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JEL Classification: D72, D73, H57, P16

Keywords: rules, discretion, bunching, thresholds, Electoral accountability, bureaucracy, Government Performance

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1 Introduction

Governments around the world regularly procure a large amount of goods, services, and public works from private suppliers, some of which are crucial to social welfare and economic growth.[1] Positioned at the intersection of government and the private sector, public procurement is at considerable risk of corruption and is highly regulated. Rules typically limit public buyers' discretion in the awarding of contracts and become more stringent when these exceed certain value thresholds.[2] Limiting discretion may be successful against corruption in weak institutional environments but may backfire with strong institutions, as it constrains the ability of honest bureaucrats to perform effectively (Banfield, 1975; Kelman, 1990).

This paper quantifies the extent to which different public administrations strategically manipulate the value of procurement contracts to remain below regulatory thresholds that limit discretion and the consequences this has in terms of procurement outcomes. We use detailed administrative data on the procurement process for the public works of Italian public administrations. Italy is a particularly interesting environment to study: Bosio et al. (2020) find that it is among the most strictly regulated countries in the world, much more than other countries with similarly high levels of human capital; and that (possibly for this reason) it ranks relatively low in terms of procurement quality. Manipulation to circumvent such strict rules might then provide benefits in terms of improved procurement quality, alongside an increase in potential abuses in a country with relatively high levels of corruption.

Our data covers the period between 2000 and 2005, when Italian public administrations were subject to the same National procurement law. Below certain thresholds in the value of procurement, this law allowed a more extensive use of discretionary procedures, such as auctions restricted to invited bidders, leaving administrations free to decide who (not) to invite to bid. It includes information on public works from approximately 10,000 administrations, encompassing standard procurement outcomes (i.e., number of bidders, winner, and discounts), but also ex-post outcomes, such as the duration of public works, delays from contractual deadlines, and cost overruns from the

[1] On average, public procurement expenditure amounts to approximately 12% of GDP for OECD countries (OECD, 2019).

[2] The European Union (EU) mandates such discretion requirements, as do the US Federal Government and the Canadian Government. Directive 1159/2000 of the European Commission. In Canada, the "Plan the Procurement Strategy" imposes thresholds above which buyers have limited discretion. In the US, the Federal Acquisition Regulation (5.101) mandates all procurement agencies to limit the discretion of contracts above a certain threshold.

price determined during the auction. We match this data with information on the political characteristics of public administrations and with a dataset that contains balance sheet information on suppliers, including financial default risk.

We use a bunching estimator to document extensive manipulation of the value of procurement just below two discretion-reducing thresholds (bunching).[3] We find that this effect primarily concerns public administrations whose officials are appointed by the government (henceforth, "appointed administrations"), such as Ministries and the Road Authority. Bunching disappears when the officials within an administration are directly elected (henceforth, "elected administrations"), such as Municipalities and Provinces. We use a LASSO machine learning algorithm to formally support the evidence that being an appointed administration is a key predictor of manipulation, among many other variables available in our data that include proxies for the competence of procurement officials (Decarolis et al., 2020*a*, 2021) and social capital (Guiso, Sapienza and Zingales, 2004). We interpret our findings as suggestive that electoral accountability may prevent elected administrations from circumventing procedural rules by manipulating the value of contracts.

We then estimate the effects of manipulation on discretion and procurement outcomes and the effects of manipulation-induced discretion on outcomes for appointed administrations, using the technique developed by Diamond and Persson (2016). We find that manipulation has a positive impact on the use of discretionary procedures by reducing the number of bids and with mixed effects on rebates depending on the threshold (our data includes two discretion-reducing thresholds). Regarding ex-post outcomes, manipulation has consistently positive effects: for both thresholds, it reduces the total duration of works, delays in project delivery, and cost overruns. When we look at the characteristics of selected suppliers, we find that it reduces the likelihood that a winner is (ex-ante) financially risky with no impact on their productivity. Finally, we find that manipulation increases incumbency, measured by repeated awards to the same suppliers. This suggests that one way that manipulation improves outcomes may be by using discretion to select or establish relationships with less risky and better performing suppliers, perhaps at the cost of more expensive procurement.

Next, we estimate the effect of being an appointed or an elected administration in the bunching

[3] Bunching below regulatory thresholds is not a phenomenon specific to Italy; there is evidence of similar bunching for the US and several other European countries that we discuss in the literature review.

areas with a treatment effect LASSO estimator. Results are in line with the main evidence that appointed administrations (but not elected ones) manipulate the value of procurement to retain discretion, with a positive average impact on most of the observed procurement outcomes.

Our results are robust to standard variations of the bunching methods. Additionally, we cross-validate our main estimates using a unique quasi-experiment determined by a 2006 procurement reform that shifted the discretion thresholds. We find that administrations quickly adjust to the new rules, but heterogeneously based on how administrators are selected in office: appointed administrations are those that react to the reform, whereas the response of elected administrations is more muted. Based on this evidence, we conclude that in our context, bunching estimators and the extended version used in Diamond and Persson (2016) are robust methods to estimate the effects of manipulation on procurement outcomes, besides the extent of bunching.

In sum, we find that appointed administrations violate procedural rules manipulating the value of contracts to retain discretion and use it mainly to improve procurement outcomes through repeated interactions with less risky and better performing suppliers. Conversely, we find no manipulation for elected administrations, possibly due to stronger electoral discipline.[4] This leads to a lower quality level of procurement for this type of administration.

We interpret our findings through the lens of a simple model of procurement that extends that in Bosio et al. (2020), by introducing the possibility for procuring administrations to manipulate the value of contracts and to obtain discretion at a cost that may depend on electoral incentives. When a potential contractor has a significant but costly quality advantage and the procuring administration has a high concern for performance and a low cost of violating procedural rules, our model predicts efficient manipulation equilibria, with and without bribes. Our empirical results are compatible with both equilibria as they both predict higher price and higher quality. They should therefore be interpreted as an average among these coexisting cases, dominating those with inefficient manipulation.

The paper proceeds as follows. Section 2 presents the related literature and Section 3 describes the institutional background and the data. Section 4 presents the empirical strategy and the central results. Section 5 assesses the robustness of our methods, while Section 6 illustrates a

[4]This could be the case, for example, if in the spirit of Besley and Coate (2003), contracts manipulations that take place and could be detected early might cause politically salient "scandals" with impact on upcoming elections. Instead, the effects on procurement outcomes that realize further ahead may be more difficult for voters to appreciate.

simple procurement model to organize the empirical findings. Section 7 concludes.

2 Related Literature

Our paper directly contributes to the debate on the impact that rules and discretion have on bureaucracies and government performance, using public procurement as a leading example. At a micro-level, Bandiera, Prat and Valletti (2009), Coviello, Guglielmo and Spagnolo (2018), Decarolis et al. (2020*b*), and Bandiera et al. (2021) have empirically shown how discretion need not always be abused, as documented by the literature on government corruption and favoritism (Rose-Ackerman, 1999; Di Tella and Schargrodsky, 2003; Baltrunaite et al., 2021), but may instead improve procurement outcomes, as forcefully argued by Kelman (1990). Indeed, one of the main findings of the cross-country comparison of procurement laws, practices, and outcomes by Bosio et al. (2020), is that rules and discretion may have very different effects in different institutional environments.

A main difference relative to these papers is that we study the effects of "unlawful" discretion, obtained through contract value manipulation and bunching below regulatory thresholds, which is explicitly sanctioned by procurement law.[5]

In this respect, this paper is closest to Palguta and Pertold (2017), Szucs (2017), and Carril (2021), who also identify bunching of procurement contracts below discretion-restricting thresholds and study its consequences on procurement outcomes.[6] Palguta and Pertold (2017) and Szucs (2017) analyze the impact of bunching using data on construction works and services in the Czech Republic and on goods and services in Hungary, respectively. These studies emphasize the aggregate costs of discretion-enhancing procurement manipulations in these countries, both in terms of higher prices and of the selection of suspicious (anonymous) or inefficient and politically connected suppliers.[7] Their data however does not include measures of ex-post procurement outcomes, which are critical for us to fully assess whether manipulation-induced discretion has effects beyond standard ex-ante procurement outcomes. Most recently, Carril (2021) studies bunching of US federal

[5]See Article 24(7) of Law No 109 of 11 February 1994, *Legge quadro in materia di lavori pubblici* (Framework Law on public contracts).

[6]Bobilev et al. (2015) document analogous bunching of procurement contracts in Sweden without investigating its consequences on outcomes. Castellani, Decarolis and Rovigatti (2018) find evidence of similar and related forms of manipulation by Italian public administrations to avoid delegating their purchases to a central agency.

[7]Szucs (2017) is closest methodologically because like us he aims to clear the causal effect of manipulation from the selective sorting of contracts below the threshold.

contracts for goods and services around the simplified acquisition threshold, below which there are fewer rules and less oversight of public purchases. His analysis of bunching is complicated by these contracts being negotiated and not having a reserve price. Still, he documents substantial bunching at the threshold, finding (like us) that manipulated contracts perform better in terms of ex-post outcomes, and that a substantial increase in the level of the threshold would be optimal.

The fact that Palguta and Pertold (2017) and Szucs (2017) found that "bad" effects of bunching to gain discretion dominate, while our paper and Carril (2021) find the opposite, is consistent with the finding of Bosio et al. (2020) that the effects of rules and discretion largely depend on the institutional context.[8]

To the best of our knowledge, our paper is the first that aims to answer the question of *who* bunches and why. Our analysis of who bunches connects our work to the literature highlighting the important role of public buyers' characteristics in determining procurement outcomes (Bandiera, Prat and Valletti, 2009; Best, Hjort and Szakonyi, 2017; Bucciol, Camboni and Valbonesi, 2020; Decarolis et al., 2020*a*, 2021). The results on elected versus appointed officials provide a new angle to this literature, suggesting that appointed officials circumvent excessively rigid rules to improve performance while elected ones do not. In this respect we also contribute new evidence to the political economy literature on electoral incentives and bureaucratic behavior, theoretically explored by Besley and Coate (2003), Maskin and Tirole (2004), and Alesina and Tabellini (2007). The empirical literature in this area has previously analyzed the effect of electoral incentives, for example, on local administrators (Baqir, 2002), judges (Lim, 2013) and public procurers (Ferraz and Finan, 2011; Coviello and Gagliarducci, 2017).[9]

From a methodological point of view, our analysis of counterfactuals based on the 2006 reform and on cross-sectional variation provides support to the recent literature that uses bunching estimators to quantify the extent of manipulation (Chetty et al., 2011; Kleven and Waseem, 2013), and in particular to its extended version allowing an estimation of the effects on outcomes developed

[8]Italy has high levels of (perceived) corruption for a developed country, but also, and perhaps for that reason, stricter rules and considerably more extensive monitoring, data collection, and anti-corruption controls and competences than most other countries with comparable human capital and institutional development.

[9]Moreover, our TE LASSO analysis indicates that appointed administrations have a lower turnover of public procurers, which suggests a role for their horizon and tenure, as in Ferraz and Finan (2011), Coviello and Gagliarducci (2017), and Decarolis et al. (2020*b*), and for other costs of bureaucratic turnover (Akhtari, Moreira and Trucco, 2016). It also indicates that appointed administrations have more qualified procurement officials as measured by their professional title, pointing at a role for competence, as in Best, Hjort and Szakonyi (2017), Bucciol, Camboni and Valbonesi (2020), Decarolis et al. (2020*a*), and Decarolis et al. (2021).

by Diamond and Persson (2016).

3 Context, Data, and Descriptive Statistics

Context. Public administrations in Italy are required to outsource public works and select contractors through public tenders. Between 2000 and 2005, public works are adjudicated with sealed-bid and single-attribute auctions (i.e., technical and quality components of the offers are not evaluated). Firms participating in the auction bid the price at which they are willing to undertake the works in the form of a percentage reduction (a rebate) with respect to the value of the project. The value of the project is the reserve price (i.e., the starting value) of the auction and the maximum price a public administration is willing to pay for a project. This value is estimated by an engineer employed by the public administration, who evaluates the types and quantities of inputs needed to complete the project according to a menu of standardized costs for each type of work required by it.

The value of the project plays a key role in determining available discretion, as the procurement law identifies two thresholds in the value of the works, at €200,000 and €300,000, around which discretion jumps discontinuously. In this context, discretion implies that works below the threshold can more easily be run through a restricted auction for invited bidders (the *Trattativa Privata*), where the public administration can freely exclude (not invite to bid) some firms as long as it invites a minimum number of bidders. Public administrations have no limits in using fully open auctions (*Pubblico Incanto* and *Licitazione Privata*). The procurement law, therefore, generates incentives to manipulate the value of the works just below the thresholds to gain discretion.

Details of the thresholds. For works with a value above €300,000, *Trattativa Privata* may only be used in the event of a disaster or other extreme conditions, which must be notified and justified by the public purchaser to the Italian Anticorruption Authority (ANAC, formerly AVCP). For works with a value below €300,000, it may be used in two less extreme circumstances without the need to notify to ANAC: first, that there should be a particular technical contingency or emergency reason; and second, that previous procedures were run with no adjudication of the work. Above €300,000, the *Trattativa Privata* consists of a two-step procedure. First, the public buyer must invite at least 15 firms to an informal auction. Then, the public buyer can negotiate the terms of the contract with the firm proposing the best offer. The procedure becomes binding for the public buyer once the contract is signed. Below €300,000, the public administration can follow the same procedure explained above but it has to invite at least five firms.[10] For works with a value below €200,000, the public administration is allowed to use the *Cottimo Fiduciario*, which is a variant of *Trattativa Privata* characterized by additional procedural simplicity and discretion at the disposal of the public administration[11][12]

The call for tender describes all contractual conditions. It includes the value of the contract, the discretion level (e.g., *Trattativa Privata*), the timeline for the delivery of the works, and all details of the contract.

The procurement law specifies the circumstances under which some terms of the contract (e.g., the date of delivery of the works and the cost of the project) might be partially renegotiated. Subcontracting part of the work is permitted by law but requires the approval of the public administration.

An auction manager is in charge of the entire procurement process, which entails the following duties: preparing the preliminary project, advertising the call for tender, administering the auction, paying the winning firm, and monitoring the realization of the work. She is directly appointed among the bureaucrats working in the public administration. The manager of the auction is responsible for sending all information regarding the auction to ANAC. The authority checks, among other things, the quality of the provided information and collects the information in its database, which we use in this paper.

In Italy there are about 10,000 public administrations procuring public works. All public administrations must follow the same procurement law, in which the value of the contract determines discontinuous jumps in available discretion around the thresholds. We group these administrations on the basis of who selects their main administrators. Appointed administrations have their administrators nominated by the central government, whereas elected public administrations have them

[10] See Coviello, Guglielmo and Spagnolo (2018) for a detailed description of the *Trattativa Privata*.

[11] See Decarolis, Giorgiantonio and Giovanniello (2011).

[12] The winner of the auction is determined by a formula illustrated in Figure C.1. After all bids are received, the public administration drops the top and bottom 10% of bids, and does the same with the rebates that are above the average by more than the average deviation from it. The winner of the auction is then defined as the highest of the remaining bids. Between 2000 and 2005, this formula was constant across all discretion levels and types of public administrations. The details of the auction format are discussed in Albano, Bianchi and Spagnolo (2006), Decarolis (2014), and Conley and Decarolis (2016). The auction format should therefore not interfere with the estimation of the impact of manipulation.

directly appointed by voters.[13]

Data. We use an administrative dataset that includes all public works with a project value above €150,000 collected by ANAC. The dataset contains detailed information on all public works awarded in Italy between 2000 and 2005. The data contains three types of information. First, the procurement contracts, including information on the type of works, type of public administration, its geographical location, the project value, and the characteristics of the auction manager, including age, professional title, and gender. We combine this information to classify public administrations by their political characteristics (appointed versus elected); horizon, captured by the number of future contracts (Gil and Marion, 2013); and bureaucratic turnover, measured by the maximum number of contracts administered by the same manager (Coviello and Gagliarducci, 2017). Second, the outcomes of the auction: the number of bidders, the winning rebate, which is the percent reduction from the reserve price, and the identity of the supplier, which we use to build a measure of incumbency. For every winner of each auction, we define her as an incumbent, if she has won at least one other auction held by the same public administration within a calendar year from the current auction. We use the identity of the supplier to determine whether or not she is incorporated in the same province of the public administration running the auction. Third, ex-post outcomes: the total duration of works, the delays from the original deadline, and the cost overrun with respect to the price defined at the end of the auction. The latter is defined as the ratio between the difference in the final cost and the awarding cost (reserve price discounted by the winning rebate), and the awarding cost itself.[14]

We match this data with the firm-level balance-sheet database *Centrale dei Bilanci* (CB). This database reports detailed information on the balance sheet of all Italian incorporated companies. From this database, we construct a measure of TFP following Hsieh and Klenow (2009), which assumes that firms have a Cobb-Douglas production function. We define TFP of contractor i in sector s as

[13] Of course this black and white distinction is a simplification, but it roughly captures that procurement agents in appointed administrations tend to be relatively more isolated from electoral discipline.

[14] Coviello, Guglielmo and Spagnolo (2018) study the causal effect of discretion in a sub-sample of these data that does not show manipulation around the threshold. In contrast, here we observe manipulation of the value of the project around the threshold, permitting a quantification of manipulation and its effects.

$$TFP_{si} = \frac{P_{si}Y_{si}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}}, \tag{1}$$

where $P_{si}Y_{si}$ is value added, K_{si} is capital stock, L_{si} is labor input, and α_s and $(1-\alpha_s)$ are respectively the capital and labor shares at industry level.[15]

From the CB database we consider a measure of financial default risk. This is an assessment of a company's economic and financial situation made by the Bank of Italy. It takes values from 1 to 9, where higher values indicate a higher risk profile. This indicator has been used in Guiso, Pistaferri and Schivardi (2013) and Crawford, Pavanini and Schivardi (2018). In the procurement context, the potential default of a supplier might represent a cause of delay in the delivery of the works, therefore studying whether or not discretion is selecting less risky suppliers can shed light on how discretion works.

We measure both TFP and the financial default risk out of the procurement sample, in 1999 or the first subsequent year in which the firm appears in the CB dataset. This is to avoid the possible endogeneity problem associated with winning a procurement contract between 2000 and 2005.

We match the procurement data with detailed data on the public administrations running the auctions. We include demographics of the public administrations (collected by the National Institute for Statistics), voter turnout and blood donations as measures of social capital in the area of the public administration as in Guiso, Sapienza and Zingales (2004), and duration of judicial trials as in Coviello et al. (2018).

Sample Selection and Descriptive Statistics. We restrict our sample to works with a project value below €500,000, to rule out the impact of other thresholds not directly associated with discretion.[16] Among the approximately 6,000 public administrations that procure works with a project value between €150,000 and €500,000, the most numerous appointed administrations in our sample are the central Road Authority (*ANAS*, with 19 regional offices[17]), and the Ministries (167, including controlled administrations). *ANAS* is an Italian government-owned company deputed to

[15] We measure the labor input using the cost of labor and the capital stock using the book value of fixed capital net of depreciation. These variables are deflated through sector-specific deflators from the *Annual macro-economic database of the European Commission* (with base year 2005). We compute the labor share by taking the industry mean of labor expenditure on value added measured at the firm level. We then set the capital share as one minus the computed labor share. To avoid outliers, we only measure TFP for observations with non-negative values for value added, cost of labor or capital stock (Calligaris et al., 2016).

[16] The €500,000 threshold is used in Coviello and Mariniello (2014).

[17] ANAS has offices in all Italian regions, except the special statute region of Trentino Alto Adige.

the construction and maintenance of Italian motorways and state highways under the control of the Italian Ministry of Infrastructure and Transport. Elected public administrations are provinces (107) and municipalities (about 4,000).[18] From these, we exclude public administrations located in the five special statute regions (out of 20) because they follow specific procurement laws. The final sample amounts to 35,100 public works, tendered by 4,436 public administrations.

