the plots in Figure 7, where we draw a running-mean smoothing of the observed values, performed separately on either side of the 1993 reform.

Taken together, this evidence highlights a positive trend in the quality of the elected mayors, rather than a sharp change after the reform. Accordingly, we specify  $f(\cdot)$  and  $g(\cdot)$  in equation (4) as a set of year dummies, excluding the two years before and after the March 1993 reform.

### 6.2.2 Results

Tables 7 and 8 report the 2SLS estimates on the number of bidders, the winning rebate, the probability that the winning firm is local, and the maximum percentage of auctions assigned to the same firm within the term, for the sample of mayors elected for the first time between five years before, and four years after the March 1993 reform.

The first column in Table 7 reports the first-stage estimate of the effect of the reform on the actual time in office. Mayors elected for the first time before the reform accumulate an average of 0.988 terms more than mayors elected after the reform, with the first-stage F-statistic of the excluded instrument suggesting that the instrument is relevant.

In columns 2 and 4 of Table 7 we first report the OLS estimates over the 2SLS sample, include these two variables in every specification, together with the other controls.

---

<sup>32</sup>A more accurate test would be to check the same characteristics over the sample of mayors that we use in the 2SLS estimation. However, the small estimation sample size (198 mayors in the March 1992-March 1994 window, and 335 in the March 1991-March 1995) would not deliver precise statistics. We assume therefore that, up to some small sample bias, if the balancing property is fulfilled over the whole sample of mayors, it is also fulfilled over the estimation sample. See Section 6.2.3 for a more extensive discussion.

to exclude any sample specific effect, while in columns 3 and 5 we report the second-stage estimates for the fully specified 2SLS model. We find that one additional term in office causes a 23.28% decrease in the number of bidders (with respect to a sample mean of 19.70), and a 12.68% reduction in the winning rebate (with respect to a sample mean of 11.68%). In Table 8 we report evidence of the relationship between the time in office and the probability that the winning firm is local, and for the maximum percentage of auctions assigned to the same firm within the term. Estimated coefficients in columns 2 and 4 are positive for both outcomes, but not statistically different from zero for the probability that the winning firm is local. In particular, a one term increase in the time in office causes a 25.52% increase in the maximum percentage of auctions assigned to the same firm within the term (with respect to a sample mean of 24.37%). It is also interesting to note that the 2SLS estimates are systematically higher than the OLS estimates over the same sample, both in Table 7 and in Table 8. According to the discussion in Section 5, this difference should be interpreted as evidence that the less colluded mayors are more likely to gain reelection, and therefore survive longer.<sup>33</sup>

### 6.2.3 Discussion

In this section we discuss two major concerns related to our identification strategy.

First, as we only observe the mayors who were elected around 1993 and then survived until 2000-2005, which might introduce a sample selection bias in the estimates. In particular, mayors elected before and after the reform may systematically differ over two dimensions. On the one hand, they may have a different probability of first reelection: we show in Table 6 that both treated and control mayors have about 80% probability of being elected for a second term. On the other hand, mayors elected before the reform may be further selected in the second reelection round: we find that, within the estimation sample, all the second term mayors without a term limit were then reelected for a third term. These probabilities are also compatible with the first-stage estimate of the effect of the reform on the actual number of terms in office (0.988, see column 1 in Table 7), which, if there was a sample selection bias, should be significantly lower than 1.

---

<sup>33</sup>We estimated the same 2SLS model on a sample including the mayors elected for the second, third and fourth time within five years before the 1993 reform, to gain in sample size (9,277 auctions instead of 8,801). Results were quantitatively and qualitatively the same.

Second, at the time of first election mayors appointed before the 1993 reform had potentially an infinite political horizon, while those elected after the reform could stay in office for at most two terms. While this difference had no impact on their *ex-post* incentives, because at 2000-2005 they all knew about the term limit, it might still be the case that the different career perspectives at the time of first election had affected their *ex-ante* decision to run for a mayoral office. Political careers, however, are not limited to the municipality office. Almost 14% of the mayors with a term limit at 2000-2005 later continued their career at higher offices (province, region, or national parliament). In particular, we do not find any statistical difference between mayors elected before and after the reform on this probability, which corroborates the assumption that they actually had similar political horizons.

## 7 Conceptual Framework

In this section we illustrate a simple theoretical model that we use to rationalize the evidence. The model highlights two key characteristics of public procurement auctions: the possibility for politicians and bidders to exchange favors; and the repeated nature over time of this interaction. The model adapts the results from the literatures on favoritism in procurement auctions (Arozamena and Weinschelbaum, 2009; Burguet and Perry, 2009) and on repeated auctions (Skrzypacz and Hopenhayn, 2004), to show that time in office helps politicians to build collusive relationships with bidders.

Figure 6 describes the time-line of the model for a generic period/auction  $t$ . Collusion takes place in a sequence of two hypothetical stages, over infinitely many first-price auctions.<sup>34</sup> In the first stage, a new mayor searches for a collusive bidder. The mayor, in exchange for a bribe, commits to reveal the highest bid, and that will allow the bidder to adjust his bid after the auction takes place. In the second stage, the favored bidder can adjust his original bid and win, if the highest bid was lower than his own private valuation.

---

<sup>34</sup>As we have shown in Section 6.2.3, while mayors have term limits, still a significant fraction of them (14%) is later appointed at higher offices. It is then plausible to assume that they actually face a continuation game. Moreover, if the payoffs in the continuation game are large enough, collusion is still an equilibrium even when the continuation probability is small (Mailath and Samuelson, 2006). Using the available procurement data, we find that projects administered by provincial governments are larger (an average starting value of 650,000 euros).

In this case, he earns the difference between his valuation and the highest bid, minus the bribe. A long-lived relationship is settled if the mayor is matched with a collusive bidder; otherwise in the next period/auction he searches for another bidder.

In what follows we illustrate the model by focusing on one generic sub-game and discuss the main assumptions. We then present the predictions of the model and its implications.

## 7.1 Stage 1: Collusion/Search Game

At any point in time ( $t$ ), for  $t = (1, 2, \dots)$ , a mayor is delegated by the principal (the citizens) to run one sealed-bid first price auction.<sup>35</sup> In each auction there are  $N_t$  bidders, and entry is costless. The mayor is randomly matched with one of the  $N_t$  bidders. In exchange for the promise of a bribe  $B > 0$ , he commits to reveal the highest bid and to let the bidder adjust the bid after the auction takes place, as well as every future auction.<sup>36</sup> The bribe is assumed to be fixed and exogenously determined.<sup>37</sup> The mayor has no costs of revealing the information, and can test only one bidder per auction. With probability  $\pi$  he is matched with a collusive bidder, i.e., a bidder who is willing to pay a bribe; otherwise he is matched with a non-collusive bidder who is not willing to pay the bribe. In this simplified setup, the mayor's per-period expected revenues from collusion are strictly positive and larger than the revenues from non collusion, as  $V_c^m = \pi B + (1 - \pi)0 > V_{nc}^m = 0$ . Hence, it is always optimal for the mayor to collude. If no collusion occurs then at the beginning of period  $t + 1$  the mayor searches for another bidder.

The bidder's decision problem is to choose whether to pay or not the bribe  $B$ . The bribe is assumed to be fixed and exogenously determined. This decision depends on the exogenous costs of collusion  $C_j$ : collusive bidders have low cost of collusion  $C_L$ , while non-collusive  $C_H$ , with  $C_H > C_L$ . If the matched bidder is of a collusive type,  $V_c^b > V_{nc}^b > 0$  and paying  $B$  is always optimal (where  $V_c^b$  and  $V_{nc}^b$  are the expected revenues from collusion and from a standard first price auction). If the matched bidder is non-collusive,

---

<sup>35</sup>From now on, we will refer to a generic ascending auction, which is equivalent in its functioning to a descending procurement auction.

<sup>36</sup>The agreement is reached in Stage 1, but the transfer in Stage 2 after the auction takes place.

<sup>37</sup>We do not have direct evidence of favoritism (bids adjustments, envelopes substitutions, or fake bids submissions) and bribes exchanges as for example in Ferraz and Finan, (2010), Ingraham (2005) and Tran (2010). However, the cases of kickbacks in Italian procurement auctions, reported by newspapers, share the same dynamics discussed in the literature.

$V_{nc}^b > (V_c^b - B) < 0$  and he will never pay the bribe  $B$ .

## 7.2 Stage 2: Procurement Auctions with Collusion

At the beginning of each Stage 2, bidders' valuations of the good  $\nu_i$  are identically and independently drawn from the c.d.f.  $F(\nu)$ , with support over the interval  $[\underline{\nu}, \bar{\nu}]$  within the independent private value framework.  $F(\nu)$  is assumed log concave, hence the ratio  $\alpha(\nu_i) = \frac{F(\nu_i)}{f(\nu_i)}$  is increasing and bidders are risk neutral. There is no reserve price, and the bidder with the highest bid is awarded the auction.

