Rules, Discretion, and Corruption in Procurement: Evidence from Italian Government Contracting

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Abstract

The benefits of bureaucratic discretion depend on whether it is used to improve public welfare or exploited for private gain. We study the relationship between discretion and corruption in Italian government procurement auctions, using a confidential database of firms and procurement officials investigated for corruption by Italian enforcement authorities. We show that discretionary procedure auctions (those awarded on the basis of negotiated rather than open bidding) are associated with corruption only when conducted with fewer than the formally required number of bidders; we similarly find that discretionary criteria ("scoring rule" rather than first price) auctions are won more often by firms investigated for corruption. We show that these "corruptible" discretionary auctions are chosen more often by officials who are themselves investigated for corruption, but less often in investigated procurement administrations (those in which enforcement authorities are investigating at least one procurement official). These findings fit with a model in which more discretion leads to greater efficiency as well as more opportunities for theft, and a central monitor manages this tradeoff by limiting discretion in high-corruption locales. Finally, we present two additional sets of analyses which suggest that monitors also use two standard tools – turnover and subcontracting limits – to further constrain auction officials in high corruption areas.

JEL classifications: C73, D72, D73, K42

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I Introduction

Governments – and bureaucracies in general – often face a tradeoff in the constraints they impose on agents in carrying out their functions. Officials may use discretion to better serve the public's interests, or exploit it for personal gain. The appropriate level of discretion depends on the benefits of an agent's informational advantage relative to the costs from his exploiting discretion for personal gain. From a public welfare perspective, the agency problem is complicated by yet another layer of delegation – politicians or high-level officials who determine the extent of discretion available to lower-level officials may be overly risk-averse, to the extent that the electorate is more attentive to, say, corruption scandals rather than an overall efficient provision of public goods. Such incentives – whether electoral or promotion-related – may then lead to insufficient discretion.

In this paper, we study both the determinants and consequences of discretion in the context of government procurement in Italy. Procurement accounts for a large fraction of government expenditure worldwide; according to the OECD, the procurement-to-spending ratio held steady at around 30 percent during 2007-2015 (OECD [2017]). Furthermore, corruption is thought to result in substantial "leakage" from procurement expenditures, even in more developed (and less corrupt) countries.[1] Thus, understanding how procurement rules might impact corruption is of interest in its own right, in addition to serving as an apt setting for studying the tradeoffs associated with discretion in bureaucracies more generally.

Our data and setting allow us to relate the characteristics of those administering procurement auctions to the choice of more discretionary auction mechanisms, and further to link the choice of a discretionary procurement mechanism to the contract being won by a firm suspected of corruption (we refer throughout to businesses suspected of corruption as "investigated" firms, and others as "clean" firms; we use the same terminology of "investigated" and "clean" for the public officials in charge of the auctions). We thus explore the extent to which discretion is misused (as reflected by an investigated firm winning the contract) and whether this abuse is in turn reined in by limits on discretion. While our empirical analysis focuses on a single country, the auction mechanisms used by Italian procurement authorities are ubiquitous worldwide, as are the constraints that higher levels of governments impose to limit self-dealing. Thus, the patterns we observe and lessons learned may have broader relevance for thinking about the optimal level of discretion in procurement.

Our work is enabled by the use of a confidential database obtained from the *Agenzia*

[1] One study sponsored by the European Commission estimated that, in EU projects that were found to have been corrupted, 13 percent of expenditures were lost due to corruption (Ferwerda and Deleanu [2013]).

Informazioni e Sicurezza Interna (AISI), the Italian equivalent of the FBI. The database lists individuals that have been flagged by the AISI as suspected of various crimes, including corruption. By linking this list to administrative data on the top employees and owners of Italian companies, we may flag a firm as *investigated* for corruption if at least one employee or owner was flagged by the AISI for suspected corruption. We then link the resultant firm-level database to information on over 200,000 procurement auctions held throughout Italy during 2000-2016. The resulting database allows us to observe whether the auction was won by an investigated firm. Finally, we complement the firms' data with similar information on investigations for corruption charges involving the public officials in charge of the awarding (and follow on monitoring) of the contracts in our data.