In Table 1, we report descriptive statistics for the sample, broken down by public administration type. The table highlights notable differences between appointed and elected administrations. On average, appointed administrations use discretionary procedures more, and achieve better auction and ex-post outcomes: higher rebates, shorter work length, fewer delays, and lower cost overruns. They are also characterized by a lower probability that the contractor is local but a higher probability that he/she is an incumbent. They select contractors with higher TFP but with a slightly higher default risk. Importantly, appointed public administrations have more frequently repeated interactions. The maximum number of contracts administered by the same auction manager within the public administration is on average 47 in appointed administrations as opposed to 15 in elected administrations, and for every public work in appointed administrations there are on average 22 future contracts versus eight in elected administrations. This evidence suggests that appointed public administrations have a longer horizon compared to elected ones, which can help improve the efficiency of the procurement mechanism using dynamic incentives or past performance information. Furthermore, managers in appointed administrations are on average more highly educated.[19]

Table B.1 and Table B.2 present comparisons of descriptive statistics of outcomes for all public administrations across the €200,000 and the €300,000 thresholds. The probability of having a *Trattativa Privata* is higher below the thresholds. The number of bidders is lower for *Trattativa Privata* and increases for high-value works. The winning rebate is lower for *Trattativa Privata*. Below thresholds, projects awarded with *Trattativa Privata* are delivered faster and are subjected to shorter delays; winners in *Trattativa Privata* are more frequently local and incumbent firms, have a higher TFP and a lower default risk probability.

[18]We exclude regions (20) from this classification because they are hybrid. Their CEO is appointed by voters but their offices include administrations such as the *Genio Civile*, which is a peripheral body of the Ministry of Infrastructure and Transport.

[19]In Table B.3 we report similar statistics when we divide elected and appointed public administrations in municipalities, provinces, *ANAS* and ministries.

Table 1: Descriptive Statistics

	All		Appointed Adm.		Elected Adm.		Other	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Panel A. Outcomes								
Trattativa Privata	0.155	0.362	0.261	0.439	0.117	0.321	0.198	0.398
N. Bidders	25.94	30.21	37.89	39.74	24.60	27.85	19.56	24.77
Winning Rebate	14.64	9.587	18.96	10.26	13.95	9.390	12.99	8.349
Work Length	330.6	201.2	266.1	190.2	343.7	195.3	342.2	221.6
Delay	126.0	139.7	79.23	113.5	138.4	141.7	123.0	145.4
Cost Overrun	0.130	0.176	0.109	0.179	0.133	0.174	0.132	0.181
Local Winner	0.505	0.500	0.356	0.479	0.556	0.497	0.468	0.499
Incumbent Winner	0.104	0.305	0.153	0.360	0.0904	0.287	0.105	0.307
TFP	0.579	0.425	0.610	0.417	0.565	0.416	0.597	0.461
Financial Default Score	5.024	1.551	5.077	1.524	4.991	1.556	5.090	1.556
Panel B. Characteristics								
Project Value	2.680	0.944	2.587	0.932	2.677	0.937	2.786	0.971
Municipality	0.526	0.499	0	0	0.796	0.403	0	0
Province	0.135	0.341	0	0	0.204	0.403	0	0
ANAS	0.0867	0.281	0.512	0.500	0	0	0	0
Ministry	0.0492	0.216	0.291	0.454	0	0	0	0
North	0.549	0.498	0.380	0.485	0.579	0.494	0.601	0.490
Center	0.291	0.454	0.354	0.478	0.280	0.449	0.271	0.445
South	0.160	0.366	0.266	0.442	0.141	0.348	0.128	0.334
Female manager	0.0814	0.273	0.0414	0.199	0.0935	0.291	0.0748	0.263
Manager age	47.78	8.256	49.77	7.990	46.78	8.306	49.64	7.605
Manager with degree	0.548	0.498	0.754	0.431	0.490	0.500	0.568	0.495
N. Manager contracts (max)	21.03	27.00	47.50	42.79	15.50	17.93	15.88	18.83
N. Future contracts	10.98	18.14	21.89	22.43	8.046	14.07	10.84	22.19
Avg. yearly expenditure	504.6	1,279	334.3	988.9	524.2	1,314	598.2	1,378

Notes. The estimation sample includes public works tendered between 2000 and 2005, with project value $y \in [1.5, 5)$, in €100,000 (2005 equivalents). Descriptive statistics are calculated for the entire sample and then separately for appointed, elected, and other administrations. *Trattativa Privata* is a dummy equal to 1 for works assigned with a discretionary procedure. *N. Bidders* is the number of bidders. *Winning Rebate* is the percentage discount over the reserve price. *Work Length* is the number of days from the first day of work until the effective end of the project, which represents the effective duration of the works. *Delay* is the difference in days between the effective end of the project and the contractual deadline. *Cost Overrun* is the ratio between the difference in the final cost and the awarding cost (reserve price discounted by the winning rebate) and the awarding cost. *Local Winner* is a dummy equal to 1 if the winning firm is located in the same province of the public buyer. *Incumbent Winner* is a dummy equal to 1 if the winning firm has won a contract with the public buyer in the past year. *TFP* and *Financial Default Score* measure revenue total factor productivity and financial default risk in 1999 respectively. *N. Manager contracts (max)* is the maximum number of contracts administered by the same manager within the public administration. *N. Future contracts* is the number of contracts tendered in the following year by the public administration. *Project Value* and *Avg. yearly expenditure* are expressed in €100,000.

4 Empirical Strategy and Results

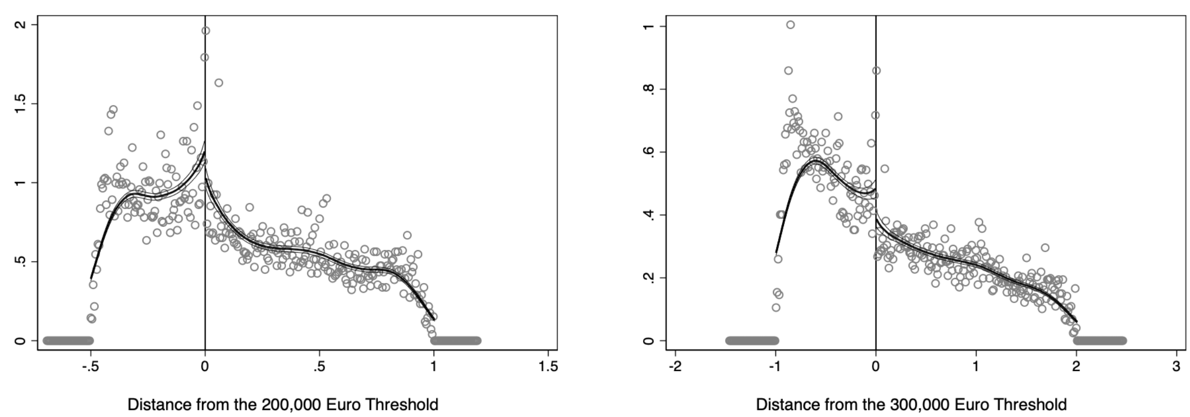
In this section, we first implement a bunching estimator to quantify the extent to which public administrations manipulate procurement. Then, we report evidence of who manipulates the value of the contract. Finally, we estimate the effects of manipulation on discretion and procurement outcomes.[20]

4.1 Evidence of manipulation around the thresholds

Figure 1 graphically shows that public administrations systematically manipulate procurement around the €200,000 and €300,000 thresholds. The McCrary (2008) tests validate the graphical intuition showing that the discontinuity in the density distribution is statistically significant. This can be seen because the confidence intervals of the density estimates are non-overlapping.

Figure 1: McCrary (2008) Density Tests around the Thresholds

(a) €200,000 Threshold (b) €300,000 Threshold



Notes. The figure shows discontinuity tests of the value of the project around the €200,000 (a) and the €300,000 (b) thresholds. Around the €200,000 (€300,000) threshold, the sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, 3)$ ($y \in (2, 5)$), in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals. The evidence suggests that the null hypothesis of no sorting is rejected at standard statistical confidence levels at both thresholds.

Table 2 quantifies bunching around the €200,000 and the €300,000 thresholds, using the Chetty et al. (2011) and Kleven and Waseem (2013) method.[21] The first row reports the estimated number

[20]In Appendix A, we provide details about the estimation methods.

[21]Compared to the McCrary (2008) procedure, these estimates provide an exact quantification of bunching in the neighborhood of the threshold, while the McCrary (2008) approach only tests for a discontinuity in the density of the distribution of the value of the project.

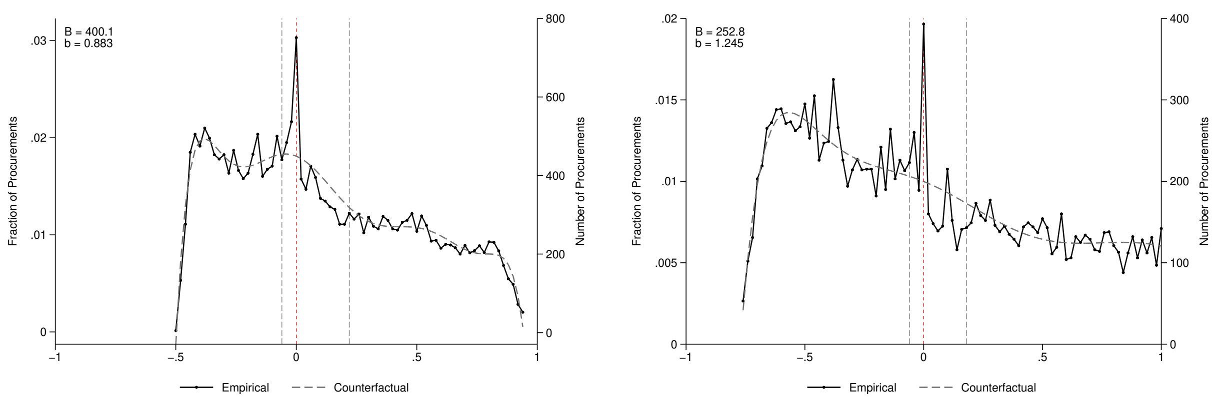
Table 2: Bunching Estimates at the Thresholds

	€200,000 Threshold	€300,000 Threshold
Bunched contracts ($\hat{B}$)	400.130	252.765
	(73.757)	(37.541)
Excess mass ($\hat{b}$)	0.883	1.245
	(0.196)	(0.203)
Upper limit (m_U)	0.220	0.180
	(0.036)	(0.025)

Notes. Each column reports the estimated number of contracts bunching at the threshold ($\hat{B}$), the excess mass at the threshold ($\hat{b}$) and the upper limit of the excluded region used in estimation (m_U) for the sample of all public works tendered between 2000 and 2005. Estimates were obtained by fitting a polynomial of eighth (ninth) degree to the observed distribution of project values around the €200,000 (€300,000) threshold, excluding data in the manipulation region. They are reported separately for the €200,000 (column 1) and the €300,000 threshold (column 2). Standard errors (in parentheses) are calculated using a bootstrap procedure described in Section 4.1.

Figure 2: Bunching at the Thresholds

(a) €200,000 Threshold (b) €300,000 Threshold



Notes. The left (right) figure plots the observed and counterfactual project value distribution relative to the €200,000 (€300,000) threshold for public works tendered between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). In each panel, the solid black connected line plots the histogram of project value, in €2,000 bins. The heavy dashed grey line shows the counterfactual project value distribution, obtained by fitting a polynomial of eighth (ninth) degree to the observed distribution of project values around the €200,000 (€300,000) threshold, excluding data in the manipulation region. The lower (m_L) and upper bounds (m_U) of the manipulation region around the thresholds are represented by the vertical dashed grey lines. The figure also reports the estimated number of contracts bunching at the threshold (B) and the excess mass below threshold (b), calculated as described in Section 4.1. Bunching is remarkably sharp at both thresholds.

of contracts bunching at the thresholds ($\hat{B}$). The second row reports the excess mass at the thresholds ($\hat{b}$), and the third reports the upper limit of the excluded region used in estimation (m_U). The estimated number of contracts bunched just below the €200,000 threshold is 400, and the excess mass at the threshold is 0.88, which implies that there are roughly 88% more contracts compared to the non-manipulated counterfactual estimates; at the €300,000 threshold, the estimated number of excess contracts is 253 and the excess mass is 1.24.

Figure 2 graphically characterizes bunching. It plots both the observed project value distribution and the estimated counterfactual distribution. In detail, the x-axis shows the difference between the project value and the threshold, normalized to zero; the y-axis on the right indicates the number of contracts in each bin, while the y-axis on the left indicates the corresponding fraction of all contracts. The solid black connected line plots the histogram of project value, the dashed grey line shows the fitted polynomial that we take as our counterfactual project value distribution, and the vertical dashed grey lines represent the lower (m_L) and upper (m_U) bounds of the manipulation region. Based on this figure, we conclude that bunching is sharp at both thresholds.

4.2 Who manipulates?

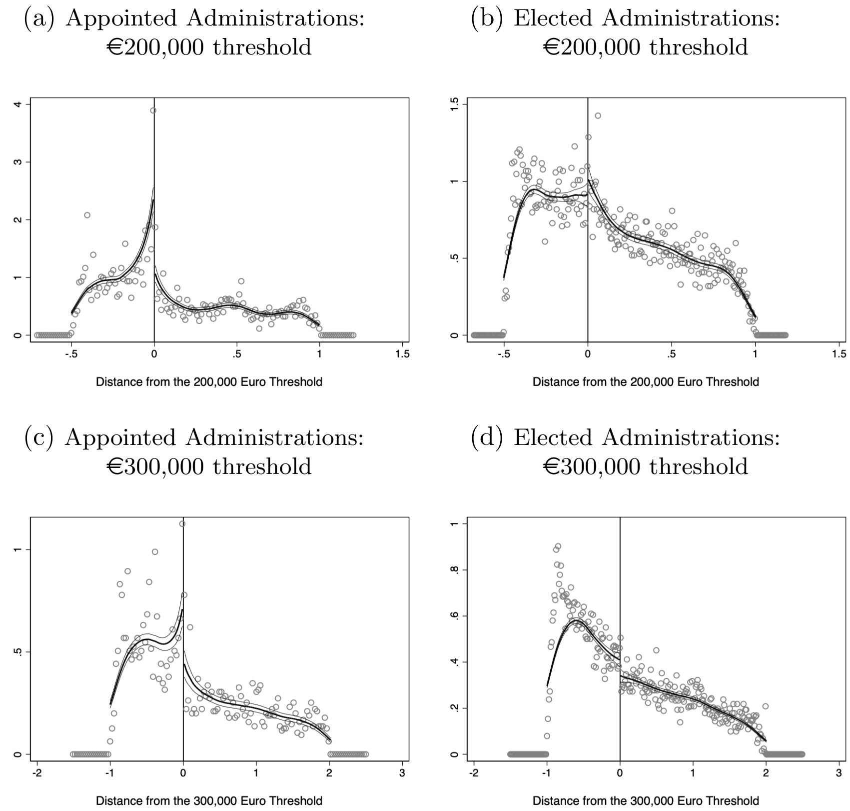
Figure 3 shows that appointed public administrations are more likely to manipulate procurement (just below the thresholds). This graphical evidence is confirmed by the bunching estimates reported in Table 3 and Figure 4, obtained by using a tenth-degree polynomial in equation 3 for both thresholds, yielding the smallest difference between bunching and missing masses in the sample of appointed administrations.[22] These estimates indicate that the sub-sample of appointed public administrations has an excess mass around the threshold between 267% and 579%, which is much larger than the average excess mass we identify in the entire sample of public administrations, which is between 88% and 124%.

We use a LASSO model selection algorithm to formally support this evidence. This technique is appropriate to sift through the more than 100 variables available in our data and that conceptually might be co-predictors of manipulation.[23] Table 4 confirms that being an appointed administration

[22] In Section 5 we assess the robustness of our estimates changing these parameters.

[23] As shown in Table 1, appointed and elected administrations are different on a number of observable characteristics available in our data and that we will include as controls.

Figure 3: McCrary (2008) Density Tests around the thresholds for Appointed and Elected Administrations



Notes. The figure shows discontinuity tests of the value of the project around the €200,000 and the €300,000 thresholds, separately for appointed and elected administrations. Each sample consists of public works tendered by appointed (elected) administrations between 2000 and 2005. Around the €200,000 (€300,000) threshold, it includes public works with project value $y \in [1.5, 3)$ ($y \in (2, 5)$), in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the reserve price and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals. The evidence suggests that the null hypothesis of no sorting is rejected at standard statistical confidence levels at both thresholds only for appointed administrations only.

Table 3: Bunching Estimates at the Thresholds for Appointed Administrations

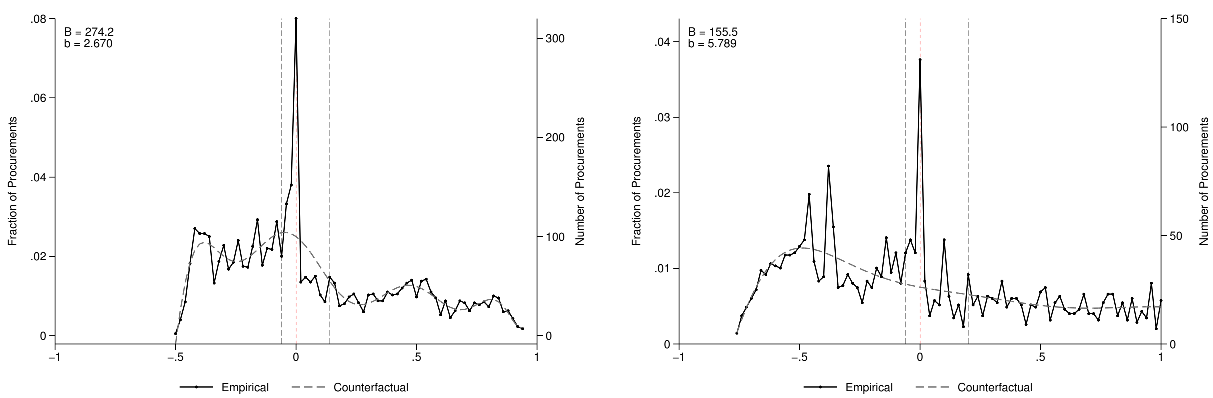
	€200,000 Threshold	€300,000 Threshold
Bunched contracts ($\hat{B}$)	274.198	155.528
	(34.586)	(17.049)
Excess mass ($\hat{b}$)	2.670	5.789
	(0.529)	(1.023)
Upper limit (m_U)	0.140	0.200
	(0.018)	(0.024)

Notes. Each column reports the estimated number of contracts bunching at the threshold ($\hat{B}$), the excess mass at the threshold ($\hat{b}$) and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered by appointed administrations between 2000 and 2005. Estimates were obtained by fitting a tenth degree polynomial to the observed distribution of project values around each threshold, excluding data in the manipulation region. They are reported separately for the €200,000 (column 1) and the €300,000 threshold (column 2). Standard errors (in parentheses) are calculated using a bootstrap procedure described in Section 4.1.

Figure 4: Bunching at the Thresholds for Appointed Administrations

€200,000 Threshold

€300,000 Threshold



Notes. The left (right) figure plots the observed and counterfactual project value distribution relative to the €200,000 (€300,000) threshold for public works tendered by appointed public administrations between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). In each panel, the solid black connected line plots the histogram of project value, in €2,000 bins. The heavy dashed grey line shows the counterfactual project value distribution, obtained by fitting a tenth degree polynomial to the observed distribution of project values around each threshold, excluding data in the manipulation region. The lower (m_L) and upper bounds (m_U) of the manipulation region around the thresholds are represented by the vertical dashed grey lines. The figure also reports the estimated number of contracts bunching at the threshold (B) and the excess mass below threshold (b), calculated as described in Section 4.1. Bunching is remarkably sharp at both thresholds for appointed administrations.

is one of the key predictors of manipulation at both thresholds.