The core of this setup is the information structure. We denote by  $h(t)$  the public history of the game. At the beginning of every period/auction, the  $N_t - 1$  non-favored bidders learn  $t$ , the time the mayor has been in office. This information is publicly known, likewise the proportion of collusive bidders in the population  $\pi$ . Bidders use this information to compute  $P_t = 1 - (1 - \pi)^t$ , the probability that the mayor has found a collusive bidder after  $t$  independent trials, which is increasing in  $t$ . The auction, therefore, is asymmetric: with probability  $P_t$  there is one favored bidder, and with  $1 - P_t$  there are  $N_t - 1$  non-favored bidders. To avoid both explicit and tacit collusion between bidders, we assume that bidders do not communicate and that the identity of present and past winners is not immediately observed (Skrzypacz and Hopenhayn, 2004). We also restrict the attention to equilibria where players' bids depend only on their current valuation and the public history of the game. This is equivalent to assume that at every auction there is a new set of non-collusive bidders replaced, for example because they rotate across municipalities.<sup>38</sup>

The auction proceeds as follows. A favored bidder (denoted by  $c$ ) is allowed to observe the highest bid  $b_h$ , and may opt to adjust his original bid and set  $b_c = b_h + \varepsilon$  if this is lower than his valuation,  $v_c$ . The  $N_t - 1$  other bidders are all symmetric, and their beliefs about the collusive bidder are reflected in  $P_t$ . Bidding is guaranteed by the fact that some of the  $N_t - 1$  bidders in any auction may value the good more than the colluded bidder.

Assuming that the expected continuation payoffs of winning or losing the auction for the non-collusive bidders are the same as in a one-shot game, we describe the per-period bidding behavior of the  $N_t - 1$  non-favored bidders. A non-favored bidder solves a

---

<sup>38</sup>This assumption is compatible with the requirements of the procurement law that prescribes contractors to submit financial guarantees before bidding. Depending on their assets, contractors, might then be limited in the possibility of participating in succeeding auctions.

maximization problem according to a strictly increasing inverse bidding function  $\phi(\cdot)$ :

$$\max_b (\nu_i - b) [P_t(F(\phi(b))^{(N-2)}F(b) + (1 - P_t)(F(\phi(b))^{(N-1)})] \quad (5)$$

where the term in square brackets is the probability that a non-favored bidder  $i$  wins the auction by bidding  $b$ ,  $F(\cdot)^{(N-2)}$  is the probability that a non-favored bidder defeats the  $N - 2$  honest rivals, and  $F(b)$  is the probability of defeating the favored bidder.

We consider a symmetric equilibrium where  $\nu_i = \phi(b)$  for all the non-favored bidders. Given the information structure, we can consider each auction as independent and use the results from Arozamena and Weinschelbaum (2009). If  $\alpha(\nu) = \frac{F(\nu)}{f(\nu)}$  is strictly concave, then  $\phi_t(b) < \phi_{t+1}(b)$ , as  $\phi_t(b)$  is strictly increasing in  $t$  for all  $b > \underline{\nu}$ , and the per-period expected revenues of the auction (the per-period coalition's expected utility) are decreasing (increasing) when  $0 \leq P_t < P_{t+1} \leq 1$ .

This simplified model only considers the case in which the mayor reciprocates the bribe by showing the highest bid to the colluded bidder, then allowing that bidder to adjust his price. Other equivalent mechanisms could be considered, though. For example, the mayor could grant the collusive bidder *ex-post* favorable renegotiations relative to the original contract, both in terms of time to delivery and costs. In this way, the colluded bidder can bid more aggressively, even above its valuation, and win the auction with a higher probability than if all firms were equally competitive.<sup>39</sup> We will empirically investigate this possibility in Section 7.4.

After the auction is run, with some exogenous probability the term in office of the mayor ends, and with the complementary probability the mayor continues in office and runs one more auction next period.

### 7.3 Predictions

In this model an equilibrium is defined by the mayor, the favored bidder, and the non-favored bidders optimization problems, plus the commonly known probability of collusion  $P_t$ . A public perfect Bayes-Nash equilibrium exists because: i) it is always optimal for the mayor to ask for a bribe; ii) it is optimal for the collusive bidder to pay the bribe; iii) the

---

<sup>39</sup>Cai et al. (2009) study public auctions of leaseholds in the urban land market in China, and report evidence that land bureaus grant *ex-post* favors (like the violation of floor to area restrictions) to some colluded bidders.

equilibrium bidding function of non-favored bidders maximizes equation (5) in a perfect Bayes-Nash Equilibrium; (iv) it is optimal for non-collusive bidders not to pay the bribe. As long as  $P_t$  is increasing in  $t$ , one potential equilibrium of the model is characterized by a gradual diffusion of collusion over periods/auctions, where in each following period/auction non-colluded bidders learn the probability that the mayor has found a colluded bidder, and behave accordingly.<sup>40</sup> The model delivers the following predictions:

**Prediction 1** *As the mayor's tenure in office increases, the probability that auctions are assigned to the same bidder increases.*

**Proof.** By construction of  $P_t$ , if  $0 < \pi < 1$  then  $P_{t+1} > P_t$ .

**Prediction 2** *As the mayor's tenure in office increases, the revenues from the auction decrease.*

**Proof.** This follows from the results of Proposition 3, pg. 651 of Arozamena and Weinschelbaum (2009) as in our setup each auction can be treated as independent and the increase in  $P_t$  exogenously determined by the time in office of the mayor.

In presence of entry costs, the number of bidders may also depend on the mayor's tenure in office. The main intuition is that non-favored bidders will enter up to the point where their expected profit is larger than the entry cost  $k$ , with  $k > 0$  (Menezes and Monteiro, 2000). Since  $P_{t+1} > P_t$ , the expected profits of non-colluded bidders should also decrease with  $t$ , thus reducing the participation of less efficient bidders. Therefore, when entry is costly we expect that:

**Prediction 3** *As the mayor's tenure in office increases, the number of bidders per auction decreases.*

---

<sup>40</sup>A more sophisticated equilibrium should consider the role of citizens/voters (the principal) in disciplining mayors (the agent) granting or not reelection. This would clearly enrich the dynamics of the model and the number of testable predictions, at the price of complicating the analysis of collusive dynamics. We leave this extension to further research, while addressing its empirical implications in Section 5. There, we discussed how the interaction between mayors and voters could bias our empirical analysis, and how our identification strategy allows us to take voters' behavior as exogenous.

We also enrich the model by arguing that local bidders might have lower costs of bribing (or lower entry costs), i.e., they find easier to pay the bribe to the mayor. If types (local or not) are not perfectly observed before the first interaction, it follows that:

**Prediction 4** *As the mayor's tenure in office increases, the probability that the winner is local increases.*

Finally, we extend the model and consider the effect of a policy that removes the mayor from politics at the end of every period (a one period term limit in politics). Since in this new scenario the structure of the game is the same, we can focus on the probability of collusion computed by the non-favored bidders ( $P_t = 1 - (1 - \pi)^t$ ). Accordingly, every period non-favored bidders know that the mayor is new mayor ( $t = 1$ ) and matches with a collusive bidder with probability ( $\pi$ ), so the model predicts:

**Prediction 5** *A policy that rotates the mayor every period delivers a constant level of collusion, and the outcomes of the auctions are constant over time.*

**Proof.** It is a sequence of one shot games with  $P_t = P_1 = \pi$ , which is constant  $\forall t$ .

## 7.4 Discussion

We use the predictions of the model to interpret the empirical findings of Section 6 as evidence that, when a mayor stays in power for longer, there is a higher probability of collusion. Accordingly, one extra term in office reduces the winning rebate (-12.68%, as in Prediction 2), because the non-favored firms update the probability that there might be a favored bidder at the beginning of each period, and then bid less aggressively. For the same reason, the number of bidders decreases (-23.28%, as in Prediction 3), since non-favored bidders will opt out and save on the entry cost, while favored bidders will be awarded a higher percentage of auctions (+25.52%, as in Prediction 1). Lastly, we find that local firms collude more when the mayor stays in power for longer (+3.2%, as in Prediction 4), although this prediction receives less support in 2SLS analysis.

We are aware that there could be other competing explanations to our empirical findings. For example, the evidence of an increasing cost of procurement might be explained

with an improvement in the quality of the public works (which is not contractible in these procurement auctions), rather than an increase in political collusion. As time in office increases, a mayor learn the quality of bidders and decide to favor those who previously delivered the highest quality. This will also lead to an increase in the cost of procurement, and in the probability that the later auctions will be awarded to the same firm. To test this possibility, we repeated our empirical exercise using the data set of Bandiera et al. (2009), which contains detailed information about the quantity and the quality of a set of standardized goods and services purchased by a sample of 68 Italian municipalities over the period 2000-2005. Despite sample size limitations, we find that the price for an average good, conditional on its quality, increases by about 16% (statistically significant at 5% level) at each additional term in office.<sup>41</sup> This falsification exercise on an external sample indicates that screening for quality is not the sole reason that we observe higher procurement prices over time.