The scale and richness of our data is such that we may employ a range of fixed effects and controls. For example, in our analyses that look at the characteristics of auctions won by firms under investigation for corruption, we include over 6,000 procurement authority fixed effects, so that we identify the relationship based on the selection of different auction mechanisms by the same entity (e.g., a municipality). Since the selection of auction type is itself potentially correlated with various characteristics that may vary over time within the same procurement authority, we probe the extent to which the patterns we document are sensitive to the inclusion/exclusion of controls, to assess whether unobserved heterogeneity is likely a first-order concern.

We begin by documenting three main patterns that shed light on the choice of discretion by officials, and the exploitation of discretion as indicated by whether an investigated firm wins an auction. We show that two auction arrangements are significantly more likely to lead to an investigated winner: first, so-called scoring rule auctions, which involve (potentially subjective) non-price criteria in selecting a winner, are 1 percentage point (6 percent) more likely to be won by investigated firms, relative to first-price (non-discretionary) auctions. Interestingly, auctions that use "negotiated" procedures in which procurement officials invite bidders (rather than allow for open bidding) are no more likely to be won by firms investigated for corruption, relative to open auctions. However, when we look at the subset of negotiated auctions in which officials fail to invite the requisite number of bidders (which we take to be an indication of abuse of discretion), we find a 1.9 percentage point (11 percent) higher probability of an investigated winner.

One plausible interpretation of these findings is that discretion itself is not necessarily problematic – rather, it is discretion that additionally serves to foreclose competition: scoring rule auctions limit competition by tailoring contract terms to a specific firm's capabilities, while negotiated contracts with few invited bidders by construction limit the competitive bidding process. When, instead, discretion goes along with firms' competition, there will be multiple benefits. Discretion reduces the red tape of open calls for

tenders. Moreover, in line with Coviello et al. [2017], we find that discretion leads to lower winning discounts and time delays in the contract execution. This is what should be expected in a context, like that of public works procurement, where contracts are inherently incomplete, due to cost and regulatory uncertainty at the time of bidding, and quality is only imperfectly contractible.[2] In this context, discretion can be crucial to select firms that will perform better, as proxied by lower delays, but at the cost of less aggressive price bids at the awarding stage.

We then link the *choice* of discretionary auctions – in particular those that we have flagged as prone to corruption – to characteristics of procurement administrators that deploy them. In particular, we exploit a distinct dimension of our data to look at whether the choice of discretion is affected by whether the auction was administered by an individual that the AISI has flagged as suspected of corruption, and also whether the auction occurred in a municipality in which the AISI has identified at least one such official. The first of these analyses aims to examine whether *individual* procurement officials prone to corruption are more likely to select (corruptible) discretionary auctions; the second examines whether locales where suspected corruption is present tend to use "corruptible" discretionary auctions. Our results show effects that go in opposite directions: public officials suspected of corruption are 2.9 percentage points more likely to use one of the two discretionary auction types we flag for concern (discretionary criteria or discretionary procedures with too few invited participants). By contrast, discretionary auctions are 1.9 percentage points *less* common in "corruption-suspected" municipalities. These results again survive a range of robustness checks.

Collectively, we argue that results are most easily reconciled with a standard, intuitive model in which greater discretion allows for more efficient implementation of government projects by well-informed and well-intentioned procurement officials, which must be traded off against the higher probability of leakage under discretionary methods. If choice of auction design is one of the primary means of oversight by a (non-corrupt) central monitor, then less discretion will be allowed in locales where the probability of corruption is higher. When possible, however, corrupt officials deploy discretion, to the benefit of corrupt firms.

This returns us to the question of whether a central legislature or senior bureaucrat chooses to impose excessively strict constraints on lower-level officials. While our observational data do not allow for decisive welfare calculations, we suggest that the data indicate overly strict constraints. The basis for this argument is as follows: in the

[2]While these are general features of contract procurement [Manelli and Vincent, 1995], in the Italian case they are further exacerbated by both the EU limits on using past performance to select contractors [Decarolis et al., 2016] and the inefficiency of the national court system [Coviello et al., 2018].

mid-2000s, the Italian legislature loosened regulations governing the use of negotiated procedures – whereas such contracts could only be deployed for relatively small projects (under 300,000 Euros) in the early 2000s, by 2011 the limit had been raised to a million Euros. This change, motivated by the government's attempt to speed up the economy by reducing the procedural times to award public contracts, led to a massive increase in the fraction of auctions conducted via negotiated procedures, from 10 percent in 2006, to 60 percent of all auctions by 2012. Yet the vast majority of these were conducted with the legally required number of bidders, and hence the loosening of rules had at most a very small effect on the fraction of contracts awarded to firms under investigation for corruption. Indeed, calculations based on our estimates imply a 0.05% increase in investigated winners overall between the periods before and after the increase of threshold for using negotiated procedures. This appears to be a small cost when compared to improvements in contracting cost and quality from discretion. This result is in a similar spirit to Bandiera et al. [2009], which finds that passive waste is more prevalent in Italy than active waste.