Table 4: Key Bunching Predictors at the Thresholds: LASSO Estimates

	5-fold CV	10-fold CV	Min. BIC
Panel A: €200,000 Threshold			
Appointed	0.022	0.022	0.016
N. Manager contracts (max)	0.009	0.009	0.009
Construction works	-0.006	-0.006	-0.001
Selected coefficients	27	27	3
Out-of-sample MSE	0.0856	0.0856	0.0854
Out-of-sample R-squared	0.0121	0.0121	0.0143
Panel B: €300,000 Threshold			
Appointed	0.011	0.011	0.006
Perugia	0.008	0.008	0.004
N. Manager contracts (max)	0.012	0.010	0.003
Selected coefficients	70	54	3
Out-of-sample MSE	0.0407	0.0406	0.0403
Out-of-sample R-squared	0.0044	0.0055	0.0127

Notes. For both thresholds, the model was trained on a 50 percent sample. Column labels denote the criterion used for estimation. The coefficients of the variables selected by the minimum BIC model (i.e., the model that performs best in out-of-sample prediction according to both MSE and R-squared) are displayed in descending order.

4.3 The effects of manipulation on discretion and procurement outcomes

In this section we estimate the effects of manipulation on the use of discretion and on procurement and selection outcomes in the sample of appointed administrations. To do so, we follow the approach developed in Diamond and Persson (2016).

The evidence from Table 5 indicates that appointed administrations manipulate procurement just below the thresholds to have more discretion by 26% (0.096/0.382) and 79% (0.259/0.329), respectively around the €200,000 and €300,000 thresholds.

Table 6 shows that manipulation around the €200,000 (€300,000) threshold is estimated to reduce the number of bidders by -5% (-24%); it has mixed effects on rebates: +4% (-11%); it reduces the overall length of the works by -11% (-14%), and the delays in the delivery of the works

Table 5: Impact of Manipulation on the Use of Discretionary Procedures, ITT

	€200,000 Threshold	€300,000 Threshold
Discretion	0.096	0.259
	(0.004)	(0.005)
Avg. outcome	0.382	0.329

Notes. The table presents estimates of the impact of manipulation on the use of *Trattativa privata*. Around the €200,000 (€300,000) threshold, the sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). For each threshold, the predicted use of discretion absent manipulation is estimated from regressions of *Trattativa privata* on a dummy for whether the project value is below the threshold and third order polynomials in the project value, excluding data in the manipulation region. Standard errors bootstrapped at the province*year level are in parentheses.

by -15% (-35%). Manipulation of the value of procurement reduces cost overrun by -17% (-35%).

The table also shows that manipulation has an effect on who wins the procurement contract. Around the €200,000 (€300,000) threshold, manipulation is estimated to increase the incumbency of the winners by 23% (47%), to reduce the likelihood that highly financially risky firms win the contract by -3% (-4%), and to have mixed effects on the probability that the winner is local: -6%, (+29%).

Table 7 reports estimates of the effects of manipulation-induced discretion on outcomes. These are Wald estimates of the local average treatment effect of manipulation-induced discretion on outcomes and are obtained as the ratio between the ITTs of each outcome and discretion, as discussed in Diamond and Persson (2016). These estimates, therefore, coincide with the previous estimates but are scaled by a factor of 0.26 or 0.79 (the first-stage), depending on the threshold.

The overall evidence suggests that appointed administrations manipulate the value of works to gain discretion to restrict bidders' participation. This practice results in fewer bidders but has mixed effects on rebates. At the same time, our evidence suggests that manipulation-induced discretion increases the probability of repeated wins by suppliers that have a lower risk profile and deliver the works faster, with fewer delays and lower cost overruns. To further validate the idea that buyers may rely on discretion-enhancing manipulations to select better contractors, in Appendix D we investigate the relationship between incumbency and past performance. We find that repeated awards to the same suppliers are more likely after good (past) performance.

Table 6: Effects of Manipulation on Outcomes, ITT

	€200,000 Threshold	€300,000 Threshold
Panel A: Procurement Outcomes		
N. Bidders	-1.500	-9.187
	(0.325)	(0.655)
Avg. outcome	31.874	38.869
Winning Rebate	0.769	-2.087
	(0.079)	(0.165)
Avg. outcome	18.648	18.238
Work Length	-25.382	-36.215
	(1.747)	(3.475)
Avg. outcome	227.62	255.688
Delay	-10.507	-24.891
	(0.950)	(1.989)
Avg. outcome	64.923	70.674
Cost Overrun	-0.016	-0.032
	(0.002)	(0.003)
Avg. outcome	0.094	0.091
Panel B: Winners Selection		
Local Winner	-0.021	0.119
	(0.003)	(0.008)
Avg. outcome	0.37	0.408
Incumbent Winner	0.042	0.102
	(0.003)	(0.006)
Avg. outcome	0.184	0.218
TFP	0.005	-0.002
	(0.005)	(0.008)
Avg. outcome	0.616	0.626
Financial Default Score	-0.145	-0.217
	(0.015)	(0.031)
Avg. outcome	4.931	4.939

Notes. The table presents estimates of the impact of manipulation on procurement and selection outcomes. Around the €200,000 (€300,000) threshold, the sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). For each threshold, the predicted outcome absent manipulation is estimated from regressions of the outcome on a dummy for whether the project value is below the threshold and third order polynomials in the project value, excluding data in the manipulation region. Standard errors bootstrapped at the province*year level are in parentheses.

Table 7: LATE Effects of Discretion when there is Manipulation

	€200,000 Threshold	€300,000 Threshold
Panel A: Procurement Outcomes		
N. Bidders	-15.647	-35.472
	(3.202)	(2.405)
Avg. outcome	31.874	38.869
Winning Rebate	8.022	-8.059
	(0.980)	(0.620)
Avg. outcome	18.648	18.238
Work Length	-264.731	-139.834
	(20.511)	(13.668)
Avg. outcome	227.62	255.688
Delay	-109.585	-96.111
	(10.482)	(8.005)
Avg. outcome	64.923	70.674
Cost Overrun	-0.163	-0.123
	(0.017)	(0.013)
Avg. outcome	0.094	0.091
Panel B: Winners Selection		
Local Winner	-0.218	0.460
	(0.036)	(0.032)
Avg. outcome	0.37	0.408
Incumbent Winner	0.443	0.392
	(0.025)	(0.023)
Avg. outcome	0.184	0.218
TFP	0.054	-0.008
	(0.053)	(0.030)
Avg. outcome	0.616	0.626
Financial Default Score	-1.507	-0.837
	(0.160)	(0.122)
Avg. outcome	4.931	4.939

Notes. The table presents estimates of manipulation induced discretion on procurement and selection outcomes, obtained as the ratio between the effects of bunching on the outcomes and of bunching on discretion. Around the €200,000 (€300,000) threshold, the sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). Standard errors bootstrapped at the province*year level are in parentheses.

4.4 Effects of appointed versus elected administrations on bunching, discretion, and procurement and selection outcomes

In this section, we formally verify whether appointed administrations use more manipulation-induced discretion than elected administrations and estimate its effects on procurement outcomes. In the absence of a quasi-experimental research design, we use the machine learning algorithm for the estimation of treatment effects developed by Chernozhukov et al. (2018). This estimator allows us to draw causal inference on the effects of being appointed versus elected from observational data, and controlling for the large set of covariates discussed in Section 4.2[24].

Table 8 reports the estimated ATEs on bunching. The treatment effects of being an appointed administration on bunching around the €200,000 and €300,000 thresholds are large and virtually identical between the two thresholds: 82% (0.063/0.077) and 81% (0.030/0.037), respectively. It is interesting to note that the covariates selected to explain the treatment appointed include our measures of relational contracting (at the €200,000 threshold), manager persistence and higher professional title (at both thresholds), all with a positive coefficient. This suggests a role for competence.[25]

Table 8: Estimated Effect of Appointed Administrations on Bunching

	€200,000 Threshold	€300,000 Threshold
ATE	0.063***	0.030***
	(0.008)	(0.007)
Avg. Exp. outcome Elected	0.077***	0.037***
	(0.002)	(0.002)
Observations	20,176	19,597

Notes. Each column reports the estimated ATEs of being appointed versus elected on bunching at the threshold. Results are averages obtained from a five folds cross-fitting procedure repeated three times. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Tables 9 and 10 report the estimated ATEs on discretion and procurement and selection outcomes in the manipulation regions below thresholds – where we documented excess bunching (see Section 4.1). Appointed public administrations are 1.8 (1.4) times more likely to use discretion around the €200,000 (€300,000) threshold compared to elected administrations. Appointed administrations have higher rebates (+12%, +15%), shorter duration of the works (-9%), shorter

[24]See Appendix A for a more extensive discussion.

[25]We thank Francesco Decarolis, who suggested that we explore this avenue.

Table 9: Estimated Effect of Appointed Administrations on Discretion in the Bunching Area

	€200,000 Threshold	€300,000 Threshold
ATE	0.345***	0.291***
	(0.083)	(0.044)
Avg. Exp. outcome Elected	0.192***	0.202***
	(0.015)	(0.016)
Observations	1,891	850

Notes. Each column reports the estimated ATEs of being appointed versus elected on discretion in the manipulation region below threshold. Results are averages obtained from a five folds cross-fitting procedure repeated three times. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

delays in delivery of the works (-28%, -35%), and lower cost overruns (-19%). The treatment effects of being an appointed administration are negative on the probability that winners are local (-21%), and positive on TFP (+19%, +20%).

5 Robustness Checks

We run two sets of robustness checks. The first considers the impact on our estimates of standard variations of the parameters of the bunching estimators and that of different definitions of public administrations. The second uses as a quasi-experiment a procurement reform that changes the incentives for manipulation for all Italian administrations.

5.1 Robustness of the bunching methods

Changes in the polynomial used to estimate the counterfactual distribution. In Table B.4 and Figure C.10, we report the estimates of manipulation for appointed public administrations using an eight-degree polynomial around the €200,000 threshold and a nine-degree polynomial around the €300,000 threshold (i.e., the parameter configurations that yield the smallest difference between bunching and missing masses in the entire sample, rather than in the sample of appointed administrations as in Table 3 and Figure 4). Our evidence that appointed public administrations manipulate procurement just below the discretion thresholds is confirmed and indeed even more pronounced at the €200,000 threshold, while estimates are virtually identical at the €300,000 threshold.

Table 10: Estimated Effect of Appointed Administrations on Outcomes in the Bunching Area

	€200,000 Threshold	€300,000 Threshold
Panel A: Procurement Outcomes		
N. Bidders [ATE]	-2.280	2.831
	(1.544)	(3.053)
Avg. Exp. outcome Elected	23.665***	24.739***
	(1.046)	(1.211)
Observations	1,797	835
Winning Rebate [ATE]	1.742***	2.127***
	(0.503)	(0.806)
Avg. Exp. outcome Elected	14.359***	13.821***
	(0.342)	(0.382)
Observations	1,840	826
Work Length [ATE]	-23.943*	-32.217
	(12.757)	(21.260)
Avg. Exp. outcome Elected	278.125***	350.147***
	(6.455)	(8.521)
Observations	1,340	652
Delay [ATE]	-30.080***	-47.293***
	(9.675)	(13.669)
Avg. Exp. outcome Elected	107.284***	136.959***
	(5.406)	(6.070)
Observations	1,340	652
Cost Overrun [ATE]	-0.024**	-0.028
	(0.011)	(0.018)
Avg. Exp. outcome Elected	0.125***	0.137***
	(0.005)	(0.009)
Observations	1,369	647
Panel B: Winners Selection		
Local Winner [ATE]	-0.120***	-0.081
	(0.042)	(0.056)
Avg. Exp. outcome Elected	0.580***	0.562***
	(0.032)	(0.023)
Observations	1,509	685
Incumbent Winner [ATE]	-0.022	0.041
	(0.025)	(0.028)
Avg. Exp. outcome Elected	0.173***	0.109***
	(0.020)	(0.016)
Observations	1,363	634
TFP [ATE]	0.103***	0.105**
	(0.035)	(0.052)
Avg. Exp. outcome Elected	0.550***	0.522***
	(0.017)	(0.027)
Observations	1,007	468
Financial Default Score [ATE]	0.126	-0.267
	(0.146)	(0.233)
Avg. Exp. outcome Elected	4.937***	5.187***
	(0.075)	(0.100)
Observations	1,001	468

Notes. Each column reports the estimated ATEs of being appointed versus elected on outcomes in the manipulation region below threshold. Results are averages obtained from a five folds cross-fitting procedure repeated three times. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Robustness in the definition of public administrations. In Tables B.5, B.6 and Figures C.11, C.12 we use a more granular definition of appointed and elected administrations and re-run the bunching analysis for four main categories: municipalities and provinces (elected); ANAS and ministries (appointed).[26][27] We confirm our results that appointed administrations manipulate while elected administrations do not.

High- versus low-corruption areas. In Figures C.4, C.5 we show that manipulation is not a characteristic of administrations operating in high-corruption environments (i.e., the South of Italy).

High- versus low-frequency elected administrations. In Figures C.8, C.9 we test whether manipulation is a feature of the elected administrations that have the most repeated interactions in our sample. We find that elected administrations that are in the 90th percentile of the frequency distribution show no evidence of bunching at the thresholds, just as less frequent elected administrations do.

Cross-sectional construction of counterfactual densities. In our set-up there is significant heterogeneity in extent to which public administrations manipulate procurement. Following Kleven (2016), and similarly to Goncalves and Mello (2021), we use the sub-set of the data where we see no evidence of manipulation to obtain alternative counterfactual densities. In Table B.7 and Figure C.13 we use elected administrations' density distributions as a counterfactual to compute the extent to which appointed administrations manipulate the value of procurement.[28] The evidence is promising: the estimates of bunching discussed in Section 4.2 are comparable to those obtained with the cross-sectional approach.

5.2 Robustness using a procurement reform

In this section, we cross-validate our results using a procurement reform, which in July 2006 shifted down the old thresholds. The €300,000 threshold was lowered to €100,000, and the €200,000 threshold was moved to €100,000 for non-urgent or foreseeable works. This reform changed the

[26]We use the polynomial degrees that yield the smallest difference between bunching and missing masses in the entire sample.

[27]Figures C.2, C.3 show the McCrary (2008) density tests.

[28]Since appointed and elected administrations display large disparities in the number of contracts awarded for each bin, elected administrations' project value distribution is adjusted by the ratio of the total number of contracts of appointed administrations to that of elected administrations.

incentives to manipulate the value of procurement around the old thresholds.[29]

We use the reform as follows: first, we test whether or not appointed administrations continued manipulating the value of the contracts around the €200,000 and €300,000 thresholds after the reform; second, we estimate the impact of the reform in a difference-in-difference-in-difference design; and third, re-compute the bunching estimators presented in Section 4.1 using the post-reform data (i.e., the data with less/no bunching).

Figure 5 reports the distribution of the value of the projects auctioned before and after July 2006 for elected and appointed administrations, across the entire sample and also separating urgent and unforeseeable works from ordinary works. From this figure we note that appointed administrations strategically adjust to the reform, while there is no major change for elected administrations. In detail, and with regard to appointed administrations, bunching disappears at the €300,000 threshold regardless of the project type, while it remains at the €200,000 threshold for urgent or unforeseeable works, as expected in light of the regulatory provisions introduced by the reform. The evidence is confirmed by the results reported in Table 11, obtained using a difference-in-difference analysis where the dependent variable is the probability that the value of a contract is in the manipulation regions below thresholds (see the definition in Section 4).[30] Estimates indicate that post-reform appointed administrations have 54.4% (0.047/0.0864) less probability of having a contract with a value in the manipulation region below the €300,000 threshold, while there is no significant effect at the €200,000 threshold. Overall, these analyses show that the reform was salient for appointed administrations and changed their behavior, drastically reducing bunching at the €300,000 threshold. For the remainder of the section, we will focus on this threshold.

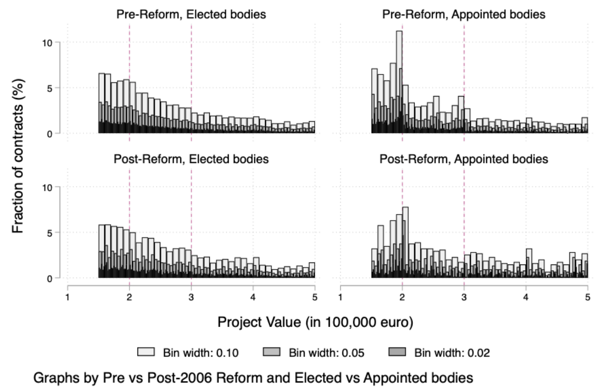
We test the robustness of our causal estimates of the effect of manipulation on discretion and outcomes by implementing a difference-in-difference-in-difference (DDD) research design, leveraging variation across three dimensions: type of procuring administration (elected v. appointed), period (pre- v. post-reform), and project size (within v. outside the bunching area). The DDD identifying assumptions are more lax than a standard difference-in-difference model: changes in discretion and outcomes above v. below threshold would have been the same for appointed and elected

[29]To run this analysis we use a different dataset that includes the years 2006 and 2007.

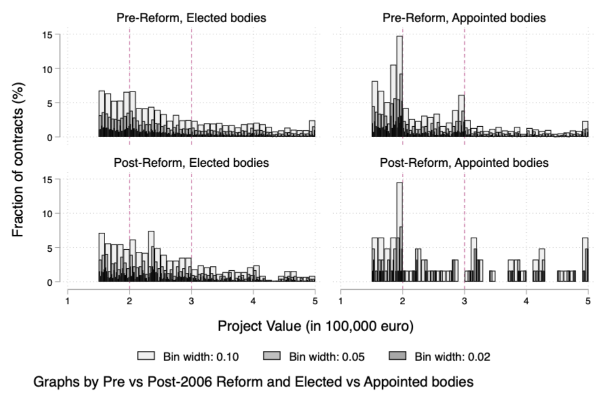
[30]The regression model is $y_{ijt} = \alpha + X'_{ijt}\gamma + \beta_0 \cdot Post_t + \beta_3 \cdot Appointed_j + \beta_4 \cdot Appointed_j \times Post_t + \epsilon_{ijt}$, where y_{ijt} is a dummy equal to one if the project value is in the manipulation region below threshold $[m_L, m_0]$, $Post_t$ is a dummy for whether time t is after reform implementation and $Appointed_j$ is a dummy for procuring administration j being appointed. X'_{ijt} includes additional controls such as year, geographic location, and work type.

Figure 5: Contracts Distribution Pre- and Post-Reform

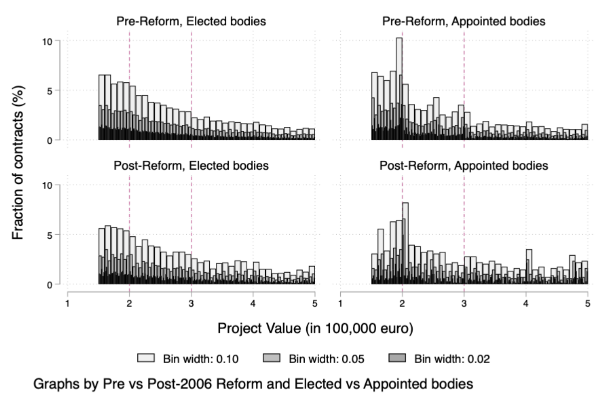
(a) All Works



(b) Urgent or Unforeseeable Works



(c) Ordinary Works



Notes. The figure displays the distribution of project values across three dimensions: pre- v. post-reform (July 2006), appointed v. elected bodies, and work type (all works, urgent or unforeseeable works, ordinary works). The sample consists of public works tendered between 2000 and 2007, with project value y [1.5, 5), in €100,000 (2007 equivalents). The evidence suggests that appointed administrations strategically adjust to the reform around the thresholds (vertical lines).