We conclude our analysis describing one possible mechanism that the mayor might use to favor contractors. As we discussed in Section 7.2, a mayor can reciprocate the bribe either by showing to the colluded bidder the highest bid and allow for an adjustment, or by granting an *ex-post* renegotiation of the initial contractual terms, which would allow favored bidders to bid more aggressively.<sup>42</sup> While we have no evidence on the first type of mechanism, for some municipalities in two regions (*Lombardy and Piedmont*) we have data on the exact date of delivery of the public work. In this sample (288 mayors, 900 auctions), almost 90% of the works were delivered, with an average of 171 days of delay. To quantify the effect of time in office on *ex-post* renegotiation, we repeated our empirical exercise considering as dependent variable both the probability of a delay, and the actual days of delay. We find that each additional term in office increases the probability of delay by 0.04 (not statistically significant), and the number of days of delay by 55.5 (statistically significant at 5% level), which correspond to a 4% and 32% increase per term, respectively.

---

<sup>41</sup>We excluded the purchases made through the central purchasing authority (*CONSIP*).

<sup>42</sup>Renegotiations are a common practice in Italian procurement. During the period 2005-2008, *CONSIP*, made 4,095 random inspections on the *ex-post* renegotiations of the procurement contracts for goods and services and found a total of 1,455 contractual infringements. Only 4% of the associated penalties were payed.

## 8 Conclusions

In this paper we used a matched mayor-auction data set to provide novel empirical evidence on the extent to which politicians can influence public procurement. Our main result is that, when politicians stay in power longer, there is a systematic deterioration in the functioning of the auction mechanism: we observe less participation, a higher cost of public works, and an increase in the probability that the winner is an insider and the same firm wins more often. This effect persists even after controlling for a large set of mayor, city, and electoral characteristics, as well as for the endogeneity of time in office using an instrumental variable approach. With the aid of a stylized theoretical model of favoritism in repeated procurement auctions, we interpret these findings as evidence that, when a mayor stays in power for longer, controlling for future eligibility for reelection, there is a higher probability of collusion. Alternative explanations for the effect of time in office do not find support in the data, while the *ex-post* renegotiation of the time of delivery of the work seems to be a potential channel to favor contractors.

From the point of view of a regulator interested in rationalizing public spending, our empirical findings, also supported by the predictions of the stylized model, encourage the implementation of policies favoring political turnover (for example, through a term limit), such that political collusion could be reduced and competition in public procurement restored. To the extent the functioning of procurement auctions is sensitive to the repeated interaction between politicians and local bidders, our findings also suggest that the local economy might benefit from introduction of policies (for example, through the institution of a central purchasing authority) aimed at limiting the power that politicians can exercise through public procurement.

## References

- Alt, J., Bueno de Mesquita, E., and S. Rose, 2009. Accountability and Competence in Elections: Theory and Evidence from U.S. Term Limits. Mimeo.
- Arozamena, L., and F. Weinschelbaum, 2009. The Effect of Corruption on Bidding Behaviour in First-Price Auctions. *European Economic Review*, 53, 645-657.
- Audet, D., 2002. Government Procurement: A Synthesis Report. *OECD Journal on Budgeting*, 2, 149-194.
- Bandiera, O., Prat, A., and T. Valletti, 2009. Active and Passive Waste in Government Spending: Evidence from a Policy Experiment. *American Economic Review*, 99, 1278-1308.
- Besley, T., and A. Case, 1995. Does Political Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits. *Quarterly Journal of Economics*, 110, 769-98.
- Besley, T., and A. Prat, 2006. Handcuffs for the Grabbing Hand? The Role of the Media in Political Accountability. *American Economic Review*, 96, 720-736.
- Burguet, R., and M.K. Perry, 2009. Preferred Suppliers in Auction Markets. *The RAND Journal of Economics*, 40, 283-295.
- Cai, C., Henderson, V., and Zhang, Q., 2009. Chinas Land Market Auctions: Evidence of Corruption?. Mimeo.
- Campante, F., Chor, D., and Q. Do, 2008. Instability and the Incentives for Corruption. *Economics & Politics*, 21, 42-92.
- Conley, T., and F. Decarolis, 2010. On Collusion in Average Bid Auctions. Mimeo.
- Dal Bó, E., and M. Rossi, 2008. Term Length and Political Performance. NBER WP n.14511.
- Decarolis, F., 2010. When the Highest Bidder Loses the Auction: Theory and Evidence from Public Procurement. Mimeo.
- Ferraz, C., and F. Finan, 2010. Electoral Accountability and Corruption: Evidence from the Audits of Local Governments. *American Economic Review*, forthcoming.
- Gamboa-Cavazos, M., Garza-Cantu, V., and C.E. Salinas, 2007. The Organization of Corruption: Political Horizons and Special Interests. Mimeo.

- Goldman, E., Rocholl, J., and J. So, 2009a. Political Connections and the Allocation of Procurement Contracts. Mimeo.
- Hyytinen, A., Lundberg, S., and O. Toivanen, 2009. Politics and Procurement: Evidence from Cleaning Contracts. Mimeo.
- Ingraham, A., 2005. A test for collusion between a bidder and an auctioneer in sealed-bid auctions. *Contributions to Economic Analysis and Policy*, 4, Article 10.
- Knott, J., and G. J. Miller, 1987. *Reforming Bureaucracy: The Politics of Institutional Choice*. New Jersey: Prentice-Hall, Inc..
- Lee, D.S., 2008. Randomized Experiments from Non-random Selection in the U.S. House Elections. *Journal of Econometrics*, 142, 675-697.
- Mailath, G.J., and L. Samuelson. 2006. *Repeated Games and Reputations*. Oxford: Oxford University Press.
- Menezes, F.M., and P.K. Monteiro, 2000. Auctions with Endogenous Participation. *Review of Economic Design*, 5, 71-89.
- Padró i Miquel, G., and J. Snyder, 2006. Effectiveness and Legislative Careers. *Legislative Studies Quarterly*, 31, 347-381.
- Skrzypacz, A., and H. Hopenhayn, 2004. Tacit Collusion in Repeated Auctions. *Journal of Economic Theory*, 114, 153-169.
- Tran, A., 2010. Which Regulations Reduce Corruption? Evidence from the Internal Records of a Bribe-Paying Firm. Mimeo.

## Tables and Figures

Table 1: City characteristics

|                  | Mean   | St.Dev. | Min | p25   | p50   | p75   | Max       |
|------------------|--------|---------|-----|-------|-------|-------|-----------|
| North-West       | 0.40   | 0.49    | 0   | 0     | 0     | 1     | 1         |
| North-East       | 0.20   | 0.40    | 0   | 0     | 0     | 0     | 1         |
| Center           | 0.14   | 0.35    | 0   | 0     | 0     | 0     | 1         |
| South            | 0.22   | 0.41    | 0   | 0     | 0     | 0     | 1         |
| Islands          | 0.04   | 0.19    | 0   | 0     | 0     | 0     | 1         |
| Population       | 11,668 | 63,363  | 504 | 1,807 | 3,845 | 8,412 | 2,733,908 |
| N. cities: 3,825 |        |         |     |       |       |       |           |

Notes. Cities with at least one auction between 2000-2005, and with a population greater than 500. *Population* is the number of resident inhabitants at the beginning of the first observed term.