We conclude our paper by presenting two further pieces of evidence focused on two methods that are commonly used to constrain procurement authorities that are prone to corruption: rotation of procurement administrators, and tighter limits on subcontracting. Focusing first on turnover, we show that the average proportion of auctions administered by each official is lower in the set of municipalities with at least one investigated official, which we take as an indication of higher turnover among procurement officials. The implied effect of suspected corruption on turnover is very large, with a 22 percent (6.82 percentage points) lower fraction of contracts managed by an average official in "corrupt" versus "non-corrupt" municipalities (and a nearly identical effect on the overall value of the contracts the average official manages). Second, we look at subcontracting rules as well as subcontracting realizations. Subcontracting is typically considered the main channel for funnelling public money into the cash needed for bribes and kickbacks. But it is also a tool for the efficient allocation of job tasks, especially for more complex projects involving multiple tasks. First, we present largely qualitative evidence that regions in which corruption is less of a concern are more apt to loosen regulations on subcontracting, whereas regions where corruption is more of a concern implement tighter subcontracting rules. We show that these rules – which effectively constrain the discretion employed by *firms* in executing contracts – may be an optimal response to limit self-dealing of criminal firms via subcontracting. As an indication that subcontracting is likely a mechanism for self-dealing, we show a series of results indicating that firms investigated for corruption subcontract more often and – conditional on subcontracting – they are more than 60 percent more likely to delegate subcontracts to other investigated firms and to award a

larger share of all subcontracts to investigated firms.

We contribute most directly to the small body of work on the causes and consequences of corruption in procurement, though our results have implications both for the economics literature on contract procurement and auction design, as well as the much larger literature on optimal delegation in government and other bureaucratic hierarchies.

Our finding that, for a given municipality, contracts that give more discretion to local administrators are associated with higher corruption provides strongly suggestive evidence of a tradeoff between improved efficiency (in terms of works completed more quickly) versus higher leakage from delegation. But the fact that discretionary auctions are relatively rare in high-corruption regions suggests that governments are aware of this tradeoff, and take it into account in the extent of discretion they allow in different areas. This latter finding was suggested by Coppier et al. [2013], who noted that there is greater discretion in (low-corruption) U.S. and U.K. procurement. Coviello et al. [2017] in their investigation of the economic impacts of allowing greater discretion in the public procurement of works in Italy also notice that higher-corruption provinces in Italy tend to use less discretionary auction procedures. We are, to our knowledge, the first to identify this relationship systematically based on local variation in corruption.

Our main results linking discretion to corruption contribute to the vast literature on the tradeoffs associated with increased delegation. The efficiency-corruption tradeoff is emphasized by, among others, Banfield [1975], who observes that reducing discretion may limit corruption, albeit at the expense of constraining honest public officials from exercising discretion to the benefit of public welfare. Given the monitoring function of higher-level governments, our findings also relate to the deep theoretical and empirical literature on the costs and benefits of decentralization (e.g., Bardhan and Mookherjee [2006], see also Olken and Pande [2012] and Burguet et al. [2016] for recent surveys of the microeconomics of corruption that review and synthesize various models of delegation).

Third, our findings contribute to the distinct – though related – literature on features of government procurement and the resultant quality of public infrastructure. Bandiera et al. [2009] show that excessive payments for standardized goods by Italian public administrations are driven more by inefficiency than corruption. Our results provide evidence on a potential source of inefficiency, namely excessively rigid contracting procedures. Lewis-Faupel et al. [2016] document positive impact of e-procurement on road quality in India and on execution time Indonesia, possibly by limiting interactions with corrupt public officials. Djankov et al. [2017] document the correlation across countries in procurement rules and practices, and link these to survey-based measures of road quality. More specifically, there is a small collection of papers that aim to link corruption and procurement directly. Mironov and Zhuravskaya [2016] document how firms with public

procurement revenue increase tunnelling of funds to politicians around elections. They also document how more corrupt places tend to award contracts to less productive firms. Auriol et al. [2016] show that politically connected companies are more likely to win auctions with limited competition, which they take to be an indication of corruption. A similar approach is taken by Baltrunaite et al. [2018] in the setting of Italian auctions, in linking political connections to discretionary auctions. Brogaard et al. [2016] show that contracts won by politically connected firms in the U.S. tend to have poorer performance, while Colonnelli and Prem [2017] examine the consequences of anti-corruption audits in Brazil on who wins government contracts.