Table 11: Difference-in-Difference Analysis – Contracts in Bunching Areas

	€200,000 Threshold		€300,000 Threshold	
	(1)	(2)	(3)	(4)
	Bunching	Bunching	Bunching	Bunching
Post	0.004	0.003	0.011	0.011
	(0.011)	(0.011)	(0.008)	(0.008)
Appointed	0.085***		0.039***	
	(0.012)		(0.014)	
Appointed × Post	0.020	0.024	-0.046***	-0.047***
	(0.025)	(0.021)	(0.017)	(0.016)
Year FEs	X	X	X	X
Region FEs	X	X	X	X
Work Type FEs	X	X	X	X
Contracting authority type FEs	-	X	-	X
Pre-reform mean (Appointed)	0.169	0.169	0.0864	0.0864
R-squared	0.018	0.020	0.010	0.011
Observations	25,542	25,542	22,103	22,103

Notes. Estimation sample includes public works tendered between 2000 and 2007 with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$) for the €200,000 (€300,000) threshold, in €100,000 (2007 equivalents). The dependent variable is a dummy for a contract being in the manipulation region below threshold $[m_L, 0]$ defined in Section 4.1. Columns 1 and 2 estimate bunching at the €200,000 threshold and column 3 and 4 at the €300,000 threshold. Standard errors robust to clustering at the public administration level in parentheses.

administrations in the absence of treatment (i.e., the threshold eliminated by the reform). The 2006 reform helps us to test that our main results are not driven by unobserved and time-varying trends in the data. Elected public administrations are an effective additional control group as they are not affected by the reform (see Figure 5). We estimate the following model

$$\begin{aligned} y_{ijt} = \alpha + \delta_{it} + X'_{ijt}\gamma + \beta_0 \cdot Post_t + \beta_1 Bunching_i + \beta_2 \cdot Bunching_i \times Post_t \\ + \beta_3 \cdot Appointed_j + \beta_4 \cdot Appointed_j \times Post_t \\ + \beta_5 \cdot Appointed_j \times Bunching_i \\ + \beta_6 \cdot Appointed_j \times Bunching_i \times Post_t + \epsilon_{ijt} \end{aligned} \tag{2}$$

where, y_{ijt} are discretion and procurement and selection outcomes; $Bunching_i$ is a dummy variable for a contract being in the manipulation region below threshold $[m_L, m_0]$ defined in Section 4.1; $Post_t$ is a dummy indicating the period after July 2006; $Appointed_j$ is a dummy for public administration j being appointed. We focus on the €300,000 threshold, so we restrict the sample to contracts with value between the upper bound of the manipulation region above the €200,000 threshold (m_U^{200K}) and €500,000.

Table 12 indicates that after the reform, appointed public administrations drop their use of discretion for contracts with a value within the bunching area by 49%. These administrations have more bidders (+37%) and winning rebates (+8%, not statistically significant), and have longer works (+29%), higher delays in delivery (+92%) and more cost overruns (129%, not statistically significant). The table also indicates that suppliers of these administrations are less likely to be local (-47%), and have lower repeated wins (-43%), while they are not statistically different in terms of TFP and default risk (while the signs of the coefficients also signal a worsening in these two outcomes). This evidence cross-validates within a quasi-experimental framework the evidence obtained in Section 4.3.

Construction of counterfactual densities with post-reform data. We further leverage the reform to use the observed distribution of contracts in the post-reform period (n_j^{Post}) as a counterfactual to compute the extent to which public administrations manipulate the value of procurement before the reform – similar to the cross-sectional approach discussed above.[31] The

[31] Since the duration of the pre-reform period is very different from that of the post-reform period in our data (Jan 2000-Jun 2006 v. Jul 2006-Dec 2007) and hence the number of contracts in the two periods is very different, we

Table 12: Reduced Form Effect of (Removed) Manipulation on Outcomes at the €300,000 Threshold

	(1) Discretion	(2) N. Bidders	(3) Winning Rebate	(4) Work Length	(5) Delay	(6) Cost Overrun	(7) Local Winner	(8) Incumbent Winner	(9) TFP	(10) Default Score
Post	-0.090***	0.351	0.474	-78.079***	-56.710***	0.027	-0.026	0.011***	-0.008	0.059
	(0.015)	(2.959)	(0.458)	(12.863)	(10.375)	(0.040)	(0.024)	(0.004)	(0.027)	(0.083)
Bunching	-0.045	4.798	-0.421	-13.476	-37.148	-0.005	-0.061	-0.039	-0.047	0.247
	(0.039)	(2.964)	(0.734)	(27.260)	(24.172)	(0.020)	(0.049)	(0.026)	(0.037)	(0.189)
Bunching × Post	0.025	-8.321***	-0.440	44.941**	25.630	-0.015	0.039	-0.003	0.030	-0.095
	(0.039)	(3.044)	(0.815)	(22.824)	(19.305)	(0.053)	(0.051)	(0.012)	(0.046)	(0.183)
Appointed × Post	0.019	-22.495***	-4.767***	111.847***	61.858***	-0.083	-0.060	-0.007	-0.079	-0.097
	(0.037)	(4.675)	(1.289)	(26.487)	(16.197)	(0.055)	(0.037)	(0.019)	(0.058)	(0.095)
Appointed × Bunching	0.222***	-12.649***	-1.207	-2.393	-12.720	-0.018	0.119**	0.083**	-0.006	-0.307**
	(0.050)	(3.964)	(0.915)	(21.541)	(12.484)	(0.025)	(0.054)	(0.039)	(0.038)	(0.137)
Appointed × Bunching × Post	-0.259**	11.610**	1.320	68.685*	56.905**	0.093	-0.211*	-0.094**	-0.071	0.171
	(0.119)	(5.249)	(2.438)	(39.752)	(26.454)	(0.070)	(0.114)	(0.043)	(0.081)	(0.387)
Other contracts below threshold × Post	-0.016	-2.180	0.177	62.758***	43.056***	0.016	0.006	-0.013**	-0.035	0.017
	(0.014)	(1.766)	(0.331)	(13.095)	(10.936)	(0.046)	(0.021)	(0.006)	(0.026)	(0.074)
Project value bin FEs	X	X	X	X	X	X	X	X	X	X
Year FEs	X	X	X	X	X	X	X	X	X	X
Region FEs	X	X	X	X	X	X	X	X	X	X
Contracting authority type FEs	X	X	X	X	X	X	X	X	X	X
Work Type FEs	X	X	X	X	X	X	X	X	X	X
Pre-reform mean (Bunching, Appointed)	0.525	31.66	16.93	238.4	62.13	0.0722	0.453	0.221	0.586	4.927
R-squared	0.139	0.225	0.445	0.178	0.096	0.005	0.078	0.068	0.026	0.038
Observations	21,894	21,791	21,174	15,418	15,204	13,477	19,953	19,568	13,816	13,697

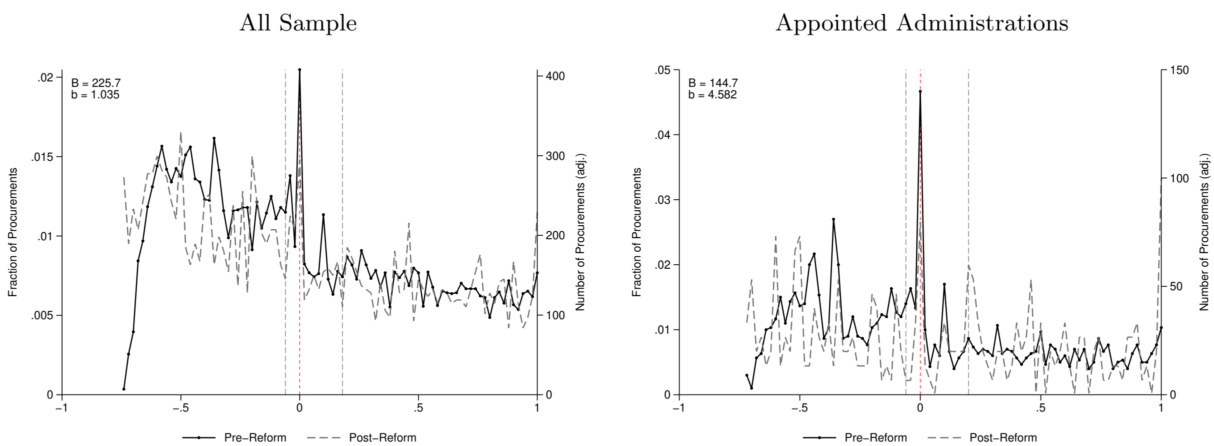
Notes. Estimation sample includes public works tendered between 2000 and 2007 with project value $y \in (m_U^{200K}, 5)$, in €100,000 (2007 equivalents). The dependent variable is a dummy for a contract being in the manipulation region below threshold $[m_L, 0]$ at the €300,000 threshold, as defined in Section 4.1. Standard errors robust to clustering at the public administration level in parentheses.

Table 13: Bunching Measures at the €300,000 Threshold – Using the Post-Reform as a Counterfactual

	All Sample	Appointed Administrations
Bunched contracts	225.714	144.691
Excess mass	1.035	4.582
Upper limit	0.180	0.200

Notes. Each column reports the number of contracts bunching at the €300,000 threshold, the excess mass at the threshold and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered in the pre-reform period between 2000 and 2005. Values were calculated using (adjusted) post-reform project value distributions as counterfactuals. They are reported separately for the entire sample (column 1) and for the sample of appointed administrations (column 2).

Figure 6: Bunching at the €300,000 Threshold – Using the Post-Reform as a Counterfactual



Notes. In the figures, the solid black connected line plots the observed project value distribution in €2,000 bins relative to the €300,000 threshold for pre-reform public works and the heavy dashed grey line shows the counterfactual distribution calculated from post-reform works. The samples include either works from all public administrations or from appointed administrations with a project value $y \in (m_U^{200K}, 5)$, in €100,000 (2007 equivalents). Since the duration of the pre-reform period is very different from that of the post-reform period, we adjust the post-reform distribution by the ratio of the total number of contracts in the pre-reform period to that in the post-reform period. To best compare the results with the bunching measures derived in the sections above, we restrict the pre-reform period to the years up to 2005.

evidence shown in Table 13 and Figure 6 once again confirms the robustness of our bunching estimates. Moreover, using this approach we find no evidence of a positive difference between missing mass and excess mass, hence of an extensive margin response as defined by Carril (2021).

adjust n_j^{Post} by the ratio of the total number of contracts in the pre-reform period to that in the post-reform period. To best compare the results with the bunching measures derived in the sections above we restrict the pre- reform period to the years up to 2005.

6 A Simple Model of Efficient Manipulation

In this section, we sketch a simple model of procurement to capture the decision of a procuring administration (PA) to manipulate project values in order to obtain discretion. The aim of the model is to help the interpretation of our empirical findings, shedding light on the role that electoral incentives and other factors such as procurers' competence and specialization may exert on the choice of efficiency-enhancing manipulation.

We extend the model developed by Bosio et al. (2020) to understand the effects of discretion and regulation in public procurement across countries with different legislations and institutional quality/levels of human capital. Our extension focuses on the decision of whether to manipulate contract values taken by different types of PAs within the same country (hence for a given regulation and institutional quality) and its consequences in terms of procurement outcomes. In the original model of Bosio et al. (2020), there is no room for manipulation because it is assumed that, if present, regulation is binding.[32] We modify their setting by introducing the possibility for the PA to circumvent the regulation limiting discretion through contract value manipulation.

As in Bosio et al. (2020), we define discretion as the possibility to exclude contractors without need of verifiable evidence to back up the decision.[33] Manipulation is then a means of obtaining discretion as it allows public administrations to avoid regulatory thresholds that make discretionary exclusion harder (e.g., prescribing the use of open auctions). The buyer that manipulates is exposed to the risk of being detected and sanctioned by the regulator.

We assume that each PA with a project value close but above the regulatory threshold can manipulate this value at a PA-specific cost τ that incorporates the PA's evaluation of all the expected costs of being caught violating the rules (including sanctions and connected reputational/electoral consequences).

If no manipulation takes place, an Open Auction (which is the baseline procedure) is run. For simplicity, we assume that the PA then uses a second price auction, in which the lowest cost firm always wins.

The rest of the model closely follows the structure and assumptions of Bosio et al. (2020): there

[32] In their words: "We assume that this rule binds, so the model cannot explain why in some countries, exclusion is restricted by law but common in practice.".

[33] This is indeed the discretion gained in auctions restricted to invited bidders only, as in the *Trattativa Privata* in our data.

are two firms, an Incumbent or Insider (I), and an Entrant or Outsider (O).[34] The PA can observe the Incumbent and the Outsider's quality (Q) and cost (K), while courts can easily observe bids and payments but not quality, which is therefore not contractible.

The PA's utility is $\alpha(Q_i - C) - \tau + B$ with $i = \{O, I\}$, where C is the price paid by the PA, α is the value the PA places on consumer welfare, τ is the PA's expected cost of manipulating projects described earlier (the PA incurs in this cost only when manipulating), and B is the bribe the PA can extract from the Incumbent (the PA can extract bribes only from the Incumbent with whom it has a relationship).

The firm's profit is zero if it is not awarded the contract, and $C - K_i - \theta B$ with $i = \{O, I\}$ if it does, where $\theta > 1$ is the transaction cost for the Incumbent to deliver a bribe to the PA. This parameter in Bosio et al. (2020) changes across countries with national anti-corruption laws and enforcement and could be assumed constant in our within-country framework without loss of generality.[35]

It is assumed that there is a maximum possible payment for the service C_{max}, and that $min\{Q_I, Q_O\} > C_{max} > max\{K_I, K_O\}$ so that it is always optimal to assign the project and that both firms are willing to take the project for a price of C_{max}.

Putting these pieces together, we can describe the predictions of the model. If no manipulation occurs, the Open Auction procedure is used and selects the lowest cost firm irrespective of quality. If the PA manipulates to obtain discretion, it excludes one of the two firms and incurs the cost τ. The PA would do so if it would get a larger payoff by avoiding a low-quality winner and/or extracting a bribe from the Incumbent to exclude the Outsider.

Within this framework, depending on parameters values, we can identify five predictions (i.e., equilibria): I) efficient manipulation without bribes, II) efficient manipulation with bribes, III) inefficient manipulation with bribes, IV) efficient non-manipulation, and V) inefficient non-manipulation,[36] where efficiency is defined as achieving the highest possible consumer welfare in the relevant scenario.

[34] As in Bosio et al. (2020), the Incumbent should be broadly interpreted as representing all suppliers with whom the PA has some kind of relationship, and the Outsider represents all other potential suppliers.

[35] As in Bosio et al. (2020), we assume that in negotiations over bribes the PA has bargaining power β, so the Nash bargain maximizes: $(U_{BARGAIN} - U_{NO})^{\beta}(\pi_{BARGAIN} - \pi_{NO})^{1-\beta}$, where $U_{BARGAIN}$ and $\pi_{BARGAIN}$ are the PA's utility and the Incumbent's profits in a bargain, and U_{NO} and π_{NO} are PA's utility and the Incumbent's profits if no bargain is reached.

[36] In Appendix E, we provide details about the characterization of the equilibria.

Efficient manipulation without bribes (Eq. I) arises when either firm has a significant quality advantage ($Q_i > Q_j$) but also higher costs ($K_i > K_j$), the PA is well-run in the sense of placing a large weight on effectively obtaining good value for money (high α), and it has a low perceived cost of violating procedural rules to get the discretion needed to enhance procured quality (low τ). In this equilibrium, the PA receives a higher payoff when excluding the low-quality firm because the value of the additional quality of the other firm is large enough to compensate for the cost of manipulation and the higher price from reduced competition. In terms of observables, this type of equilibrium is associated with an improvement in overall quality and smaller discounts compared to open auctions. If the Incumbent has higher quality ($Q_I > Q_O$) but also higher costs ($K_I > K_O$), we will see incumbents winning more often when there is manipulation. Vice versa, if the Incumbent has lower quality ($Q_I < Q_O$) but also lower costs ($K_I < K_O$), we will see incumbents winning less often when there is manipulation.

Efficient manipulation with bribes (Eq. II) arises when the Incumbent has a significant but smaller quality advantage ($Q_I > Q_O$) as well as higher costs ($K_I > K_O$), and the PA is slightly less concerned with effective performance (smaller α) or it has a relatively higher cost of manipulation (larger τ). In this case, the PA will need a bribe to compensate for the cost of manipulating τ and induce it to efficiently exclude the low-quality Outsider; that is, an "efficiency bribe". As in the previous type of equilibrium, in terms of observables, this second type of equilibrium is associated with an improvement in overall quality compared to an open procedure, and smaller discounts because of reduced competition. We will also see incumbents winning more often when there is manipulation.

Inefficient manipulation with bribes (Eq. III) arises more often when the PA has a low cost of violating rules (low τ) and a low concern for procurement performance (low α), coupled with an incumbent that is still competitive in terms of costs or quality. In this case, the PA can leverage exclusion to extract a bribe from the incumbent's rent. In terms of observables, this type of equilibrium is generally associated with a worsening on consumer welfare, with lower quality and/or higher costs.

Efficient non-manipulation (Eq. IV) arises when either type of firm has a significant cost advantage and sufficiently high quality, and the PA is performance-oriented (high α) and has a high cost of violating procedural limits to discretion (high τ). In this case, the cost advantage of one of the two firms is so large that is not worthwhile for the PA to manipulate, either to collect a bribe or to select a higher quality competitor. In terms of observables, this type of equilibrium is associated with lower costs compared to a discretionary procedure, while the impact on quality is ambiguous – it could either go up or down compared to a restricted procedure.

Finally, inefficient non-manipulation (Eq. V) arises when either type of firm has a cost advantage but also relatively low quality, and the PA has a high cost of violating procedural rules (high τ) and little concern for procurement performance (low α). In this case, the exclusion of the low-quality firm without a bribe would be beneficial for consumers, however it does not happen because the PA does not want to incur the cost of circumventing inefficient procedural rules (i.e., we have "inefficient regulation"). In terms of observables, this type of equilibrium is associated with lower costs but significantly lower quality than with restricted procedures.

6.1 Discussion of the predictions of the model

We use the five predictions to interpret our empirical findings. With respect to appointed PAs, our empirical analysis shows that manipulation plus exclusion (more *Trattativa Privata*, stronger reduction in the number of bidders, and more incumbents) causes higher quality (lower work length, lower delays, lower cost overruns, and higher TFP). This average outcome is coherent with a predominance of the two efficient manipulation equilibria (I and II), that is, with a performance-oriented PA (high α) facing low-cost manipulation (low τ). A lower τ is consistent with appointed PAs and bureaucrats being further away from political competition and therefore more protected from electoral discipline. A higher α is consistent with appointed PAs being more sensitive to effective performance, even if it realizes further away in time (often well after the conclusion of the contract), because in these less political institutions bureaucrats are more accountable to peers for the performance delivered (Alesina and Tabellini, 2007), and may be more competent or specialized.

The empirical result that manipulation induces incumbency, together with higher quality and mixed effects on price, is predicted by the model in both efficient manipulation equilibria. Efficient manipulation without bribes (Eq. I) predicts incumbency as long as the incumbent's quality advantage is sufficiently large so that it dominates on cost disadvantage and manipulation cost. Efficient manipulation with bribes (Eq. II) always predicts incumbency (the Outsider cannot bribe). These two efficient manipulation equilibria are observationally equivalent, so we cannot evaluate which one dominates in our data, but the higher the realized value for money ($Q - C$), the less likely that the equilibrium includes bribes.