Table 2: Mayor/Term characteristics

|                               | Mean  | St.Dev. | Min   | p25   | p50   | p75   | Max   |
|-------------------------------|-------|---------|-------|-------|-------|-------|-------|
| Female                        | 0.08  | 0.28    | 0     | 0     | 0     | 0     | 1     |
| Age                           | 49.88 | 9.15    | 25.30 | 43.40 | 49.62 | 55.82 | 84.28 |
| Born in the city              | 0.52  | 0.50    | 0     | 0     | 1     | 1     | 1     |
| Born in the province          | 0.85  | 0.36    | 0     | 1     | 1     | 1     | 1     |
| Born in the region            | 0.94  | 0.24    | 0     | 1     | 1     | 1     | 1     |
| <i>Education:</i>             |       |         |       |       |       |       |       |
| Secondary                     | 0.52  | 0.50    | 0     | 0     | 1     | 1     | 1     |
| College                       | 0.47  | 0.50    | 0     | 0     | 0     | 1     | 1     |
| <i>Employment:</i>            |       |         |       |       |       |       |       |
| Not employed                  | 0.11  | 0.32    | 0     | 0     | 0     | 0     | 1     |
| Low-skilled                   | 0.03  | 0.18    | 0     | 0     | 0     | 0     | 1     |
| Medium-skilled                | 0.09  | 0.28    | 0     | 0     | 0     | 0     | 1     |
| High-skilled                  | 0.77  | 0.42    | 0     | 1     | 1     | 1     | 1     |
| <i>Political party:</i>       |       |         |       |       |       |       |       |
| Center-right                  | 0.11  | 0.31    | 0     | 0     | 0     | 0     | 1     |
| Center                        | 0.06  | 0.23    | 0     | 0     | 0     | 0     | 1     |
| Center-left                   | 0.30  | 0.46    | 0     | 0     | 0     | 1     | 1     |
| Separatist                    | 0.01  | 0.09    | 0     | 0     | 0     | 0     | 1     |
| Others                        | 0.54  | 0.50    | 0     | 0     | 1     | 1     | 1     |
| <i>Political experience:</i>  |       |         |       |       |       |       |       |
| Previous experience           | 0.62  | 0.49    | 0     | 0     | 1     | 1     | 1     |
| Years in office (as mayor)    | 2.30  | 3.24    | 0     | 0     | 0     | 4.14  | 14.97 |
| Term in office (as mayor) = 1 | 0.58  | 0.49    | 0     | 1     | 1     | 1     | 3     |
| Term in office (as mayor) = 2 | 0.35  | 0.48    | 0     | 0     | 1     | 1     | 3     |
| Term in office (as mayor) = 3 | 0.05  | 0.21    | 0     | 0     | 0     | 1     | 3     |
| Term in office (as mayor) = 4 | 0.02  | 0.17    | 0     | 0     | 0     | 1     | 3     |
| Term limit binding            | 0.39  | 0.49    | 0     | 0     | 0     | 1     | 1     |
| Party tenure (years)          | 1.77  | 2.63    | 0     | 0     | 0     | 4.14  | 15.78 |
| Party tenure (terms)          | 0.41  | 0.60    | 0     | 0     | 0     | 1     | 4     |
| <i>Mayor's coalition:</i>     |       |         |       |       |       |       |       |
| N. parties mayor's coalition  | 1.31  | 0.99    | 1     | 1     | 1     | 1     | 12    |
| Seats mayor's coalition (%)   | 67.79 | 7.52    | 60    | 66.67 | 66.67 | 66.67 | 100   |
| N. seats above majority       | 2.89  | 1.08    | 1     | 2     | 3     | 3     | 14    |
| N. terms: 5,209               |       |         |       |       |       |       |       |

Notes. Mayors with no early terminations in the past. *Secondary* includes both lower and upper secondary education. *Low-skilled* includes blue-collar, *Medium-skilled* clerks, and *High-skilled* entrepreneurs and self-employed. *Previous experience* is a dummy for whether the mayor was in the council or in the executive committee before. *Years/terms in office (as mayor)* without interruption. *Term limit binding* is a dummy for whether the mayor cannot be reelected. *Party tenure* is the tenure of the mayor's party in years/terms. *N. parties mayor's coalition* is the number of parties in the mayor's coalition. *N. seats above majority* is the number of seats for the mayor's coalition above the absolute majority.

Table 3: Auction characteristics

|                                     | Mean  | St.Dev. | Min  | p25  | p50   | p75   | Max    |
|-------------------------------------|-------|---------|------|------|-------|-------|--------|
| <i>Outcome:</i>                     |       |         |      |      |       |       |        |
| Number of bidders                   | 21.34 | 21.12   | 1    | 5    | 14    | 31    | 100    |
| Winning rebate (in %)               | 12.97 | 8.39    | 0    | 6.90 | 12.42 | 17.10 | 49.99  |
| Winner in the city                  | 0.12  | 0.33    | 0    | 0    | 0     | 0     | 1      |
| Winner in the province              | 0.52  | 0.50    | 0    | 0    | 1     | 1     | 1      |
| Winner in the region                | 0.70  | 0.46    | 0    | 0    | 1     | 1     | 1      |
| Max (%) wins same firm              | 0.24  | 0.25    | 0.02 | 0.08 | 0.16  | 0.33  | 1      |
| <i>Selection mechanism:</i>         |       |         |      |      |       |       |        |
| Direct negotiation                  | 0.09  | 0.29    | 0    | 0    | 0     | 0     | 1      |
| <i>Characteristics of the good:</i> |       |         |      |      |       |       |        |
| Starting value                      | 5.40  | 9.35    | 1.34 | 2.03 | 2.94  | 5.16  | 190.83 |
| Road                                | 0.23  | 0.42    | 0    | 0    | 0     | 0     | 1      |
| School                              | 0.13  | 0.33    | 0    | 0    | 0     | 0     | 1      |
| Building                            | 0.05  | 0.22    | 0    | 0    | 0     | 0     | 1      |
| Housing                             | 0.01  | 0.11    | 0    | 0    | 0     | 0     | 1      |
| Art                                 | 0.04  | 0.19    | 0    | 0    | 0     | 0     | 1      |
| Others                              | 0.54  | 0.50    | 0    | 0    | 1     | 1     | 1      |
| <i>Year bid delivery:</i>           |       |         |      |      |       |       |        |
| 2000                                | 0.15  | 0.36    | 0    | 0    | 0     | 0     | 1      |
| 2001                                | 0.20  | 0.40    | 0    | 0    | 0     | 0     | 1      |
| 2002                                | 0.21  | 0.41    | 0    | 0    | 0     | 0     | 1      |
| 2003                                | 0.20  | 0.40    | 0    | 0    | 0     | 0     | 1      |
| 2004                                | 0.15  | 0.36    | 0    | 0    | 0     | 0     | 1      |
| 2005                                | 0.09  | 0.29    | 0    | 0    | 0     | 0     | 1      |
| N. auctions: 27,537                 |       |         |      |      |       |       |        |

Notes. Auctions for works with starting value greater or equal than 150,000 euros, and no more than 100 bidders. *Winner in the city/province/region* is a dummy for whether the winning firm is registered in the same city/province/region. *Max % wins same firm* is the highest percentage of auctions assigned to the same firm within the term, and is term invariant. *Direct negotiation* is a dummy for the selection mechanism being a *Trattativa privata*. *Starting value* is the reserve price set by the contracting authority, in 100,000 euros (2000 equivalents).

Table 4: Time in office and the *level of competition*, OLS

|                              | (1)                   | (2)                  | (3)                  | (4)                        | (5)                  | (6)                  |
|------------------------------|-----------------------|----------------------|----------------------|----------------------------|----------------------|----------------------|
| Mean outcome:                | A: N. bidders = 21.33 |                      |                      | B: Winning rebate = 12.97% |                      |                      |
| N. years in office           | -1.111***<br>(0.133)  | -0.434***<br>(0.116) |                      | -0.409***<br>(0.063)       | -0.148***<br>(0.045) |                      |
| N. terms in office           |                       |                      | -2.153***<br>(0.538) |                            |                      | -0.741***<br>(0.218) |
| Term limit binding           | 5.199***<br>(1.386)   | 2.354***<br>(0.889)  | 2.702***<br>(0.927)  | 0.284<br>(0.651)           | 0.137<br>(0.378)     | 0.261<br>(0.407)     |
| Population                   |                       | 0.067***<br>(0.025)  | 0.067***<br>(0.025)  |                            | 0.057***<br>(0.014)  | 0.057***<br>(0.014)  |
| Starting value               |                       | 0.685***<br>(0.077)  | 0.685***<br>(0.077)  |                            | 0.086***<br>(0.011)  | 0.087***<br>(0.011)  |
| Party tenure (terms)         |                       | -0.373<br>(0.470)    | -0.375<br>(0.471)    |                            | -0.351<br>(0.213)    | -0.351<br>(0.214)    |
| N. parties mayor's coalition |                       | 0.293<br>(0.187)     | 0.295<br>(0.187)     |                            | 0.160*<br>(0.095)    | 0.160*<br>(0.095)    |
| N. seats above majority      |                       | -0.262<br>(0.191)    | -0.269<br>(0.191)    |                            | 0.006<br>(0.087)     | 0.004<br>(0.088)     |
| Female                       |                       | -0.038<br>(0.817)    | -0.028<br>(0.817)    |                            | -0.085<br>(0.295)    | -0.081<br>(0.295)    |
| Age                          |                       | 0.010<br>(0.031)     | 0.010<br>(0.031)     |                            | 0.023*<br>(0.013)    | 0.023*<br>(0.013)    |
| N. auctions                  | 27,537                | 27,537               | 27,537               | 27,537                     | 27,537               | 27,537               |
| R-squared                    | 0.008                 | 0.215                | 0.215                | 0.015                      | 0.444                | 0.444                |
| Region fixed effects         | no                    | yes                  | yes                  | no                         | yes                  | yes                  |
| Year dummies                 | no                    | yes                  | yes                  | no                         | yes                  | yes                  |
| City characteristics         | no                    | yes                  | yes                  | no                         | yes                  | yes                  |
| Auction characteristics      | no                    | yes                  | yes                  | no                         | yes                  | yes                  |
| Mayor characteristics        | no                    | yes                  | yes                  | no                         | yes                  | yes                  |
| Electoral characteristics    | no                    | yes                  | yes                  | no                         | yes                  | yes                  |