Our work is distinct from these earlier efforts in a number of ways. Most importantly, we have an unusual country-wide measure which allows us to identify firms as potentially corrupt – in contrast Auriol et al. [2016] take the selection of connected companies in closed auctions as an indication of corruption in itself. Similarly, Mironov and Zhuravskaya [2016] use the strength of correlation between tunneling activity around elections and probability of winning procurement contracts as measure of corruption. Brogaard et al. [2016] and Colonnelli and Prem [2017] look at the consequences of procurement corruption (and anti-corruption crackdowns) rather than the features of auctions that make them vulnerable to corruption.[3]

A final, closely related strand of the procurement literature looks at the consequences of anti-corruption policies on public procurement. In this area there are scant empirical findings. Among the few exceptions there are Olken [2007] with his comparative analysis of centralized audits vs. grassroots participation in monitoring, and Di Tella and Schargrodsky [2003] with their evidence on the combination of public officials' wages and corruption audits. Our findings on turnover and subcontracting in particular may be relevant to this policy-focused body of work, as these are tools that can be deployed relatively easily by policymakers. In particular, for what regards subcontracting, our data offers a unique possibility to provide evidence for the link between subcontracting and criminal behaviour, which has never been systematically documented before.

II Conceptual Framework: Corruption and Oversight

In this section, we lay out a very simple and intuitive model that may be used to organize our empirical results. In brief, the model considers the task of a central monitoring

[3] A different strand of the empirical literature approaches the discretion-corruption link via structural modelling. Andreyanov et al. [2017] develops a statistical test for corruption from a model of bidding in first price auctions, while Szucs [2018] exploits a reform by the Hungarian government allowing for an expansion of discretionary procedures to procure goods and services. In contrast to our findings for Italy, Szucs [2018] finds benefits from tighter restrictions on discretion, which would reduce corruption.

authority (such as a regional government) that aims to limit corruption. Discretion makes it easier for officials to abuse their positions if they choose to do so, but also empowers civic-minded officials to execute contracts more efficiently.

More specifically, we assume that a central authority may choose whether to allow procurement officials in administration a to run an auction with greater discretion. Let d be a parameter that captures the potential benefit from discretion in implementing the project so that, for example, the value of the project is v in the absence of discretion and $v+d$ if discretion is allowed. While v is perfectly observed, d is known only to the official overseeing the project; others (including enforcement officials) observe only $\hat{d} = d + \epsilon$. It is possible that $d < 0$, so that discretion is socially destructive, whereas monitors may still receive a positive signal (i.e., $\epsilon > -d > 0$). This assumption allows for the case that a civic-minded official will choose not to use a discretionary auction.

A further cost of discretion is that it provides opportunities for self-dealing, which may be obfuscated precisely because of uncertainty in the value of discretion. We do not aim, at this level of abstraction, to model the firm-official interaction. In our simple framework, one can think of corrupt officials extracting kickbacks from firms, or prospective bidders corrupting procurement officials by offering bribes. For a potentially corrupt administrator, we think of their theft decision as dictated by the private returns from stealing s, less a punishment cost which is a function of detection probability e, which is a public-administration-specific parameter, so that his payoff function will be: $\pi = s - e_a s^2$. In the internal solution, this payoff function leads to a theft choice of $s^* = 1/2e_a$.

We assume that the monitoring authority may constrain a public administration from utilizing discretionary auctions by setting a threshold for the signal of discretion's benefit, accounting for both stealing (which is a function of the public administration's enforcement efforts, e_a) and the probability that a contract is corrupted (which depends on the share of corrupt public officials in administration the administration, p_a). A risk-neutral monitor seeking to maximize the project value will then set a threshold $\hat{d^*} = p_a/2e_a$.