For elected PAs, we observe little or no manipulation, higher prices, and considerably lower quality compared to appointed PAs using manipulation. These results are consistent with types IV and V equilibria and a high τ. A higher perceived cost of manipulation for elected PAs, relative to the value attributed to quality, seems justified by this being immediately observable (already when the call for tender is made public) and therefore having the potential to generate "scandals", with a direct impact on upcoming elections.

7 Conclusion

We quantify manipulation of the value of procurement contracts among more than 30,000 contracts managed by Italian public administrations of different types. Using a bunching estimator, we document that appointed administrations manipulate the value of the contracts to avoid crossing regulatory thresholds that make it harder to use discretionary procedures. The evidence for elected administrations is muted. We show that manipulating administrations more often use such discretionary procedures, have fewer bidders with mixed effects on rebates (depending on the threshold), and have consistently better ex-post outcomes: shorter work duration, fewer delays in the delivery of the works, and fewer cost overruns. They also select suppliers that win repeated contracts if they performed well in the past and that have a lower (ex-ante) financial default risk.

We provide a simple model to illustrate our findings. The model has multiple equilibria, two of which predict efficient manipulation (improved procurement performance) and incumbency, one with bribes and one without.

In a broader sense, our results indicate that accounting for the heterogeneity across government agencies is important for a full understanding of bureaucratic behavior. They are therefore in line with Bandiera, Prat and Valletti (2009), who show that excessive regulation, red tape, and bureaucratic inefficiency are more significant sources of waste than corruption in Italy, and that more autonomous administrations have better procurement processes and are less corrupt. They also support the conclusion of Bosio et al. (2020), that looking at the laws without accounting for the practice does not allow a full understanding of the effects of regulation, and that in high human capital countries, fewer rules constraining bureaucratic discretion or a looser enforcement of these rules would likely be beneficial.

Among the differences between appointed and elected administrations, we find that procurers of the former are on average better educated. In light of the recent evidence on the importance of bureaucratic competence (Bucciol, Camboni and Valbonesi, 2020; Decarolis et al., 2020*a*, 2021), studying the relationship between rules, discretion, and competence in public administrations appears to be an important avenue for future research.

References

Akhtari, Mitra, Diana Moreira, and Laura Trucco. 2016. "Political Turnover, Bureaucratic Turnover, and the Quality of Public Services." *Working Paper 468671, Harvard University OpenScholar.*

Albano, Gian Luigi, Milo Bianchi, and Giancarlo Spagnolo. 2006. "Bid average methods in procurement." *Rivista di Politica Economica*, 96: 41–62.

Alesina, Alberto, and Guido Tabellini. 2007. "Bureaucrats or Politicians? Part I: A Single Policy Task." *American Economic Review*, 97(1): 169–179.

Baltrunaite, Audinga, Cristina Giorgiantonio, Sauro Mocetti, and Tommaso Orlando. 2021. "Discretion and Supplier Selection in Public Procurement." *The Journal of Law, Economics, and Organization*, 37(1): 134–166.

Bandiera, Oriana, Andrea Prat, and Tommaso Valletti. 2009. "Active and Passive Waste in Government Spending: Evidence from a Policy Experiment." *American Economic Review*, 99(4): 1278–1308.

Bandiera, Oriana, Michael Carlos Best, Adnan Qadir Khan, and Andrea Prat. 2021. "The Allocation of Authority in Organizations: A Field Experiment with Bureaucrats." *The Quarterly Journal of Economics.*

Banfield, Edward C. 1975. "Corruption as a Feature of Governmental Organization." *Journal of Law and Economics*, 18(3): 587–605.

Baqir, Reza. 2002. "Districting and Government Overspending." *Journal of Political Economy*, 110(6): 1318–354.

Besley, Timothy, and Stephen Coate. 2003. "Elected versus Appointed Regulators: Theory and Evidence." *Journal of the European Economic Association*, 1(5): 1176–1206.

Best, Michael Carlos, Jonas Hjort, and David Szakonyi. 2017. "Individuals and Organizations as Sources of State Effectiveness." *NBER Working Paper no. 23350.*

Bobilev, Roman, Andrea Guglielmo, Elena Paltseva, and Giancarlo Spagnolo. 2015. "Public Procurement Thresholds and Data in Sweden." *Report for Konkurrensverket.*

Bosio, Erica, Simeon Djankov, Edward L. Glaeser, and Andrei Shleifer. 2020. "Public Procurement in Law and Practice." *NBER Working Paper 27188.*

Bucciol, Alessandro, Riccardo Camboni, and Paola Valbonesi. 2020. "Purchasing medical devices: the role of buyers' competence and discretion." *Journal of Health Economics*, 74: 102370.

Calligaris, Sara, Massimo Del Gatto, Fadi Hassan, Gianmarco I.P. Ottaviano, and Fabiano Schivardi. 2016. "Italy's productivity conundrum." *European Commission Discussion Paper 030.*

Carril, Rodrigo. 2021. "Rules versus discretion in public procurement." *Economics Working Papers 1765, Department of Economics and Business, Universitat Pompeu Fabra.*

Castellani, Lorenzo, Francesco Decarolis, and Gabriele Rovigatti. 2018. "Procurement Centralization in the EU: The Case of Italy." *CEPR Discussion Paper No. 12567.*

Chernozhukov, Victor, Denis Chetverikov, Mert Demirer, Esther Duflo, Christian Hansen, Whitney Newey, and James Robins. 2018. "Double/debiased machine learning for treatment and structural parameters." *The Econometrics Journal*, 21(1): C1–C68.

Chetty, Raj, John N. Friedman, Tore Olsen, and Luigi Pistaferri. 2011. "Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records." *The Quarterly Journal of Economics*, 126(2): 749–804.

Conley, Timothy G., and Francesco Decarolis. 2016. "Detecting Bidders Groups in Collusive Auctions." *American Economic Journal: Microeconomics*, 8(2): 1–38.

Coviello, Decio, and Mario Mariniello. 2014. "Publicity requirements in public procurement:

Evidence from a regression discontinuity design." *Journal of Public Economics*, 109: 76–100.

Coviello, Decio, Andrea Guglielmo, and Giancarlo Spagnolo. 2018. "The Effect of Discretion on Procurement Performance." *Management Science*, 64(2): 715–738.

Coviello, Decio, and Stefano Gagliarducci. 2017. "Tenure in Office and Public Procurement." *American Economic Journal: Economic Policy*, 9(3): 59–105.

Coviello, Decio, Luigi Moretti, Giancarlo Spagnolo, and Paola Valbonesi. 2018. "Court Efficiency and Procurement Performance." *The Scandinavian Journal of Economics*, 120: 826–858.

Crawford, Gregory S., Nicola Pavanini, and Fabiano Schivardi. 2018. "Asymmetric Information and Imperfect Competition in Lending Markets." *American Economic Review*, 108(7): 1659–1701.

Decarolis, Francesco. 2014. "Awarding Price, Contract Performance, and Bids Screening: Evidence from Procurement Auctions." *American Economic Journal: Applied Economics*, 6(1): 108–132.

Decarolis, Francesco, Cristina Giorgiantonio, and Valentina Giovanniello. 2011. "The awarding of public works in Italy: an analysis of the mechanisms for the selection of contractors." *Mercato Concorrenza Regole*, 2: 235–272.

Decarolis, Francesco, Gaétan de Rassenfosse, Leonardo M. Giuffrida, Elisabetta Iossa, Vincenzo Mollisi, Emilio Raiteri, and Giancarlo Spagnolo. 2021. "Buyers' role in innovation procurement: Evidence from US military RD contracts." *Journal of Economics Management Strategy*, 30(4): 697–720.

Decarolis, Francesco, Leonardo M. Giuffrida, Elisabetta Iossa, Vincenzo Mollisi, and Giancarlo Spagnolo. 2020*a*. "Bureaucratic Competence and Procurement Outcomes." *The Journal of Law, Economics, and Organization*, 36(3): 537–597.

Decarolis, Francesco, Raymond J. Fisman, Paolo Pinotti, and Silvia Vannutelli. 2020*b*. "Rules, Discretion, and Corruption in Procurement: Evidence from Italian Government Contracting." *NBER Working Paper 28209*.

Diamond, Rebecca, and Petra Persson. 2016. "The Long-term Consequences of Teacher Discretion in Grading of High-stakes Tests." *NBER Working Paper 22207*.

Di Tella, Rafael, and Ernesto Schargrodsky. 2003. "The Role of Wages and Auditing during a Crackdown on Corruption in the City of Buenos Aires." *The Journal of Law & Economics*, 46(1): 269–292.

Ferraz, Claudio, and Frederico Finan. 2011. "Electoral Accountability and Corruption: Evidence from the Audits of Local Governments." *American Economic Review*, 101(4): 1274–1311.

Gil, Ricard, and Justin Marion. 2013. "Self-Enforcing Agreements and Relational Contracting: Evidence from California Highway Procurement." *The Journal of Law, Economics, and Organization*, 29(2): 239–277.

Golden, Miriam A., and Lucio Picci. 2005. "Proposal for a New Measure of Corruption, Illustrated with Italian Data." *Economics and Politics*, 17: 37–75.

Goncalves, Felipe, and Steven Mello. 2021. "A Few Bad Apples? Racial Bias in Policing." *American Economic Review*, 111(5): 1406–1441.

Guiso, Luigi, Luigi Pistaferri, and Fabiano Schivardi. 2013. "Credit within the Firm." *The Review of Economic Studies*, 80(1): 211–247.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2004. "The Role of Social Capital in Financial Development." *American Economic Review*, 94(3): 526–556.

Hsieh, Chang-Tai, and Peter J. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *The Quarterly Journal of Economics*, 124(4): 1403–1448.

Kelman, Steven. 1990. *Procurement and Public Management: The Fear of Discretion and the*

Quality of Government Performance. AEI Press.

Kleven, Henrik J. 2016. "Bunching." *Annual Review of Economics*, 8(1): 435–464.

Kleven, Henrik J., and Mazhar Waseem. 2013. "Using Notches to Uncover Optimization Frictions and Structural Elasticities: Theory and Evidence from Pakistan." *The Quarterly Journal of Economics*, 128(2): 669–723.

Lim, Claire S. H. 2013. "Preferences and Incentives of Appointed and Elected Public Officials: Evidence from State Trial Court Judges." *American Economic Review*, 103(4): 1360–1397.

Maskin, Eric, and Jean Tirole. 2004. "The Politician and the Judge: Accountability in Government." *American Economic Review*, 94(4): 1034–1054.

Palguta, Ján, and Filip Pertold. 2017. "Manipulation of Procurement Contracts: Evidence from the Introduction of Discretionary Thresholds." *American Economic Journal: Economic Policy*, 9(2): 293–315.

Rose-Ackerman, Susan. 1999. *Corruption and Government: Causes, Consequences, and Reform.* Cambridge University Press.

Szucs, Ferenc. 2017. "Discretion and corruption in public procurement." *Job market paper.*

Appendices

A Estimation details

Details of the quantification of bunching. Our method quantifies bunching by the estimation of the counterfactual distribution around the thresholds. This distribution represents an estimate of what the distribution of project values would have looked like in the absence of bunching. We quantify bunching as the difference between the actual (peaked) distribution and the estimated distribution.

We obtain the counterfactual distribution fitting a flexible polynomial to the observed distribution of project values, but by excluding data in a window around the threshold. We call this region the manipulation region around the threshold. The fitted distribution is then used to extrapolate the values at the threshold and to quantify what is defined excess bunching around the threshold.

Steps to estimate (excess) bunching. We first center each project value (in 2005 euro equivalents) as a distance from each threshold. We next group contracts into project value bins, and the counterfactual distribution is estimated using the following polynomial regression:

$$n_j = \sum_{i=0}^{p} \alpha_i \left(m_j\right)^i + \sum_{i=m_L}^{m_U} \gamma_i \mathbb{1}\left(m_j = i\right) + \epsilon_j, \tag{3}$$

where n_j is the number of contracts in each bin j, m_j is the project value in bin j, p is the order of the polynomial, and $[m_L, m_U]$ is the manipulation (or excluded) region around the threshold. The manipulation region below threshold $[m_L, m_0]$ is where excess bunching materializes, while the manipulation region just above threshold $(m_0, m_U]$ is the area of missing mass. We estimate the counterfactual distribution of contracts' project value by the predicted values of n_j

$$\hat{n}_j = \sum_{i=0}^{p} \hat{\alpha}_i \left(m_j\right)^i . \tag{4}$$

Excess bunching is then quantified as the difference between the observed and the counterfactual bin counts in the excluded region at and below the threshold

$$\hat{B} = \sum_{j=m_L}^{m_0} \left(n_j - \hat{n}_j\right) = \sum_{j=m_L}^{m_0} \hat{\gamma}_j, \tag{5}$$

while the amount of missing mass due to bunching is $\hat{M} = \sum_{j>m_0}^{m_U} \left(\hat{n}_j - n_j\right)$.

Finally, we estimate the excess mass below threshold relative to the average density of the counterfactual project value distribution:

$$\hat{b} = \frac{\hat{B}}{\frac{1}{N}\sum_{j=m_L}^{m_0} \hat{n}_j}, \tag{6}$$

where N is the number of bins in the manipulation region below threshold $[m_L, m_0]$.

The bunching method is based on two key identifying assumptions. First, the density distribution of the project value would be smooth absent the threshold. Second, the threshold only affects the project value distribution within a certain segment of the distribution (*local effects assumption*). The first assumption can be verified by examining the distribution of project values in the post-reform period, once the discretion thresholds were removed (see Section 5.2), while the second is consistent with our focus on the manipulation of contract values around the threshold rather than contract splitting. Even if some procurers may be engaging in contract splitting, they would reasonably not choose highly suspicious project values close but below the threshold.[37].

The estimator requires few parameters: the width of the bins, the order of the polynomial (p), and the location of the lower and upper bounds of the manipulation region (m_L and m_U). Following Kleven and Waseem (2013), we select the lower bound m_L by visual inspection, starting where we observe the change in distribution induced by manipulation. We select the upper bound m_U by minimizing the difference between the bunching and the missing masses. We use €2,000 bins, and a polynomial of eight-degree (ninth-degree) for the €200,000 (€300,000) threshold. Among the various parameter configurations considered, we prefer these because they yield the smallest difference between bunching and missing mass. This approach ignores extensive margin responses, since it is based on the insight that these responses converge to zero just above the threshold (Kleven and Waseem, 2013). In Section 5 we assess the robustness of our estimates. We compute standard errors using a bootstrap procedure that re-samples the error term of equation (3).

Details of the LASSO estimates of bunching. The LASSO algorithm minimizes the following constrained objective function

$$\sum_{i=1}^{N}(y_i - \beta_0 - \sum_{j=1}^{p}\beta_j x_{ij})^2 + \lambda\sum_{j=1}^{p}|\beta_j| = SCR + \lambda\sum_{j=1}^{p}|\beta_j|,$$

where λ is the penalization parameter and the best model is selected on the basis of smallest mean squared error (MSE) with k-fold cross-validation or Bayesian Information Criterion (BIC) minimization.

For each threshold, we define our measure of bunching y_i as a dummy for contract i being in the manipulation region below threshold $[m_L, m_0]$. In the model we include as potential covariates the type of procuring administration: appointed v. elected; a measure of relational contracting: the number of future contracts (Gil and Marion, 2013); average yearly expenditure; procurement officials' characteristics: turnover, measured by the maximum number of contracts administered by the same official (Coviello and Gagliarducci, 2017), professional title, gender, age; the type of works; province and year fixed effects; social capital and proxies for the institutional environment: voter turnout at the referenda, blood donations, judicial efficiency, and population.[38]

In our LASSO estimates (Tables 4) we compare predictions based on the post-selection coefficients of three different specifications: 5-fold cross-validation, 10-fold cross-validation and minimum BIC. For both thresholds, the minimum BIC model performs best in out-of-sample prediction according to both MSE and R-squared. Key predictors are the dummy for appointed public administrations and the maximum number of contracts administered by the same procurement official within the public administration for the €200,000 threshold. The dummy appointed and the dummy for the province of Perugia are the key predictors of manipulation at the €300,000 threshold.[39]

[37] Moreover, if present, contract splitting is likely to be rare as it is impossible for all works (e.g., buildings, see also Coviello, Guglielmo and Spagnolo (2018)) and, while feasible for roads, it is very costly: running multiple procurements has a high administrative cost and having repeated winners with restricted proceedings may raise suspicion. Even if a certain number of contract splitting would be present in our counterfactual, our robustness checks ensure that our results are accurate.

[38] To maximize sample size, we assign the sample mean (or the baseline category, if a dummy variable) to covariates with missing data, and include a dummy for missing status for these variables.

[39] In the period of our analysis the province of Perugia was in a state of emergency following a strong earthquake in

Details of the extended bunching method to estimate the effects of bunching on outcomes. Diamond and Persson (2016) show that the effect of bunching can be estimated as the difference between the average observed outcomes across all contracts in the manipulation region and the average predicted outcomes for contracts in the manipulation region had there been no manipulation. The key identifying assumption of this estimator is that the counterfactual distribution of the outcomes can be parametrically estimated by fitting the polynomial in the unmanipulated regions of the distribution. Note that we did this step in Section 4.1 to quantify bunching. We implement their estimator following these steps:

First, for each outcome y_j, we estimate a regression model that is similar to Equation (3), but that for the case of the outcomes directly allows for a threshold effect:

$$y_j = \sum_{i=0}^{p} \alpha_i (m_j)^i + \beta Threshold_j + \sum_{i=m_L}^{m_U} \gamma_i \mathbb{1}(m_j = i) + \epsilon_j, \tag{7}$$

This equation produces predicted outcomes in the absence of manipulation

$$\hat{y}_j = \sum_{i=0}^{p} \hat{\alpha}_i (m_j)^i + \hat{\beta} Threshold_j. \tag{8}$$

In the next step, we estimate the counterfactual expected outcomes in the manipulation region by combining the previous estimates with those of the counterfactual project value distribution $\hat{n}_j$. We estimate the reduced form effect of project value manipulation on outcomes as the difference between the average observed outcomes across all contracts in the manipulation region and the average predicted outcomes for contracts in the manipulation region had there been no manipulation[40]

$$\Delta\hat{y}_j = \frac{\sum_{i=m_L}^{m_U} (y_j \cdot n_j)}{\sum_{i=m_L}^{m_U} n_j} - \frac{\sum_{i=m_L}^{m_U} (\hat{y}_j \cdot \hat{n}_j)}{\sum_{i=m_L}^{m_U} \hat{n}_j}, \tag{9}$$

Finally, Diamond and Persson (2016) indicate that one can estimate the causal effect of discretion in presence of bunching considering the ratio between the effects of bunching on the outcomes and of bunching on discretion. This corresponds to a Wald estimate of the LATE effects of manipulation-induced discretion.

1997. The fact that this is a predictor of manipulation at the €300,000 threshold is consistent with the requirement for an urgency reason to use discretion below this threshold.

[40] Diamond and Persson (2016) emphasize that the reduced form effect is not sensitive to the exact choice of polynomial; for our estimation, we follow their choice of a third-order polynomial.