Notes. Estimates on 4,787 mayors (5,209 terms). *N. bidders* is the number of firms that submitted a bid. *Winning Rebate* is expressed as a percentage discount from the the starting value. *Term limit binding* is a dummy for whether the mayor cannot be reelected. *Population* is the number of resident inhabitants at the beginning of the term, in 10,000. *Starting value* is the reserve price set by the contracting authority, in 100,000 euros (2000 equivalents). *Party tenure (terms)* is the tenure of the mayor's party in terms. *N. parties mayors' coalition* is the number of parties in the mayor's coalition. *N. seats above majority* is the number of seats for the mayor's coalition above the absolute majority. When denoted with "yes", regressions additionally include *Region fixed effects* (19 dummies); *Year dummies* (2000-2004) refer to the year of bid delivery; *City characteristics* (disposable income per capita in 2005; judicial efficiency at year-region level; budget deficit in percentage of the revenues at year level); *Auction characteristics* (squared term of the starting value, 5 object characteristics dummies, 1 selection mechanism dummy); *Mayor characteristics* (2 education dummies, 3 previous occupation dummies, a dummy for being born in the region); *Electoral characteristics* (a dummy for being in the last year before the next election, 2 political party dummies, a dummy for previous experience in council or executive committee). All mayoral and electoral characteristics as at the beginning of the term. Standard errors robust to clustering at the mayor level in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Table 5: Time in office and the *nature of competition*, OLS

|                              | (1)                     | (2)                  | (3)                  | (4)                              | (5)                  | (6)                  |
|------------------------------|-------------------------|----------------------|----------------------|----------------------------------|----------------------|----------------------|
| Mean outcome:                | A: Winner local = 70.46 |                      |                      | B: Max % wins same firm = 24.41% |                      |                      |
| N. years in office           | 1.442***<br>(0.188)     | 0.486**<br>(0.200)   |                      | 1.967***<br>(0.287)              | 0.777***<br>(0.287)  |                      |
| N. terms in office           |                         |                      | 2.652***<br>(0.960)  |                                  |                      | 3.581***<br>(1.384)  |
| Term limit binding           | -7.100***<br>(1.457)    | -1.846<br>(1.478)    | -2.503<br>(1.555)    | -6.947***<br>(2.156)             | -2.201<br>(1.665)    | -2.552<br>(1.821)    |
| Population                   |                         | 0.070***<br>(0.025)  | 0.070***<br>(0.025)  |                                  | -0.024<br>(0.037)    | -0.024<br>(0.037)    |
| Starting Value               |                         | -0.978***<br>(0.075) | -0.979***<br>(0.075) |                                  | -0.099***<br>(0.028) | -0.100***<br>(0.028) |
| Party tenure (terms)         |                         | 1.124<br>(0.855)     | 1.118<br>(0.856)     |                                  | 2.128**<br>(0.830)   | 2.130**<br>(0.832)   |
| N. parties mayor's coalition |                         | 0.470<br>(0.352)     | 0.469<br>(0.351)     |                                  | -1.273***<br>(0.287) | -1.276***<br>(0.288) |
| N. seats above majority      |                         | -0.383<br>(0.461)    | -0.374<br>(0.460)    |                                  | -1.350***<br>(0.381) | -1.345***<br>(0.382) |
| Female                       |                         | 0.355<br>(1.476)     | 0.349<br>(1.475)     |                                  | -1.087<br>(1.355)    | -1.103<br>(1.355)    |
| Age                          |                         | 0.042<br>(0.068)     | 0.041<br>(0.068)     |                                  | -0.064<br>(0.052)    | -0.063<br>(0.052)    |
| N. auctions                  | 27,537                  | 27,537               | 27,537               | 23,110                           | 23,110               | 23,110               |
| R-squared                    | 0.003                   | 0.080                | 0.080                | 0.026                            | 0.299                | 0.299                |
| Region fixed effects         | no                      | yes                  | yes                  | no                               | yes                  | yes                  |
| Year dummies                 | no                      | yes                  | yes                  | no                               | yes                  | yes                  |
| City characteristics         | no                      | yes                  | yes                  | no                               | yes                  | yes                  |
| Auction characteristics      | no                      | yes                  | yes                  | no                               | yes                  | yes                  |
| Mayor characteristics        | no                      | yes                  | yes                  | no                               | yes                  | yes                  |
| Electoral characteristics    | no                      | yes                  | yes                  | no                               | yes                  | yes                  |

Notes. Estimates on 4,787 mayors (5,209 terms) for *Winner local*. Estimates on 3,725 mayors (4,322 terms) for *Max % wins same firm* (terms elected between 1998 and 2003). *Winner local* indicates whether the winning firm is registered in the same region. *Max % wins same firm* is the highest percentage of auctions assigned to the same firm within the term, and is term invariant. *Term limit binding* is a dummy for whether the mayor cannot be reelected. *Population* is the number of resident inhabitants at the beginning of the term, in 10,000. *Starting value* is the reserve price set by the contracting authority, in 100,000 euros (2000 equivalents). *Party tenure (terms)* is the tenure of the mayor's party in terms. *N. parties mayors' coalition* is the number of parties in the mayor's coalition. *N. seats above majority* is the number of seats for the mayor's coalition above the absolute majority. When denoted with "yes", regressions additionally include *Region fixed effects* (19 dummies); *Year dummies* (2000-2004) refer to the year of bid delivery; *City characteristics* (disposable income per capita in 2005; judicial efficiency at year-region level; budget deficit in percentage of the revenues at year level); *Auction characteristics* (squared term of the starting value, 5 object characteristics dummies, 1 selection mechanism dummy); *Mayor characteristics* (2 education dummies, 3 previous occupation dummies, a dummy for being born in the region); *Electoral characteristics* (a dummy for being in the last year before the next election, 2 political party dummies, a dummy for previous experience in council or executive committee). All mayoral and electoral characteristics as at the beginning of the term. Standard errors robust to clustering at the mayor level in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Table 6: Mayors' characteristics around the March 1993 reform

|                                 | Elected before March 1993 | Elected after March 1993 |               |
|---------------------------------|---------------------------|--------------------------|---------------|
|                                 | Mean                      | Mean                     | p-value diff. |
| A: $-12/+12$ months bandwidth   |                           |                          |               |
| Female                          | 0.065                     | 0.063                    | 0.703         |
| Age                             | 44.396                    | 43.920                   | 0.541         |
| Local                           | 0.947                     | 0.947                    | 0.967         |
| High-skilled                    | 0.822                     | 0.830                    | 0.814         |
| College                         | 0.544                     | 0.541                    | 0.934         |
| Previous experience             | 0.444                     | 0.430                    | 0.727         |
| Probability of first reelection | 0.831                     | 0.780                    | 0.338         |
| N. mayors                       | 65                        | 772                      |               |
| B: $-24/+24$ months bandwidth   |                           |                          |               |
| Female                          | 0.063                     | 0.066                    | 0.818         |
| Age                             | 44.824                    | 44.119                   | 0.271         |
| Local                           | 0.953                     | 0.941                    | 0.425         |
| High-skilled                    | 0.813                     | 0.820                    | 0.756         |
| College                         | 0.496                     | 0.550                    | 0.106         |
| Previous experience             | 0.398                     | 0.424                    | 0.433         |
| Probability of first reelection | 0.736                     | 0.775                    | 0.398         |
| N. mayors                       | 91                        | 1,164                    |               |
| C: $-36/+36$ months bandwidth   |                           |                          |               |
| Female                          | 0.044                     | 0.080                    | 0.000         |
| Age                             | 44.328                    | 44.379                   | 0.798         |
| Local                           | 0.940                     | 0.936                    | 0.379         |
| High-skilled                    | 0.780                     | 0.780                    | 0.981         |
| College                         | 0.375                     | 0.442                    | 0.000         |
| Previous experience             | 0.344                     | 0.525                    | 0.000         |
| Probability of first reelection | 0.789                     | 0.807                    | 0.137         |
| N. mayors                       | 1,479                     | 3,623                    |               |
| D: $-48/+48$ months bandwidth   |                           |                          |               |
| Female                          | 0.043                     | 0.080                    | 0.000         |
| Age                             | 44.372                    | 44.397                   | 0.901         |
| Local                           | 0.940                     | 0.937                    | 0.506         |
| High-skilled                    | 0.780                     | 0.780                    | 0.934         |
| College                         | 0.380                     | 0.443                    | 0.000         |
| Previous experience             | 0.328                     | 0.527                    | 0.000         |
| Probability of first reelection | 0.785                     | 0.805                    | 0.089         |
| N. mayors                       | 1,543                     | 3,782                    |               |
| E: $-60/+48$ months bandwidth   |                           |                          |               |
| Female                          | 0.040                     | 0.080                    | 0.000         |
| Age                             | 44.657                    | 44.397                   | 0.155         |
| Local                           | 0.944                     | 0.937                    | 0.108         |
| High-skilled                    | 0.756                     | 0.780                    | 0.003         |
| College                         | 0.383                     | 0.443                    | 0.000         |
| Previous experience             | 0.253                     | 0.527                    | 0.000         |
| Probability of first reelection | 0.773                     | 0.805                    | 0.003         |
| N. mayors                       | 1,992                     | 3,782                    |               |

Notes. All mayors at first election. *High-skilled* includes entrepreneurs and self-employed. *Local* is a dummy for being born in the same region. *Probability of first reelection* is a dummy for whether the mayor was then reelected for a second term. *Previous experience* is a dummy for whether the mayor was in the council or the executive committee before.