This model captures the simple intuition that, in locations with weaker enforcement or a higher prevalence of corrupt agents (which plausibly are correlated), there will be a higher threshold set for the use of discretionary auctions. Hence, differences among administrations in (p_a, e_a) might lead to instances in which the monitor restrains discretion in situations in which it would be socially optimal to allow for it. But it also follows that corrupt officials will use discretionary auctions more often since, by definition, non-corrupt officials use discretion only when $d > 0$ whereas corrupt ones will do so whenever the monitor allows it. This setup captures some of the key results we now turn to document and, as discussed below, the model can be easily extended to include an additional

layer of decision-making accounting for the fact that, for heterogenous projects (for instance, in terms of their ex ante value), the national regulation typically sets monetary thresholds that determine which projects are eligible for discretion.

III Background and data collection

III.A Institutional details on Italian procurement

Italian regulations that govern public procurement underwent a number of reforms during our sample period as a result of, among other things, the passage of European Union Procurement Directives aimed at creating a common set of rules for public procurement in the EU. In particular, these reforms aimed to improve the design of source selection systems (the process for evaluating bids), for instance by promoting the use of scoring rule auctions (i.e., auctions based on multiple criteria) as opposed to conventional first price auctions. We study public contracts under the "ordinary regime," which sets the procurement rules for most projects, excluding secret military services and some strategic infrastructure projects.

Source selection systems under the ordinary regime vary along two main dimensions: the awarding procedure and the selection criterion. Starting with the first dimension, there are two primary procedures for awarding contracts: open auctions and negotiations. Open auctions are "ordinary" procedures for the assignment of procurement contracts, in which the public administration (PA) overseeing the project has little discretion in the choice of contractor. These auctions presume that the PA is capable of accurately defining, from the outset, the relevant scope and technical specifications of the contract, so that bidders may submit definite, non-renegotiable offers (at least as far as the essential aspects of the contract are concerned).

Negotiated procedures are, by contrast, marked by significant discretionary powers for the PA. In particular, the PA consults a set of prospective contractors and may negotiate the conditions of the contract with one or more of them. Negotiated procedures are treated as exceptional, and admissible only when specific conditions apply: for the most part, they are permitted only when the contract value is below a given monetary threshold. Above this threshold, negotiations are allowed only when there is some urgency in fulfilling the contract, or when a previous attempt to run an open auction for the same contract failed to elicit any bids.

The second key aspect of contracting is the specification of the criterion for determining the winner. Both open and negotiated procedures can use either the "lowest price" criterion or a "scoring rule" criterion (also known as "most economically advan-

tageous tender" criterion). In the first case, the enterprise offering the lowest price is awarded the contract, provided that this offer is judged by the PA to be reliable, that is, the offer is not so low as to be unrealistic. The second approach allows the PA to account for a broader range of considerations beyond price, as specified in the call for tender. Non-price parameters of a bid may include both hard and soft elements. This is why, for instance, past performance is not usable. An example of a quantitative (hard) parameter could be the number of engineers that will work on the specific project, while an example of a soft element is the aesthetic quality of the proposed solution. There are a few limits that regulations places on the choice of parameters, one being that they must all pertain to the bid and not the firm. This is why the use of past performance as a parameter is forbidden. But the discretion margins in deciding the set of parameters and their associated weights are high.[4]

As one might expect, the full set of regulations governing procurement are far more complex than we can describe here, and we defer to Decarolis and Giorgiantonio [2015] for a more in depth discussion.[5] However, we observe that, beyond some modest differences, the set of procedures and criteria governing Italian procurement are quite general. By definition, Italian procurement rules also characterize the institutional framework in the EU more generally. But they also reflect procurement rules in a much broader set of countries, as documented in a recent survey by the World Bank [2017].

One particular feature of procurement rules does warrant further elaboration, given our focus on delegation and discretion by individual procurement officials. Whenever not expressly constrained by national or local rules, the choice of both the awarding procedure and the selection criterion is delegated to the contracting officer overseeing each contract (the *"Responsabile Unico del Procedimento"*, or RUP). This public official is selected from among management-level bureaucrats in the relevant public administration, unless none

[4]For instance, in a 2017 case, the Italian Supreme Court confirmed the conviction by the Court of Santa Maria Capua Vetere (case n. 13431, March 2017) of a group of public officers and business owners for rigging eight scoring rule auctions in this manner. In particular, the scheme involved an RUP modifying the parameters of the scoring formula based on recommendations from a representative of one of the bidders. The modifications involved the inclusion of elements for which the firm was particularly well-qualified and also criteria that could only be fulfilled by the firm (e.g., specifying the use of a specific brand of machinery only possessed by the firm. See https://www.avvisopubblico.it/home/home/cosa-facciamo/informare/documenti-tematici/appalti/bandi-fotografia-il-codice-penale-punisce-anche-gli-affidamenti-disposti-senza-gara/ for further details.