B Additional tables

Table B.1: Descriptive Statistics of Outcomes – Comparison Across the €200,000 Threshold

Variables	Mean	SD	Median	N	Mean	SD	Median	N
	Below €200,000							
	No *Trattativa Privata*				Yes *Trattativa Privata*			
N. Bidders	25.11	27.50	15	8,567	4.950	5.565	4	2,312
Winning Rebate	15.27	9.689	13.76	8,425	10.64	9.387	8.200	2,397
Work Length	283.6	174.9	249	6,243	236.8	170.3	191	1,783
Delay	106.0	121.3	69	6,243	85.56	112.2	45	1,783
Cost Overrun	0.130	0.182	0.0680	6,718	0.115	0.183	0.0518	1,732
Local Winner	0.507	0.500	1	6,682	0.625	0.484	1	2,104
Incumbent Winner	0.0826	0.275	0	6,199	0.192	0.394	0	1,915
TFP	0.571	0.418	0.552	4,150	0.581	0.418	0.563	1,416
Financial Default Score	5.025	1.552	5	4,097	4.808	1.529	5	1,407
	Above €200,000							
	No *Trattativa Privata*				Yes *Trattativa Privata*			
N. Bidders	28.97	29.95	19	10,653	5.595	6.279	4	1,962
Winning Rebate	15.17	9.352	13.72	10,492	9.779	8.897	7.520	1,955
Work Length	324.8	187.8	298	7,918	295.7	199.8	260.5	1,492
Delay	123.9	134.3	88	7,918	121.1	144.8	78	1,492
Cost Overrun	0.127	0.172	0.0683	8,488	0.135	0.189	0.0685	1,497
Local Winner	0.494	0.500	0	8,403	0.621	0.485	1	1,661
Incumbent Winner	0.0929	0.290	0	7,845	0.177	0.382	0	1,558
TFP	0.573	0.422	0.569	5,507	0.583	0.448	0.579	1,165
Financial Default Score	5.062	1.560	5	5,442	4.938	1.516	5	1,156

Notes. Descriptive statistics are calculated for all the public works tendered between 2000 and 2005, with reserve price $y \in [1.5, 3)$, in €100,000 (2005 equivalents). *Trattativa Privata* is a dummy equal to 1 for works assigned with a discretionary procedure. *N. Bidders* is the number of bidders. *Winning Rebate* is the percentage discount over the reserve price. *Work Length* is the number of days from the first day of work until the effective end of the project, which represents the effective duration of the works. *Delay* is the difference in days between the effective end of the project and the contractual deadline. *Cost Overrun* is the ratio between the difference in the final cost and the awarding cost (reserve price discounted by the winning rebate) and the awarding cost. *Local Winner* is a dummy equal to 1 if the winning firm is located in the same province of the public buyer. *Incumbent Winner* is a dummy equal to 1 if the winning firm has won a contract with the public buyer in the past year. *TFP* and *Financial Default Score* measure revenue total factor productivity and financial default risk in 1999 respectively.

Table B.2: Descriptive Statistics of Outcomes – Comparison Across the €300,000 Threshold

Variables	Mean	SD	Median	N	Mean	SD	Median	N
	Below €300,000							
	No Trattativa Privata				Yes Trattativa Privata			
N. Bidders	29.08	29.97	19	10,739	5.562	6.243	4	1,991
Winning Rebate	15.21	9.349	13.77	10,577	9.849	8.916	7.770	1,982
Work Length	325.1	188.5	298	7,993	295.9	199.7	260	1,515
Delay	123.5	134.4	88	7,993	121.0	144.4	78	1,515
Cost Overrun	0.127	0.172	0.0684	8,531	0.136	0.193	0.0674	1,519
Local Winner	0.494	0.500	0	8,460	0.623	0.485	1	1,688
Incumbent Winner	0.0938	0.292	0	7,902	0.180	0.385	0	1,586
TFP	0.575	0.423	0.570	5,547	0.584	0.446	0.582	1,189
Financial Default Score	5.061	1.560	5	5,482	4.947	1.514	5	1,180
	Above €300,000							
	No Trattativa Privata				Yes Trattativa Privata			
N. Bidders	33.19	34.80	21	10,311	7.213	9.530	5	653
Winning Rebate	15.66	9.384	14.16	10,176	10.18	8.765	7.530	626
Work Length	395.5	214.5	364	7,966	409.5	247.8	360	517
Delay	151.1	153.2	112	7,966	173.9	192.7	119	517
Cost Overrun	0.134	0.169	0.0773	8,165	0.146	0.198	0.0867	496
Local Winner	0.455	0.498	0	8,116	0.584	0.493	1	543
Incumbent Winner	0.0888	0.284	0	7,545	0.158	0.365	0	499
TFP	0.589	0.427	0.583	5,583	0.547	0.450	0.544	403
Financial Default Score	5.071	1.550	5	5,529	4.819	1.543	5	397

Notes. Descriptive statistics are calculated for all the public works tendered between 2000 and 2005, with reserve price $y \in (2,5]$, in €100,000 (2005 equivalents). *Trattativa Privata* is a dummy equal to 1 for works assigned with a discretionary procedure. *N. Bidders* is the number of bidders. *Winning Rebate* is the percentage discount over the reserve price. *Work Length* is the number of days from the first day of work until the effective end of the project, which represents the effective duration of the works. *Delay* is the difference in days between the effective end of the project and the contractual deadline. *Cost Overrun* is the ratio between the difference in the final cost and the awarding cost (reserve price discounted by the winning rebate) and the awarding cost. *Local Winner* is a dummy equal to 1 if the winning firm is located in the same province of the public buyer. *Incumbent Winner* is a dummy equal to 1 if the winning firm has won a contract with the public buyer in the past year. *TFP* and *Financial Default Score* measure revenue total factor productivity and financial default risk in 1999 respectively.

Table B.3: Descriptive Statistics by Public Administration Type

	Municipality		Province		ANAS		Ministries		Other	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Panel A. Outcomes										
Trattativa Privata	0.112	0.315	0.136	0.343	0.225	0.417	0.357	0.479	0.200	0.400
N. Bidders	22.34	25.54	33.42	34.08	58.11	42.58	16.30	20.54	19.48	24.84
Winning Rebate	13.34	9.020	16.32	10.37	23.25	10.01	14.50	8.790	13.13	8.216
Work Length	356.0	193.1	296.7	196.3	185.9	123.3	328.9	194.6	346.7	223.1
Delay	147.9	144.6	102.3	123.3	42.95	62.99	109.0	139.0	123.1	144.0
Cost Overrun	0.138	0.177	0.115	0.162	0.0287	0.0903	0.127	0.161	0.143	0.192
Local Winner	0.563	0.496	0.530	0.499	0.265	0.441	0.436	0.496	0.476	0.499
Incumbent Winner	0.0743	0.262	0.152	0.359	0.211	0.408	0.0873	0.282	0.101	0.301
TFP	0.567	0.413	0.557	0.426	0.570	0.394	0.666	0.447	0.604	0.455
Financial Default Score	5.016	1.558	4.894	1.548	4.918	1.503	5.126	1.521	5.146	1.556
Panel B. Characteristics										
Project Value	2.681	0.936	2.660	0.944	2.556	0.923	2.500	0.888	2.788	0.973
North	0.587	0.492	0.549	0.498	0.283	0.451	0.357	0.479	0.612	0.487
Center	0.277	0.447	0.294	0.456	0.364	0.481	0.404	0.491	0.268	0.443
South	0.136	0.343	0.157	0.364	0.352	0.478	0.239	0.427	0.120	0.324
Female manager	0.105	0.306	0.0502	0.218	0.00728	0.0850	0.0925	0.290	0.0718	0.258
Manager age	46.24	8.273	48.88	8.095	50.32	8.884	50.30	6.170	49.28	7.623
Manager with degree	0.452	0.498	0.636	0.481	0.784	0.412	0.763	0.425	0.583	0.493
N. Manager contracts (max)	10.41	11.70	35.34	23.40	79.93	35.02	18.11	16.49	14.39	17.73
N. Future contracts	5.695	12.43	17.25	16.18	38.88	18.46	4.489	5.508	9.371	20.64
Avg. yearly expenditure	558.4	1,361	390.1	1,102	112.2	31.09	567.9	1,372	592.9	1,379

Notes. The estimation sample includes public works tendered between 2000 and 2005, with project value $y \in [1.5, 5)$, in €100,000 (2005 equivalents). Descriptive statistics are calculated for the main types of public administrations: municipalities, provinces (elected), ANAS, ministries (appointed), and other. *Trattativa Privata* is a dummy equal to 1 for works assigned with a discretionary procedure. *N. Bidders* is the number of bidders. *Winning Rebate* is the percentage discount over the reserve price. *Work Length* is the number of days from the first day of work until the effective end of the project, which represents the effective duration of the works. *Delay* is the difference in days between the effective end of the project and the contractual deadline. *Cost Overrun* is the ratio between the difference in the final cost and the awarding cost (reserve price discounted by the winning rebate) and the awarding cost. *Local Winner* is a dummy equal to 1 if the winning firm is located in the same province of the public buyer. *Incumbent Winner* is a dummy equal to 1 if the winning firm has won a contract with the public buyer in the past year. *TFP* and *Financial Default Score* measure revenue total factor productivity and financial default risk in 1999 respectively. *N. Manager contracts (max)* is the maximum number of contracts administered by the same manager within the public administration. *N. Future contracts* is the number of contracts tendered in the following year by the public administration. *Project Value* and *Avg. yearly expenditure* are expressed in €100,000.

Table B.4: Bunching Estimates at the Thresholds for Appointed Administrations – Robustness Check

	€200,000 Threshold	€300,000 Threshold
Bunched contracts	330.338	155.709
	(30.350)	(17.109)
Excess mass	3.726	5.805
	(0.559)	(1.016)
Upper limit	0.140	0.200
	(0.024)	(0.021)

Notes. Each column reports the estimated number of contracts bunching at the threshold ($\hat{B}$), the excess mass at the threshold ($\hat{b}$) and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered by appointed administrations between 2000 and 2005. Estimates were obtained by fitting a polynomial of eighth (ninth) degree to the observed distribution of project values around the €200,000 (€300,000) threshold, excluding data in the manipulation region. They are reported separately for the €200,000 (column 1) and the €300,000 threshold (column 2). Standard errors (in parentheses) are calculated using a bootstrap procedure described in Section 4.1.

Table B.5: Bunching Estimates at the €200,000 Threshold for Main Categories of Public Administrations

	Municipalities	Provinces	ANAS	Ministries
Bunched contracts	33.096	44.208	233.695	55.422
	(34.640)	(22.925)	(23.099)	(11.503)
Excess mass	0.145	0.808	4.964	1.902
	(0.155)	(0.473)	(0.917)	(0.542)
Upper limit	0.140	0.140	0.140	0.200
	(0.016)	(0.023)	(0.008)	(0.022)

Notes. Each column reports the estimated number of contracts bunching at the threshold ($\hat{B}$), the excess mass at the threshold ($\hat{b}$) and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered between 2000 and 2005. Estimates were obtained by fitting a polynomial of eighth degree to the observed distribution of project values around the threshold, excluding data in the manipulation region. They are reported separately for municipalities (column 1), provinces (column 2), ANAS (column 3) and ministries (column 4). Standard errors (in parentheses) were calculated using a bootstrap procedure described in Section 4.1.

Table B.6: Bunching Estimates at the €300,000 Threshold for Main Categories of Public Administrations

	Municipalities	Provinces	ANAS	Ministries
Bunched contracts	34.734	23.345	94.179	36.841
	(24.874)	(12.208)	(9.987)	(7.426)
Excess mass	0.329	0.876	7.270	5.233
	(0.242)	(0.503)	(1.401)	(1.590)
Upper limit	0.140	0.160	0.160	0.140
	(0.012)	(0.016)	(0.029)	(0.033)

Notes. Each column reports the estimated number of contracts bunching at the threshold ($\hat{B}$), the excess mass at the threshold ($\hat{b}$) and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered between 2000 and 2005. Estimates were obtained by fitting a polynomial of ninth degree to the observed distribution of project values around the threshold, excluding data in the manipulation region. They are reported separately for municipalities (column 1), provinces (column 2), ANAS (column 3) and ministries (column 4). Standard errors (in parentheses) were calculated using a bootstrap procedure described in Section 4.1.

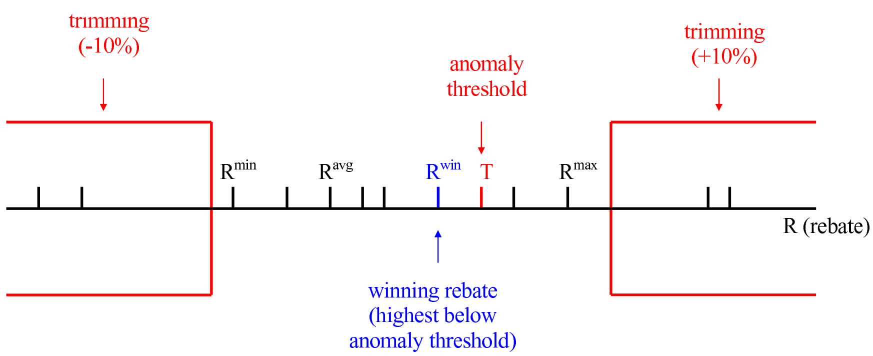
Table B.7: Bunching Measures at the Thresholds for Appointed Administrations – Cross-sectional Approach

	€200,000 Threshold	€300,000 Threshold
Bunched contracts	360.743	129.423
Excess mass	4.450	3.876
Upper limit	0.140	0.200

Notes. Each column reports the number of contracts bunching at the threshold, the excess mass at the threshold and the upper limit of the excluded region used in estimation (m_U) for the sample of public works tendered by appointed administrations between 2000 and 2005. Values were calculated using (adjusted) elected administrations' project value distributions as counterfactuals. They are reported separately for the €200,000 (column 1) and the €300,000 threshold (column 2).

C Additional figures

Figure C.1: The Awarding Mechanism

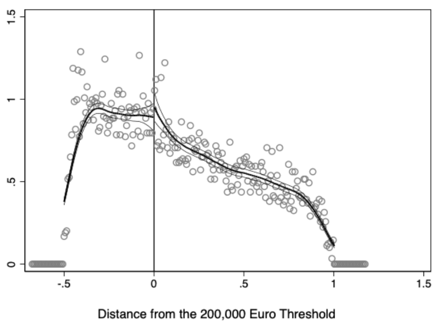


Source: Coviello, Guglielmo and Spagnolo (2018).

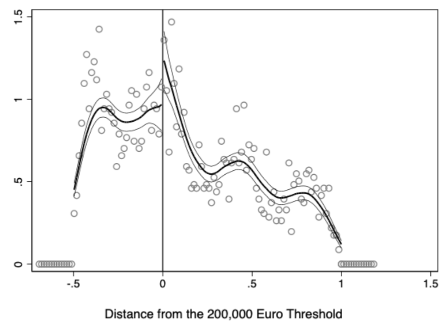
Note. We denote by R^{avg} the average rebate, expressed as a percentage reduction form the starting value; T the anomaly threshold obtained as the sum of R^{avg} and the average deviation of the bids above R^{avg}; R^{win} the winning rebate, and the max rebate below T; and R^{min} and R^{max} the minimum and the maximum rebates, respectively.

Figure C.2: McCrary (2008) Density Tests – The €200,000 Threshold

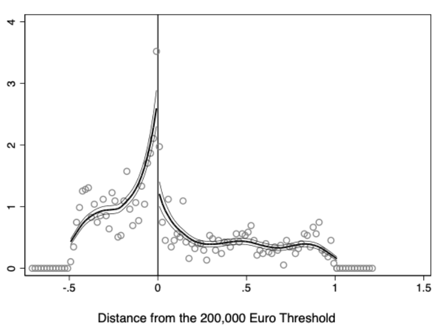
(a) The Buyer is the Municipality



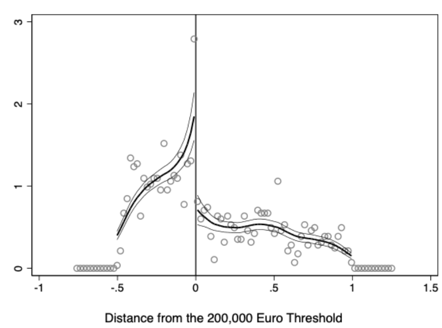
(b) The Buyer is the Province



(c) The Buyer is ANAS



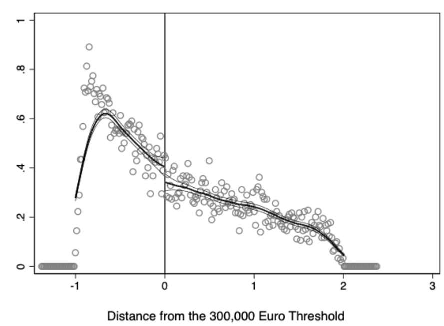
(d) The Buyer is the Ministry



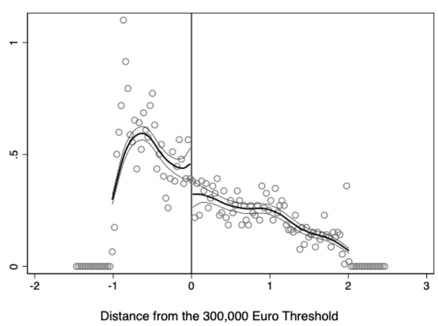
Notes. The figure shows discontinuity tests of the value of the project around The €200,000 threshold for the four main types of contracting authorities in our sample, i.e. Municipalities, Provinces, Ministries, and ANAS. The sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, 3)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

Figure C.3: McCrary (2008) Density Tests – The €300,000 Threshold

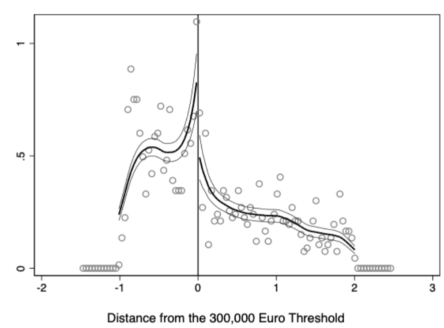
(a) The Buyer is the Municipality



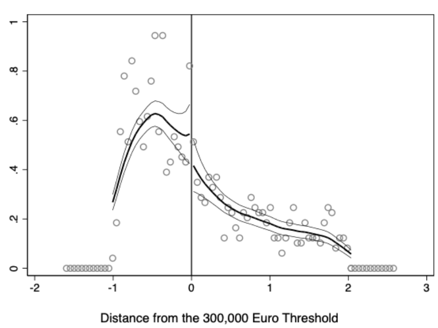
(b) The Buyer is the Province



(c) The Buyer is ANAS



(d) The Buyer is the Ministry

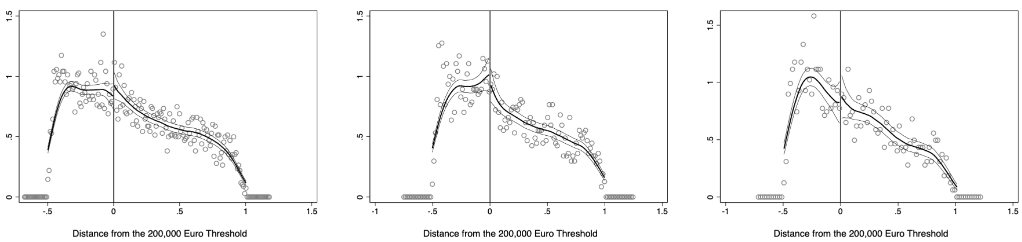


Notes. The figure shows discontinuity tests of the value of the project around The €300,000 threshold for the four main types of contracting authorities in our sample, i.e. Municipalities, Provinces, Ministries, and the ANAS. The sample consists of all public works tendered between 2000 and 2005, with project value $y \in (2, 5)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