Table 7: Time in office and the *level of competition*, *fuzzy-RDD*

|                              | (1)                  | (2)                  | (3)                  | (4)                 | (5)                  |
|------------------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
| <i>Dependent variable:</i>   | N. terms in office   | N.<br>bidders        | N.<br>bidders        | Winning<br>rebate   | Winning<br>rebate    |
| Method:                      | OLS                  | OLS                  | 2SLS                 | OLS                 | 2SLS                 |
| Stage:                       | First                |                      | Second               |                     | Second               |
| Mean outcome:                | 2.07                 | 19.70                | 19.70                | 11.68%              | 11.68%               |
| N. terms in office           |                      | -2.604***<br>(0.876) | -4.284***<br>(1.381) | -0.530<br>(0.324)   | -1.444***<br>(0.441) |
| Elected before March 1993    | 0.988***<br>(0.009)  |                      |                      |                     |                      |
| Term limit binding           | 0.832***<br>(0.049)  | -0.241<br>(1.976)    | 1.052<br>(2.211)     | -0.760<br>(0.749)   | 0.077<br>(0.824)     |
| Population                   | 0.000<br>(0.000)     | 0.094*<br>(0.049)    | 0.091*<br>(0.047)    | 0.041***<br>(0.005) | 0.041***<br>(0.004)  |
| Starting value               | 0.000<br>(0.000)     | 0.796***<br>(0.092)  | 0.795***<br>(0.092)  | 0.116***<br>(0.023) | 0.116***<br>(0.022)  |
| Party tenure (terms)         | 0.018***<br>(0.005)  | -1.089<br>(0.788)    | -0.778<br>(0.752)    | -0.320<br>(0.245)   | -0.204<br>(0.241)    |
| N. parties mayor's coalition | 0.002*<br>(0.001)    | 0.084<br>(0.284)     | 0.139<br>(0.275)     | 0.364***<br>(0.098) | 0.381***<br>(0.098)  |
| N. seats above majority      | -0.002<br>(0.002)    | 0.197<br>(0.293)     | 0.148<br>(0.288)     | 0.031<br>(0.119)    | 0.018<br>(0.119)     |
| Female                       | -0.009**<br>(0.005)  | 2.000<br>(1.379)     | 1.957<br>(1.318)     | -0.089<br>(0.526)   | -0.099<br>(0.528)    |
| Age                          | -0.001***<br>(0.000) | 0.090*<br>(0.047)    | 0.085*<br>(0.046)    | 0.033**<br>(0.015)  | 0.032**<br>(0.015)   |
| N. auctions                  | 8,801                | 8,801                | 8,801                | 8,801               | 8,801                |
| R-squared                    | 0.939                | 0.234                | 0.236                | 0.426               | 0.428                |
| F-exc.-Inst                  | 12,403               |                      |                      |                     |                      |
| Region fixed effects         | yes                  | yes                  | yes                  | yes                 | yes                  |
| Year dummies                 | yes                  | yes                  | yes                  | yes                 | yes                  |
| City characteristics         | yes                  | yes                  | yes                  | yes                 | yes                  |
| Auction characteristics      | yes                  | yes                  | yes                  | yes                 | yes                  |
| Mayor characteristics        | yes                  | yes                  | yes                  | yes                 | yes                  |
| Electoral characteristics    | yes                  | yes                  | yes                  | yes                 | yes                  |

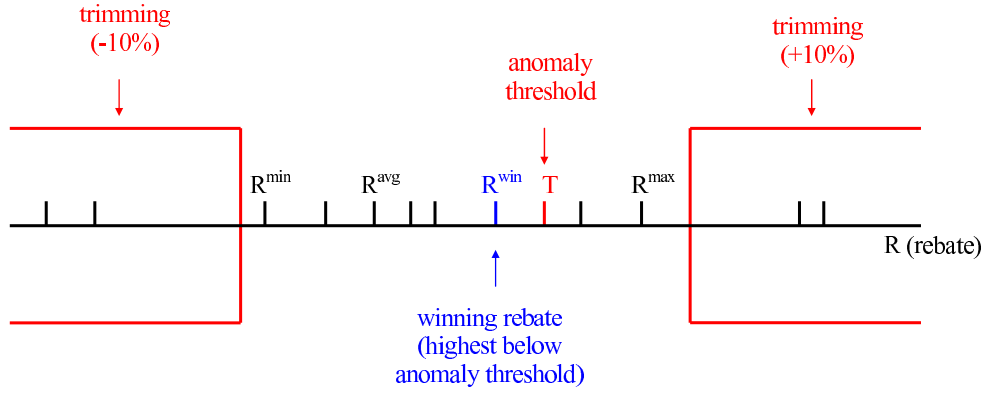
Notes. Estimates on 1,627 mayors (1,668 terms). In the interval [-24,+24], 2,012 auctions and 335 mayors. Mayors in the third (*treated*) or second (*control*) term, elected for the first time between March 27, 1988 and March 27, 1997, [-60,+48] months around the electoral reform. *Winner local* is a dummy for whether the winning firm is registered in same the region. *Max % wins same firm* is the highest percentage of auctions assigned to the same firm within the term. *Elected before March 1993* is a dummy for whether the mayor was elected for the first time before March 27, 1993. *Term limit binding* is a dummy for whether the mayor cannot be reelected. *Population* is the number of resident inhabitants at the beginning of the term, in 10,000. *Starting value* is the reserve price set by the contracting authority, in 100,000 euros (2000 equivalents). *Party tenure (terms)* is the tenure of the mayor's party in terms. *N. parties mayors' coalition* is the number of parties in the mayor's coalition. *N. seats above majority* is the number of seats for the mayor's coalition above the absolute majority. When denoted with "yes", regressions additionally include *Region fixed effects* (19 dummies); *Year dummies* (2000-2004) refer to the year of bid delivery; *City characteristics* (disposable income per capita in 2005; judicial efficiency at year-region level; budget deficit in percentage of the revenues at year level); *Auction characteristics* (squared term of the starting value, 5 object characteristics dummies, 1 selection mechanism dummy); *Mayor characteristics* (2 education dummies, 3 previous occupation dummies, a dummy for being born in the region); *Electoral characteristics* (a dummy for being in the last year before the next election, 2 political party dummies, a dummy for previous experience in council or executive committee). All mayoral and electoral characteristics as at the beginning of the term. Standard errors robust to clustering at the mayor level in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Table 8: Time in office and the *nature of competition*, fuzzy-RDD

|                              | (1)                  | (2)                  | (3)                  | (4)                     |
|------------------------------|----------------------|----------------------|----------------------|-------------------------|
| <i>Dependent variable:</i>   | Winner<br>local      | Winner<br>local      | Max %<br>same firm   | Max % wins<br>same firm |
| Method:                      | OLS                  | 2SLS                 | OLS                  | 2SLS                    |
| Mean outcome:                | 70.61                | 70.61                | 24.37                | 24.37                   |
| N. terms in office           | 2.366<br>(1.761)     | 1.909<br>(2.695)     | 1.964<br>(2.169)     | 6.410**<br>(2.525)      |
| Term limit binding           | 6.882<br>(4.586)     | 4.756<br>(4.975)     | -6.446<br>(9.445)    | -6.580<br>(9.444)       |
| Population                   | 0.087***<br>(0.023)  | 0.083***<br>(0.024)  | -0.851***<br>(0.131) | -0.892***<br>(0.121)    |
| Starting value               | -0.996***<br>(0.127) | -0.998***<br>(0.126) | -0.106**<br>(0.045)  | -0.101**<br>(0.045)     |
| Party tenure (terms)         | 2.297*<br>(1.351)    | 2.410*<br>(1.342)    | 2.308*<br>(1.359)    | 1.934<br>(1.337)        |
| N. parties mayor's coalition | -0.216<br>(0.631)    | -0.214<br>(0.630)    | -1.909***<br>(0.494) | -1.933***<br>(0.463)    |
| N. seats above majority      | -0.091<br>(0.816)    | -0.119<br>(0.807)    | -0.061<br>(0.583)    | 0.107<br>(0.560)        |
| Female                       | 4.978**<br>(1.968)   | 4.766**<br>(1.988)   | -1.710<br>(1.860)    | -1.660<br>(1.911)       |
| Age                          | 0.084<br>(0.090)     | 0.079<br>(0.090)     | -0.089<br>(0.075)    | -0.085<br>(0.075)       |
| N. auctions                  | 8,801                | 8,801                | 7,616                | 7,616                   |
| R-squared                    | 0.093                | 0.093                | 0.331                | 0.339                   |
| Region fixed effects         | yes                  | yes                  | yes                  | yes                     |
| Year dummies                 | yes                  | yes                  | yes                  | yes                     |
| City characteristics         | yes                  | yes                  | yes                  | yes                     |
| Auction characteristics      | yes                  | yes                  | yes                  | yes                     |
| Mayor characteristics        | yes                  | yes                  | yes                  | yes                     |
| Electoral characteristics    | yes                  | yes                  | yes                  | yes                     |

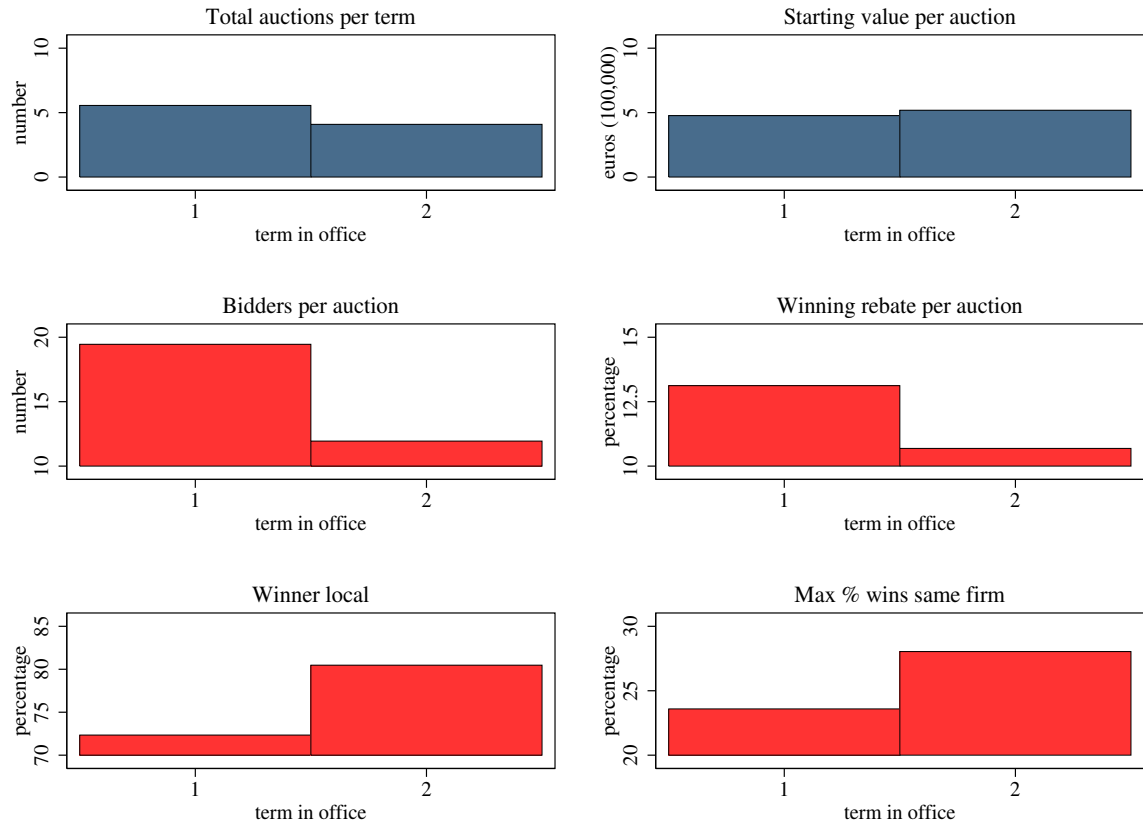
Notes. Estimates on 1,627 mayors (1,668 terms) for *Winner local*, and on 1,353 mayors (1,349 terms) for *Max % wins same firm* (terms elected between 1998 and 2003). In the interval [-24,+24], 2,012 auctions and 335 mayors for *Winner local*, and 1,081 auctions and 143 mayors for *Max % wins same firm*. Mayors in the third (*treated*) or second (*control*) term, elected for the first time between March 27, 1988 and March 27, 1997, [-60,+48] months around the electoral reform. *Winner local* is a dummy for whether the winning firm is registered in the same region. *Max % wins same firm* is the highest percentage of public tenders assigned to the same firm within the term, and is term invariant. *Term limit binding* is a dummy for whether the mayor cannot be reelected. *Population* is the number of resident inhabitants at the beginning of the term, in 10,000. *Starting value* is the reserve price set by the contracting authority, in 100,000 euros (2000 equivalents). *Party tenure (terms)* is the tenure of the mayor's party in terms. *N. parties mayors' coalition* is the number of parties in the mayor's coalition. *N. seats above majority* is the number of seats for the mayor's coalition above the absolute majority. When denoted with "yes", regressions additionally include *Region fixed effects* (19 dummies); *Year dummies* (2000-2004) refer to the year of bid delivery; *City characteristics* (disposable income per capita in 2005; judicial efficiency at year-region level; budget deficit in percentage of the revenues at year level); *Auction characteristics* (squared term of the starting value, 5 object characteristics dummies, 1 selection mechanism dummy); *Mayor characteristics* (2 education dummies, 3 previous occupation dummies, a dummy for being born in the region); *Electoral characteristics* (a dummy for being in the last year before the next election, 2 political party dummies, a dummy for previous experience in council or executive committee). All mayoral and electoral characteristics as at the beginning of the term. First-stage estimates reported in Table 7. Standard errors robust to clustering at the mayor level in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Figure 1: The awarding mechanism



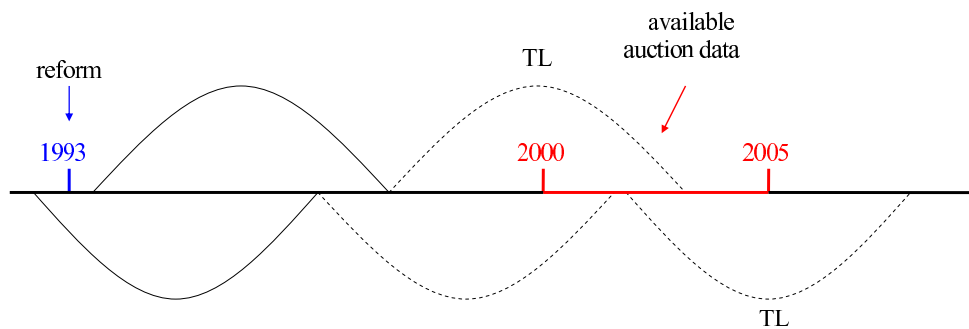
Notes.  $R^{\text{avg}}$  is the average rebate, expressed as a percentage reduction from the starting value.  $T$ , is the anomaly threshold obtained as the sum of  $R^{\text{avg}}$  and the average deviation of the bids above  $R^{\text{avg}}$ .  $R^{\text{win}}$  is the winning rebate that minimizes the distance from below  $T$ .

Figure 2: Auctions' characteristics across terms (no term limit in the second term)



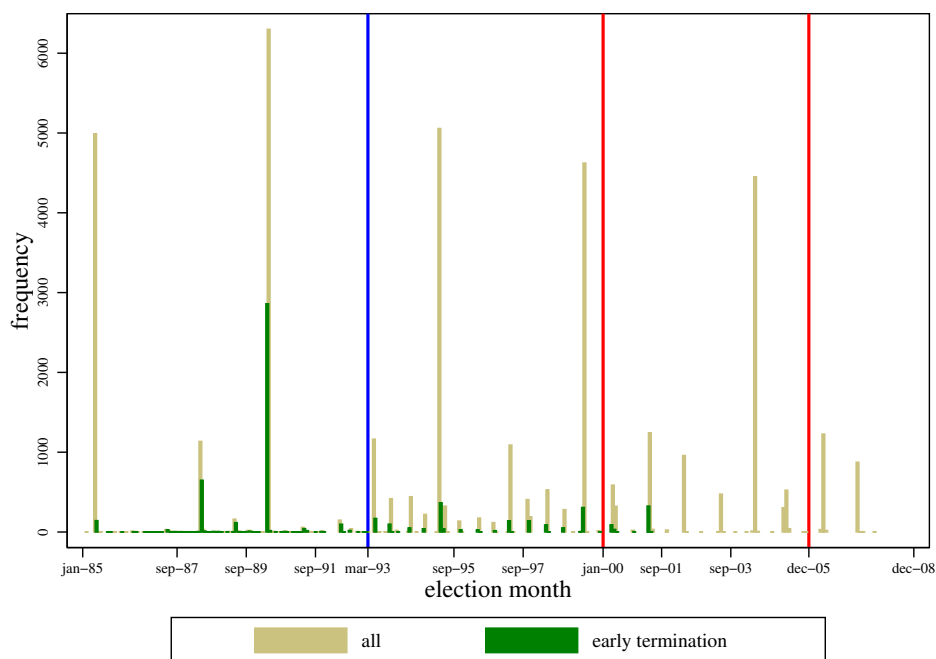
Notes. All variables averaged over the cities, by term. Pooled sample of all mayors who are then reelected for a second term, without a term limit. *Total auctions per term* and *Max % wins same firm* on terms elected between 1998 and 2003 only. *Total auctions per term* is the total number of auctions. *Starting value per auctions* is the reserve price of the auction expressed in 100 thousand euros (2000 equivalents). *Bidders per auction* is the number of bidding firms per auction. *Winning rebate per auction* is the winning rebate expressed as a percentage discount from the starting value. *Winner local* is a dummy for whether the winning firm is registered in the same region. *Max % wins same firm* is the highest percentage of public tenders assigned to the same firm within the term.