Figure C.4: McCrary (2008) Density Tests by Area – The €200,000 Threshold

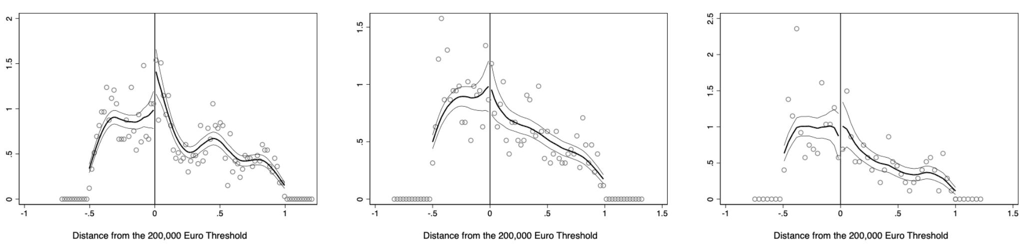
(a) The Buyer is the Municipality

North | Center | South



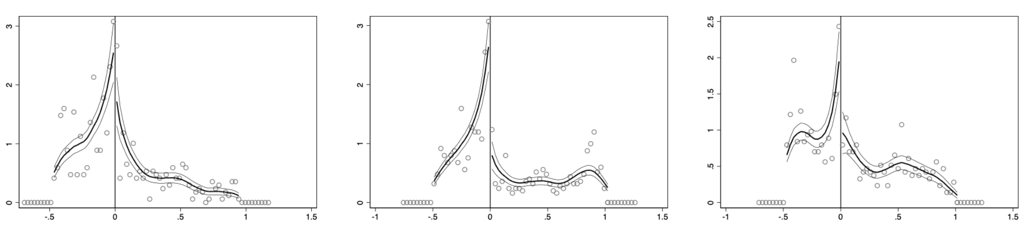
(b) The Buyer is the Province

North | Center | South



(c) The Buyer is ANAS

North | Center | South

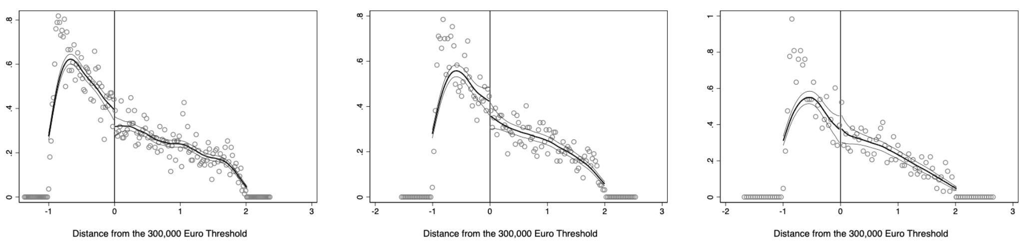


Notes. The figure shows discontinuity tests of the value of the project around the €200,000 threshold for Municipalities, Provinces and ANAS, disaggregated by geographical area (North/Center/South). The sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, 3)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

Figure C.5: McCrary (2008) Density Tests by Area – The €300,000 Threshold

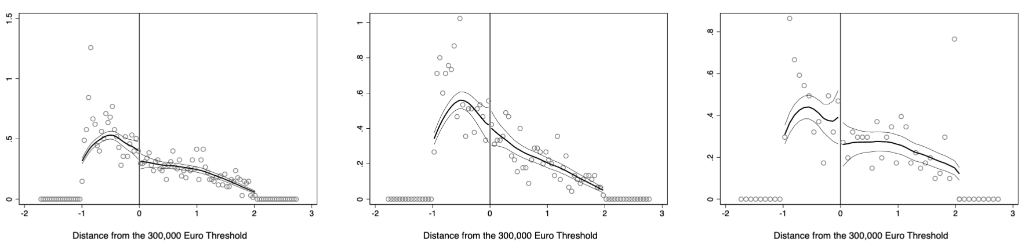
(a) The Buyer is the Municipality

North | Center | South



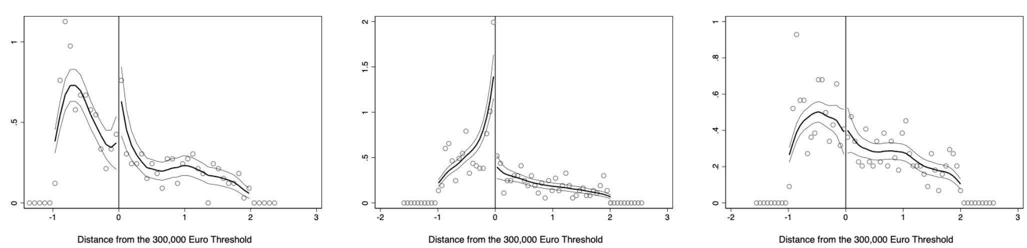
(b) The Buyer is the Province

North | Center | South



(c) The Buyer is ANAS

North | Center | South

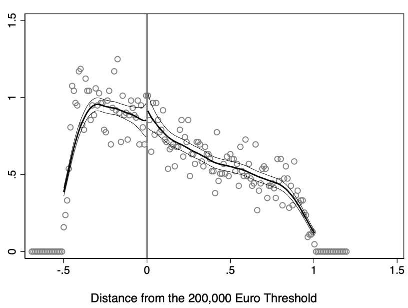


Notes. The figure shows discontinuity tests of the value of the project around the €300,000 threshold for Municipalities, Provinces and ANAS, disaggregated by geographical area (North/Center/South). The sample consists of all public works tendered between 2000 and 2005, with project value $y \in (2, 5)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

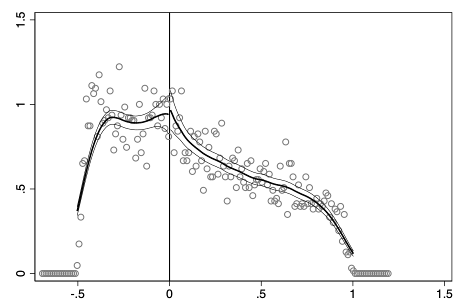
Figure C.6: McCrary (2008) Density Tests by Corruption – The €200,000 Threshold

(a) The Buyer is the Municipality

High Corruption

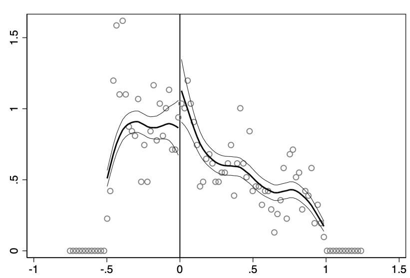


Low Corruption

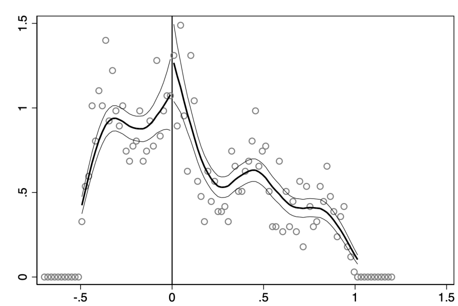


(b) The Buyer is the Province

High Corruption

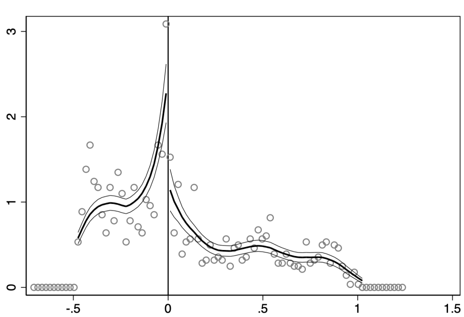


Low Corruption

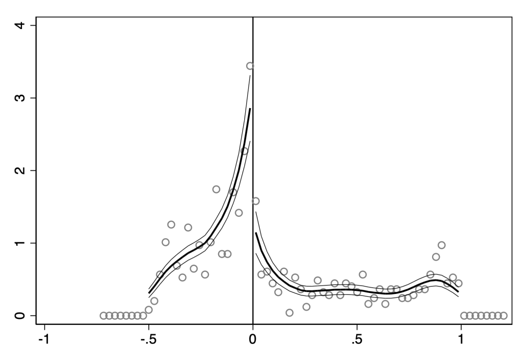


(c) The Buyer is ANAS

High Corruption



Low Corruption

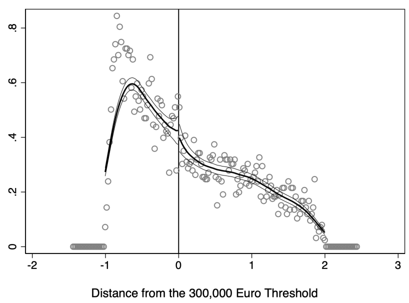


Notes. The figure shows discontinuity tests of the value of the project around The €200,000 threshold for Municipalities, Provinces and ANAS, distinguishing between high vs low corruption areas (i.e., above vs below the median of the Golden and Picci (2005) corruption index). The sample consists of all public works tendered between 2000 and 2005, with project value $y \in [1.5, 3)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

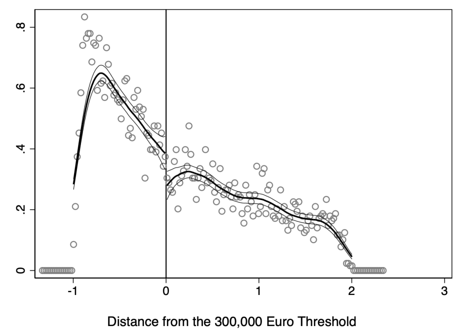
Figure C.7: McCrary (2008) Density Tests by Corruption – The €300,000 Threshold

(a) The Buyer is the Municipality

High Corruption

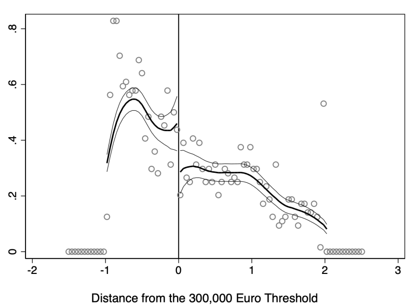


Low Corruption

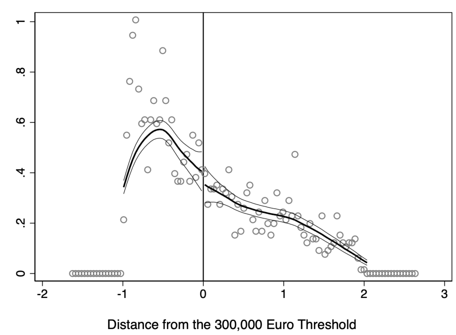


(b) The Buyer is the Province

High Corruption

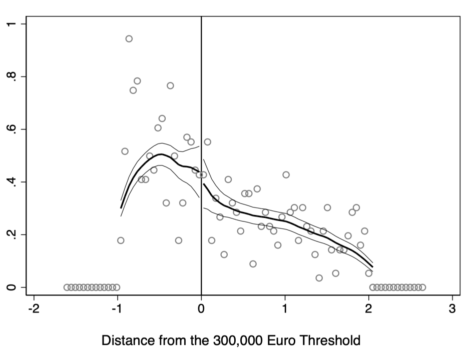


Low Corruption

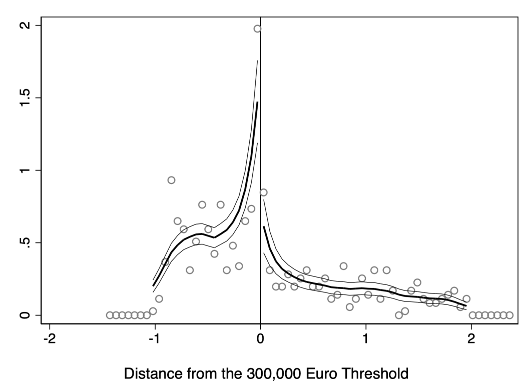


(c) The Buyer is ANAS

High Corruption



Low Corruption

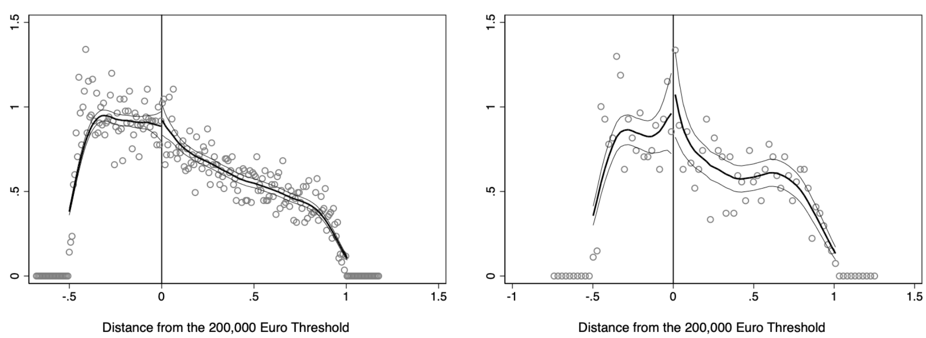


Notes. The figure shows discontinuity tests of the value of the project around The €300,000 Threshold for Municipalities, Provinces and ANAS, distinguishing between high vs low corruption areas (i.e., above vs below the median of the Golden and Picci (2005) corruption index). The sample consists of all public works tendered between 2000 and 2005, with project value $y \in (2, 5)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

Figure C.8: McCrary (2008) Density Tests by Frequency – The €200,000 Threshold

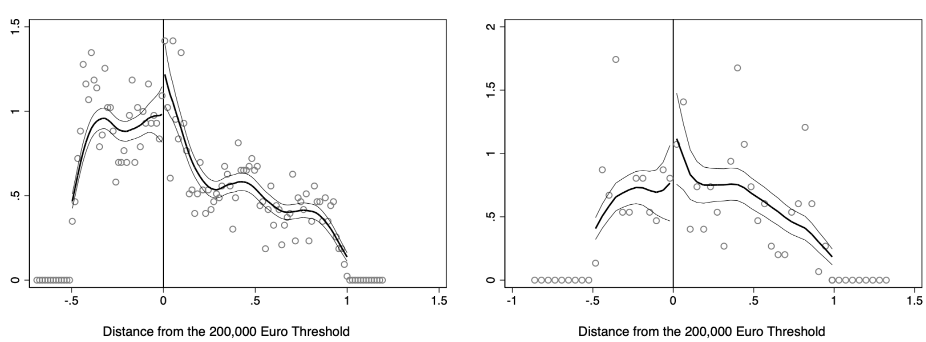
(a) The Buyer is the Municipality

Low-frequency High-frequency



(b) The Buyer is the Province

Low-frequency High-frequency

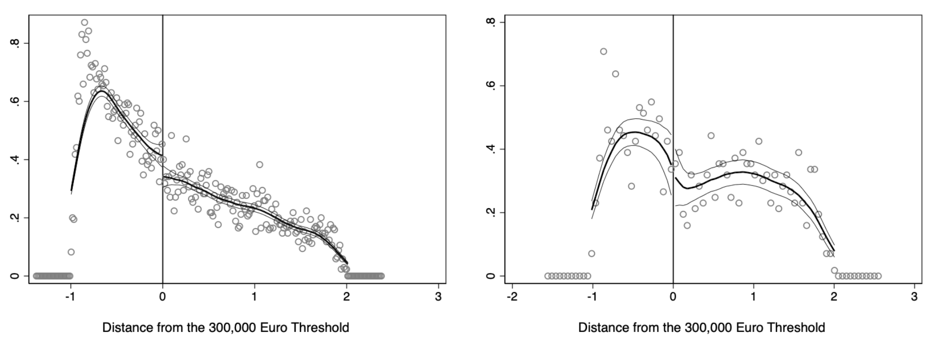


Notes. The figure shows discontinuity tests of the value of the project around The €200,000 threshold for Municipalities and Provinces characterized by low- v. high-frequency (in the 90th percentile). The sample consists of public works tendered between 2000 and 2005, with project value $y \in [1.5, 3)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

Figure C.9: McCrary (2008) Density Tests by Frequency – The €300,000 Threshold

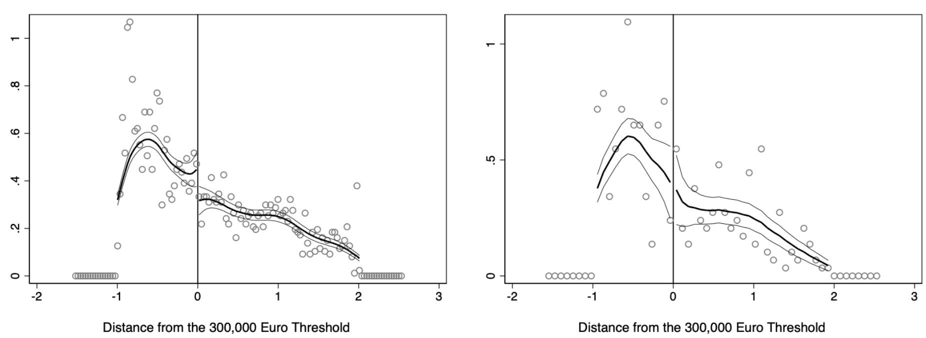
(a) The Buyer is the Municipality

Low-frequency High-frequency



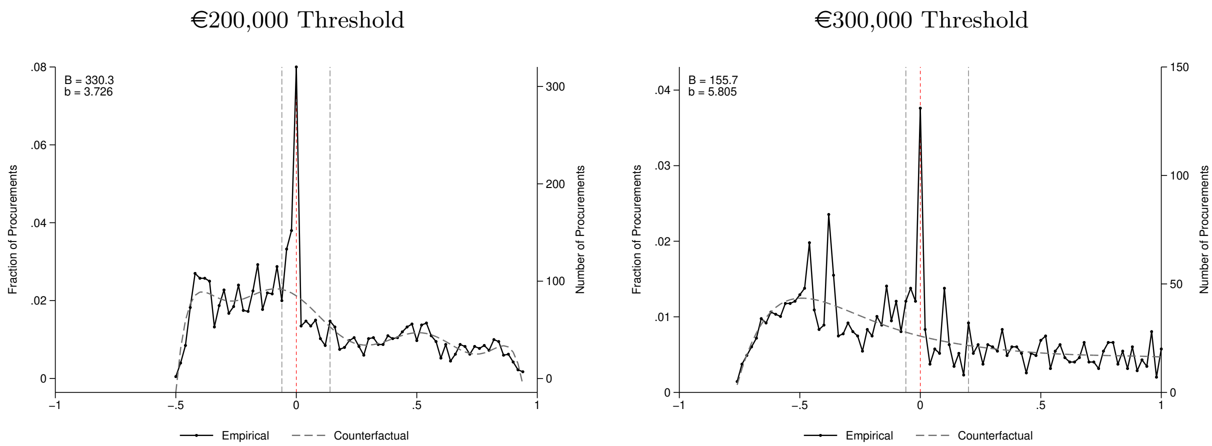
(b) The Buyer is the Province

Low-frequency High-frequency



Notes. The figure shows discontinuity tests of the value of the project around The €200,000 threshold for Municipalities and Provinces characterized by low- v. high-frequency (in the 90th percentile). The sample consists of all public works tendered between 2000 and 2005, with project value $y \in (2, 5)$, in €100,000 (2005 equivalents). In each panel, the running variable is the difference between the project value and the threshold (vertical line); circles are average observed values; the bold, solid line is a kernel estimate (see McCrary 2008); and the two thin lines are 95% confidence intervals.