Figure 3: The 1993 electoral reform



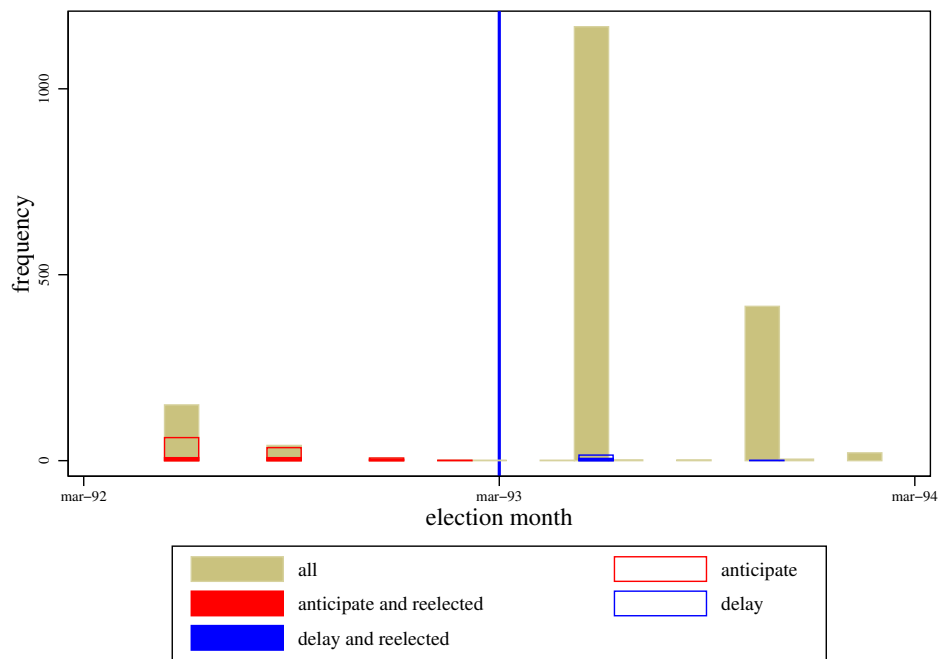
Notes. *TL* means that the term limit is binding. Dash lines for potential following terms.

Figure 4: Election timing



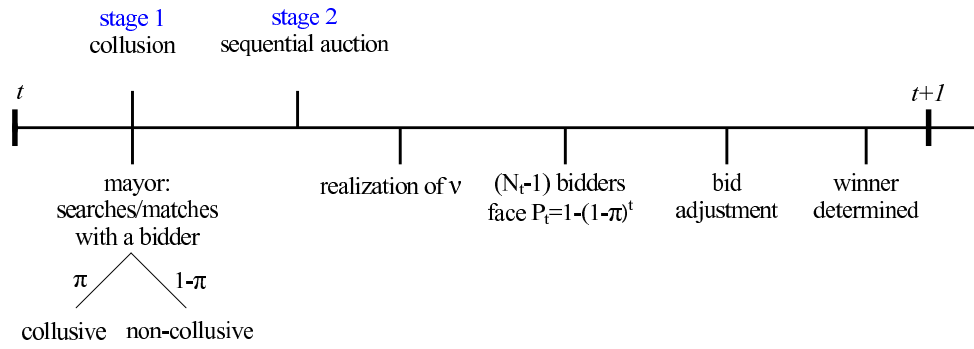
Notes. The blue vertical line denotes the time of the electoral reform. Between red lines: the period over which we have auction data. *Early termination* before the beginning of the last year in office because of: mayor's resignation, vote of no confidence by 50% of either the council or the executive committee. *Early termination* computed on terms elected before 2003 only, otherwise right censored.

Figure 5: Manipulation of the election timing around the March 1993 reform



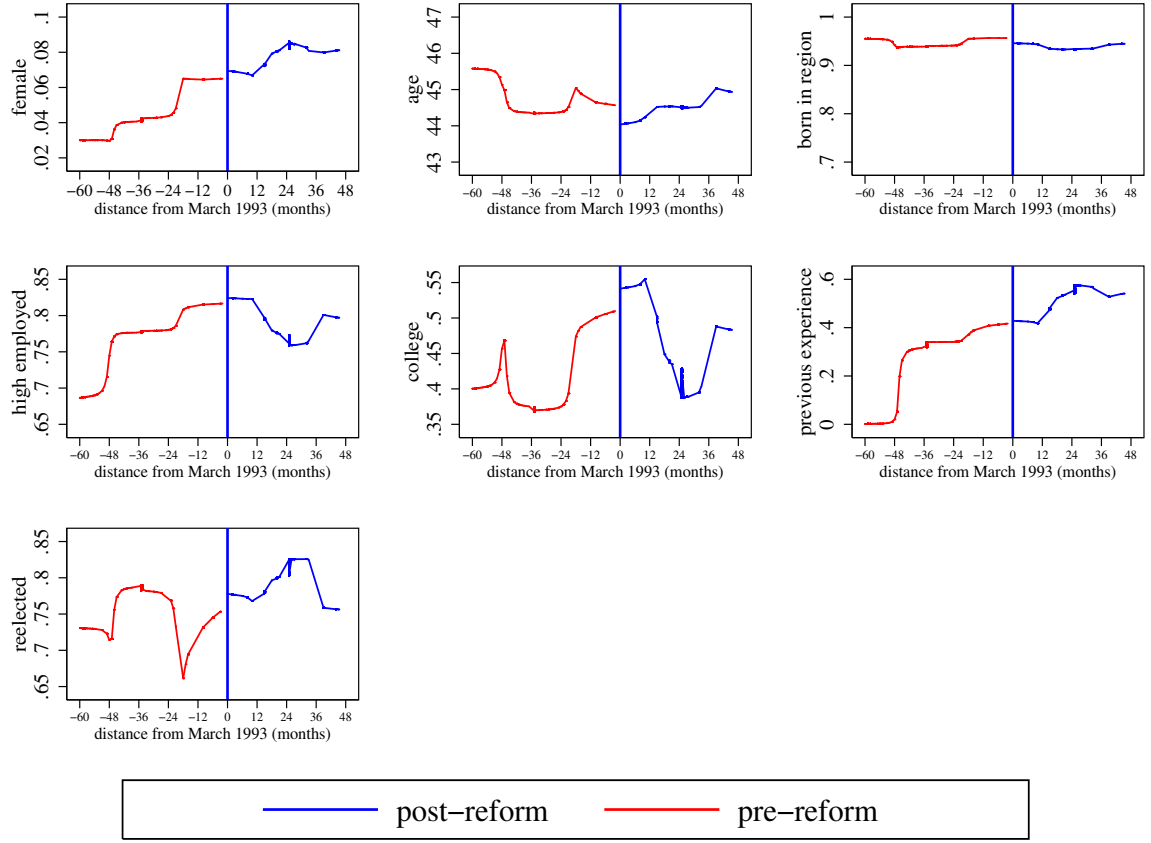
Notes. The blue vertical line denotes the time of the electoral reform.

Figure 6: The time-line of the model



Notes.  $\pi$  is the proportion of colluded bidders in the population.  $\nu_i$  is the individual evaluation.

Figure 7: Balancing around the 1993 electoral reform



Notes. The blue vertical line denotes the electoral reform. The solid line is a running-mean smoothing of the variable on the vertical axis (with a bandwidth of 12 months), performed separately on either side of the electoral reform. *High-skilled* includes entrepreneurs and self-employed. *Local* is a dummy for being born in the region. *Probability of first reelection* is a dummy for whether the mayor was elected for a second term. *Previous experience* is an indicator for whether the mayor was in the council or the executive committee before. *Reelected* is an indicator for whether the mayor was reelected for a second term (unconditional on recandidacy).