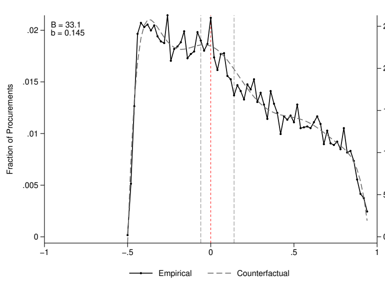
Figure C.10: Bunching at the Thresholds for Appointed Administrations – Robustness Check



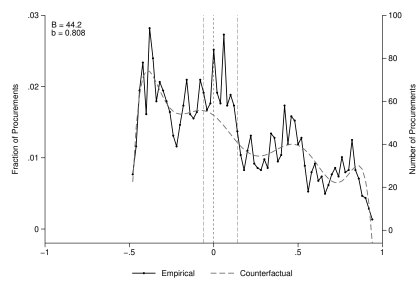
Notes. The left (right) figure plots the observed and counterfactual project value distribution relative to the €200,000 (€300,000) threshold for public works tendered by appointed public administrations between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). In each panel, the solid black connected line plots the histogram of project value, in €2,000 bins. The heavy dashed grey line shows the counterfactual project value distribution, obtained by fitting a polynomial of eighth (ninth) degree to the observed distribution of project values around the €200,000 (€300,000) euro threshold, excluding data in the manipulation region. The lower (m_L) and upper bounds (m_U) of the manipulation region around the thresholds are represented by the vertical dashed grey lines. The figure also reports the estimated number of contracts bunching at the threshold (B) and the excess mass below threshold (b), calculated as described in Section 4.1. Bunching is remarkably sharp at both thresholds for appointed administrations.

Figure C.11: Bunching at the €200,000 Threshold for Main Categories of Public Administrations

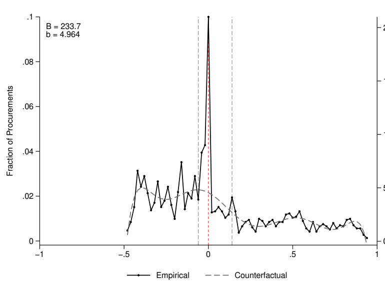
(a) Municipalities



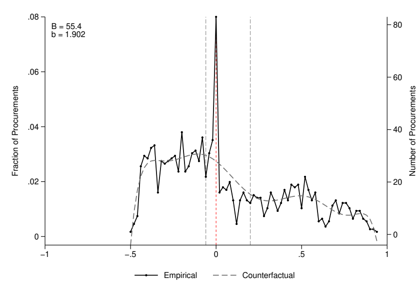
(b) Provinces



(c) ANAS



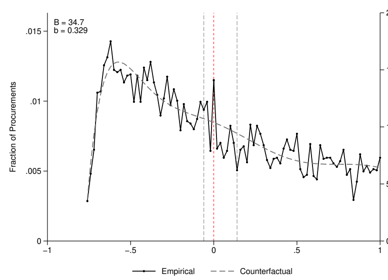
(d) Ministries



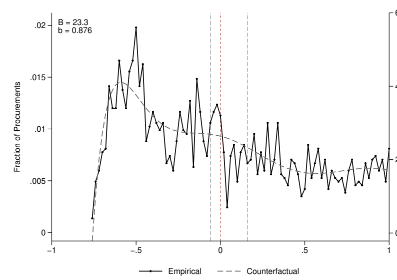
Notes. The figure plots the observed and counterfactual project value distribution relative to the €200,000 threshold for works tendered by the four main categories of public administrations between 2000 and 2005, with project value $y \in [1.5, m_L^{300K})$, in €100,000 (2005 equivalents). In each panel, the solid black connected line plots the histogram of project value, in €2,000 bins. The heavy dashed grey line shows the counterfactual project value distribution, obtained by fitting a polynomial of eighth degree to the observed distribution of project values around the threshold, excluding data in the manipulation region. The lower (m_L) and upper bounds (m_U) of the manipulation region around the thresholds are represented by the vertical dashed grey lines. The figure also reports the estimated number of contracts bunching at the threshold (B) and the excess mass below threshold (b), calculated as described in Section 4.1. Bunching is remarkably sharp at both thresholds.

Figure C.12: Bunching at the €300,000 Threshold for Main Categories of Public Administrations

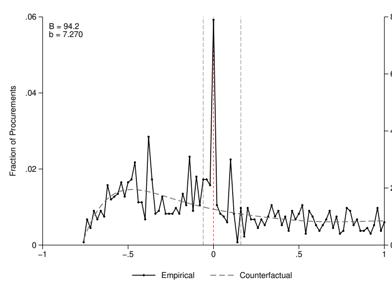
(a) Municipalities



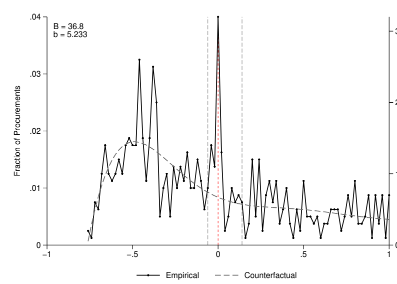
(b) Provinces



(c) ANAS



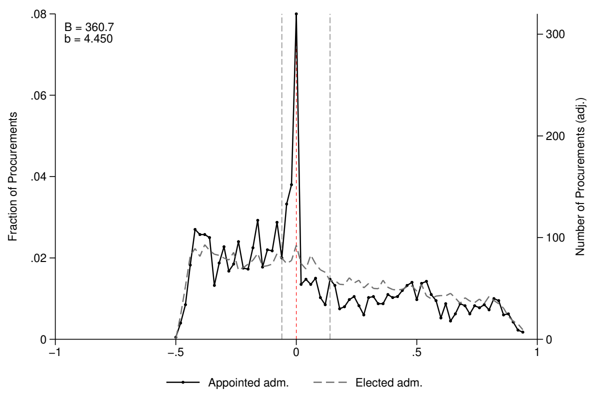
(d) Ministries



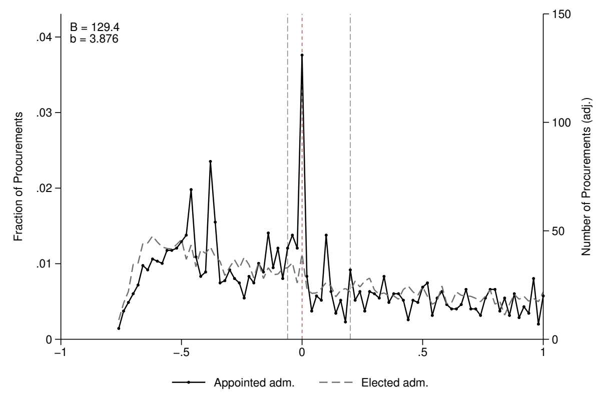
Notes. The figure plots the observed and counterfactual project value distribution relative to the €300,000 threshold for works tendered by the four main categories of public administrations between 2000 and 2005, with project value $y \in (m_U^{200K}, 5)$, in €100,000 (2005 equivalents). In each panel, the solid black connected line plots the histogram of project value, in €2,000 bins. The heavy dashed grey line shows the counterfactual project value distribution, obtained by fitting a polynomial of ninth degree to the observed distribution of project values around the threshold, excluding data in the manipulation region. The lower (m_L) and upper bounds (m_U) of the manipulation region around the thresholds are represented by the vertical dashed grey lines. The figure also reports the estimated number of contracts bunching at the threshold (B) and the excess mass below threshold (b), calculated as described in Section 4.1. Bunching is remarkably sharp at both thresholds.

Figure C.13: Bunching at the Thresholds for Appointed Administrations – Cross-sectional Approach

€200,000 Threshold



€300,000 Threshold



Notes. In the left (right) figure, the solid black connected line plots the observed project value distribution in €2,000 bins relative to the €200,000 (€300,000) threshold for works of appointed public administrations and the heavy dashed grey line shows the counterfactual distribution calculated from works of elected public administrations. The samples include public works tendered between 2000 and 2005 with a project value $y \in [1.5, m_L^{300K})$ ($y \in (m_U^{200K}, 5)$), in €100,000 (2005 equivalents). Since appointed and elected administrations display large disparities in the number of contracts per bin, elected administrations' project value distribution is adjusted by the ratio of the total number of contracts of appointed administrations to that of elected administrations.

D Incumbency and Past Performance in Appointed Administrations

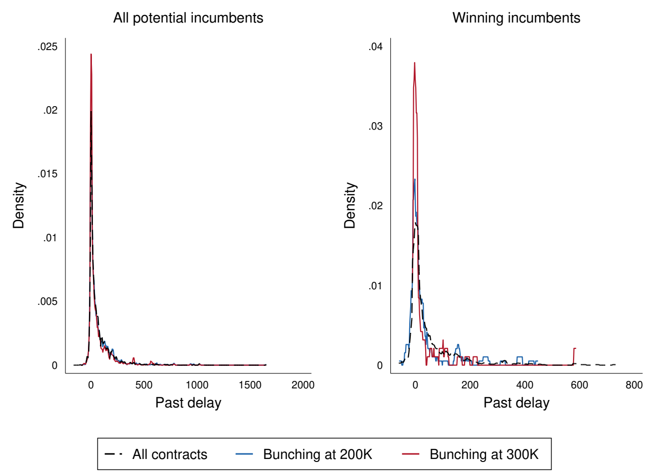
In this Appendix, we investigate the relationship between incumbency and past performance for appointed administrations. As in Coviello, Guglielmo and Spagnolo (2018), we reorganize the data and construct for each public buyer a panel of potential incumbents. Then, for each potential incumbent, we measure the average delay in the delivery of the adjudicated works and the average cost overrun.

Figure D.14 sheds light on incumbents' selection mechanism by showing the distribution of past delays and past cost overruns for all potential incumbents and for winning incumbents, for the entire sample and for contracts in the manipulation regions below thresholds. Winning incumbents' distributions are less right-skewed than those of all potential incumbents, implying that winners are more likely to have executed past contracts with fewer delays and lower cost overruns. This holds for the entire sample and for contracts in the manipulation regions below thresholds. Furthermore, the distributions of past delays and past cost overruns for winning incumbents in the manipulation regions below thresholds are characterized by lower means (and medians) than the overall distributions for winning incumbents.

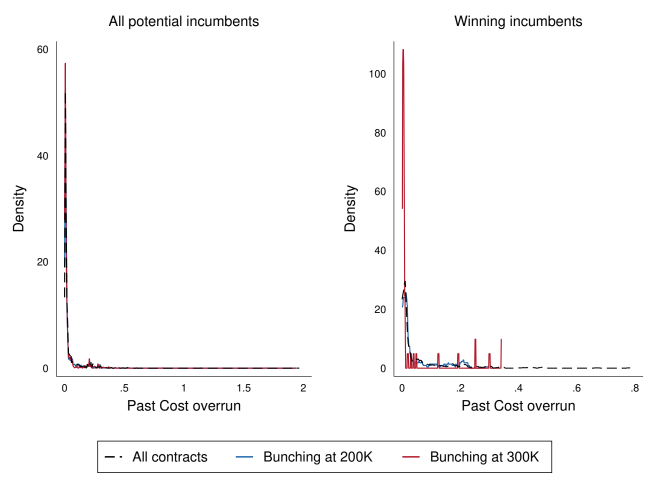
This evidence suggests that increased repeated awards to the same suppliers are more likely after good (past) performance, also and especially when contracts are exposed to manipulation.

Figure D.14: Incumbency and Past Performance in Appointed Administrations

(a) Incumbency and Past Delays



(b) Incumbency and Past Cost Overruns



Notes. The left figures plot past delays and cost overruns for all potential incumbents. The right figures plot past delays and cost overruns for winning incumbents.

E Model Proofs

Incumbent has higher cost. We focus first on the case of Incumbent with higher costs ($K_I > K_O$) and analyze the various cases we would observe in equilibrium.

The baseline is Open Auction, which for simplicity we assume is a second price auction. It will have the Outsider win and pay $C = K_I$. In this case, the PA's utility is $(Q_O - K_I)$ while the Outsider profit is $K_I - K_O$ and consumer welfare $Q_O - K_I$.

Looking at manipulation with exclusion, we have two cases:

- Manipulation with exclusion and no bribe will happen if and only if $Q_I - Q_O > C_{max} - K_I + \frac{\tau}{\alpha}$ because the Incumbent's quality advantage is so large that the Outsider will be excluded even without a bribe. PA utility is $\alpha(Q_I - C_{max}) - \tau$ while the Incumbent profit is $C_{max} - K_I$ and consumer surplus is $Q_I - C_{max}$. Exclusion is socially optimal and occurs without any bribes. This is a type I equilibrium.
    - For the range $C_{max} - K_I + \frac{\tau}{\alpha} > Q_I - Q_O > C_{max} - K_I$, exclusion of the Outsider without bribe would be beneficial for consumers, but it does not happen because of the cost of using a restricted procedure – we can call this area "inefficient regulation". As τ becomes larger – it is more costly to run a restricted procedure – this inefficient regulation area increases. Instead, as α becomes larger – the PA cares more about consumer welfare – this inefficiency area decreases. This is a type V equilibrium.
- Manipulation with exclusion and bribe will happen if and only if $Q_I - Q_O < C_{max} - K_I + \frac{\tau}{\alpha}$. A bargaining over the bribe happens between PA and Incumbent to exclude the Outsider by maximizing $[\alpha(Q_I - C_{max}) - \tau + B - \alpha(Q_O - K_I)]^{\beta} \times [C_{max} - K_I - \theta B]^{(1-\beta)}$. To achieve a bargain over the bribe, this condition has to hold $(C_{max} - K_I)(1 - \frac{1}{\theta\alpha}) + \frac{\tau}{\alpha} < Q_I - Q_O$ (i.e., the bribe has to be profitable for both parties.) In this case, the bribe is $B = (C_{max} - K_I)(\frac{\beta}{\theta} + \alpha(1-\beta)) + (1-\beta)\alpha(Q_O - Q_I + \frac{\tau}{\alpha})$. PA Utility is $\alpha(Q_I - C_{max}) + B - \tau$ while the Incumbent profit is $C_{max} - K_I - \theta B$ and consumer welfare is $Q_I - C_{max}$.
    - For the range $(C_{max} - K_I)(1 - \frac{1}{\theta\alpha}) + \frac{\tau}{\alpha} < (C_{max} - K_I) < Q_I - Q_O$, exclusion of the Outsider would be beneficial on the consumer welfare perspective even if there is a bribe paid to the PA – we can call this area "efficiency bribe". This is a type II equilibrium. As τ becomes larger – it is more costly to run a restricted procedure – this efficiency bribe area is smaller. Instead, as θ becomes larger – it is more costly to bribe – this efficiency bribe area decreases. Finally, larger α will increase this efficiency bribe area if $(C_{max} - K_I)\frac{1}{\theta} < \tau$ otherwise it will shrink it.
    - For the range $(C_{max} - K_I)(1 - \frac{1}{\theta\alpha}) + \frac{\tau}{\alpha} < Q_I - Q_O < (C_{max} - K_I)$, exclusion of the outsider with a bribe will be suboptimal for consumers. This is a type III equilibrium.
    - If $(C_{max} - K_I)(1 - \frac{1}{\theta\alpha}) + \frac{\tau}{\alpha} > Q_I - Q_O$ there will be no exclusion and the outcome would be the same as open auction. This is a type IV equilibrium.

Incumbent has lower cost. When the Incumbent has lower costs ($K_I < K_O$), with Open Auction, we will have the Incumbent win and pay $C = K_O$. In this case, PA utility is $\alpha(Q_I - K_O)$ while the Incumbent profit is $K_O - K_I$ and consumer welfare $Q_I - K_O$.

Looking at the manipulation (with exclusion):

- The Incumbent will win with or without bribes if and only if $(C_{max} - K_O) + \frac{\tau}{\alpha} > (Q_O - Q_I)$ – i.e. the cost advantage of the Incumbent is too large. The PA can extract a bribe by promising to exclude the outsider if $(C_{max}-K_O)(\frac{1}{\theta\alpha}-1)-\frac{\tau}{\alpha} > 0$ — i.e. it is mutually profitable to exchange a bribe. A bargaining over the bribe happens between PA and Incumbent to exclude the Outsider by maximizing $[\alpha(Q_I-C_{max})-\tau+B-\alpha(Q_I-K_O)]^{\beta}\times[C_{max}-K_O-\theta B]^{(1-\beta)}$. In this case, the bribe is $B=(C_{max}-K_O)(\frac{\beta}{\theta}+\alpha(1-\beta))+(1-\beta)\tau$. PA Utility is $\alpha(Q_I-C_{max})+B-\tau$ while the Incumbent profit is $C_{max}-K_I-\theta B$ and consumer welfare is Q_I-C_{max}.

- Putting the two conditions together, we will observe a corrupt bargaining if $(C_{max}-K_O)\frac{1}{\theta\alpha} > (Q_O-Q_I)$ – this is a type III equilibrium. The corrupt bargaining will be less likely for larger $\theta\alpha$ – more costly to bribe or PA care more about consumer welfare – or higher quality advantage/lower cost disadvantage for the Outsider.
- If $(C_{max}-K_O)\frac{1}{\theta\alpha} < (Q_O-Q_I)$, the incumbent would win via open auction – this is a type IV equilibrium.
- For the range $(C_{max}-K_O)+\frac{\tau}{\alpha} > (Q_O-Q_I) > (C_{max}-K_O)$, the Incumbent is chosen even if choosing the outsider would increase consumer welfare – regulation here arms consumer welfare – we are in an area of "inefficient regulation". This is a type V equilibrium. This area will increase as τ becomes larger and α become smaller.

- The Incumbent will be excluded without bribes if $(C_{max}-K_O)+\frac{\tau}{\alpha} < (Q_O-Q_I)$ – i.e., the cost advantage of the Incumbent is not large enough. Here we will observe two cases with bribes: 1) bribe with exclusion of outsider and 2) bribe without exclusion. The PA can extract a bribe by promising to exclude the outsider if $\frac{(C_{max}-K_I)}{\theta\alpha} > (Q_O-Q_I)$. A bargaining over the bribe happens between PA and Incumbent to exclude the Outsider by maximizing $[\alpha(Q_I-C_{max})-\tau+B-\alpha(Q_O-C_{max})+\tau]^{\beta}\times[C_{max}-K_I-\theta B]^{(1-\beta)}$. In this case, the bribe is $B=(C_{max}-K_I)\frac{\beta}{\theta}+(1-\beta)\alpha(Q_O-Q_I)$. PA Utility is $\alpha(Q_I-C_{max})+B-\tau$ while the Incumbent profit is $C_{max}-K_I-\theta B$ and consumer welfare is Q_I-C_{max}.
  - Putting the two conditions together, we will observe a corrupt bargaining if $\frac{(C_{max}-K_I)}{\theta\alpha} > (C_{max}-K_O)+\frac{\tau}{\alpha}$ – this is a type III equilibrium. If $\frac{(C_{max}-K_I)}{\theta\alpha} < (C_{max}-K_O)+\frac{\tau}{\alpha}$, the Incumbent will be excluded – this is a type I equilibrium.
  - The corrupt bargaining will be less likely with higher cost of manipulation τ, larger $\theta\alpha$ – more costly to bribe or PA cares more about consumer welfare – and lower cost advantage for the Incumbent.
- The PA can also extract a bribe without excluding the outsider if $\frac{(K_O-K_I)}{\theta\alpha}+C_{max}-K_O > (Q_O-Q_I)$. A bargaining over the bribe happens between PA and Incumbent to exclude the Outsider by maximizing $[\alpha(Q_I-K_O)-\tau+B-\alpha(Q_O-C_{max})+\tau]^{\beta}\times[K_O-K_I-\theta B]^{(1-\beta)}$. In this case, the bribe is $B=(K_O-K_I)\frac{\beta}{\theta}+(1-\beta)\alpha(Q_O-Q_I+K_O-C_{max})$. PA Utility is $\alpha(Q_I-K_O)+B-\tau$ while the Incumbent profit is $K_O-K_I-\theta B$ and consumer welfare is Q_I-K_O.
  - Putting the two conditions together, we will observe a corrupt bargaining if $\frac{(K_O-K_I)}{\theta} > \tau$, which however will not change consumer welfare compared to open auction – this is a type III equilibrium. If $\frac{(K_O-K_I)}{\theta} < \tau$, the Incumbent will be excluded – this is a type I equilibrium.
  - The corrupt bargaining will be less likely for smaller cost advantage for Incumbent, or larger cost of manipulation.