[5]For instance, there are also specific rules for assessing so-called "abnormal" tenders or abnormally low offers, i.e., discounts on the publicly announced reserve price that are so steep that it is deemed implausible that a firm could fulfil the contract at so low a price. Under certain conditions, notably when the contract value is below a certain monetary threshold and when the selection criterion is price-only, the bids identified as abnormally low can be automatically eliminated. This feature impacts firms' strategies in important ways Conley and Decarolis [2016]. In the analysis below, however, we will pool together all price-only auctions, regardless of whether abnormally low bids are automatically excluded.

is available for this role (in which case special rules apply). The RUP is nominated via a formal and public act by the PA's top official, which in municipalities is the mayor.

The RUP is in charge of managing the entire contracting process, from the project definition phase, through the bidding phase, to the awarding and realization of the contract. Thus, subject to constraints imposed by the nature of the contract as well as oversight and/or fear of sanction, the RUP has considerable control over how the contract is structured. An RUP who wishes to use a discretionary procedure or criterion may aim to be appointed to oversee auctions that are amenable to such methods (e.g., avoiding auctions very unlikely to need discretion), and conditional on the project may select more discretionary approaches. However, as the simple conceptual framework of the previous section illustrates, it is difficult to make strong inferences about an RUP's intent merely from the selection of discretionary auctions. A socially-motivated procurement official may also choose a negotiated procedure to expedite project execution and (with the interests of the municipality at heart) even manipulate contract amounts to facilitate their use. We thus rely on detailed data on RUP and firms described below to discern whether discretion is more plausibly used for self-serving reasons.

III.B Data

III.B.1 Procurement Data

Our procurement data come from a database provided by the Public Contracts Observatory at the Italian Anticorruption Authority (ANAC), the public entity that oversees public procurement in Italy. The data cover all contracts for public works awarded by every Italian administration since 2000 that involve amounts above a threshold reserve price (€150,000 until 2010, and €40,000 for 2011-2016). In terms of project categories, they include all contracts for government buildings, and transportation infrastructure like roads, highways, bridges and waterworks. These are also the most common categories of projects awarded in the public works sector, accounting for a combined share in excess of 50% for both the number and the value of all contracts awarded each year.

For each contract, we have detailed information about the contracting phase, including the start and end date of the bidding process, the type of contracting authority, the auction procedure used to award the contract, the selection criterion, the number of bidders, and the identity of the winning bidder. The data also include information on auction outcomes, such as the initial project value, the winning discount and the total effective costs, the expected and effective contractual duration, the extent of subcontracting, and the identities of subcontracting firms.

We observe 5 types of contracting authorities in the data: central administrations,

municipalities, other local administrations (regions and provinces), government-owned companies and decentralized administrations (i.e. hospitals and universities). For each authority, we know the exact geographic location and the identity of the RUP managing each contract. Local institutions – municipalities in particular – play the largest role in public works procurement. Local governments account for 74% of total projects awarded (56% city councils, 17% provincial councils, 3% regional governments). While about half of the contracts in our database are awarded by city councils, they are relatively small projects, with average value of €527,000, as compared to average value of €868,000 for provincial and regional governments, and over €1.5 million for hospitals and universities. There is also a wide range in the number of contracts per contracting authority. There are 1200 city councils that awarded only a single contract (mean population of 1,411), whereas the city of Rome awarded 3,519 contracts.

As previously noted, the contracting authority can choose between two main types of awarding procedures, open and negotiated. If the latter, we additionally observe the number of firms invited to participate in the auction, and for all auctions we see the number (and identities) of all firms that present offers (the number of bidding firms is, by definition, less than or equal to the number of invited offers). Under normal circumstances, negotiated procedures require a minimum number of invitations.[6] When we observe fewer than the legally mandated number of bids, we flag the auction as involving potential abuse of discretionary procedures (denoted by the variable $DiscretProc_{lowN}$). Conversely, we denote as $DiscretProc_{highN}$ negotiated auctions with the legally mandated number of bidders. Finally, we denote negotiated procedures by the variable $DiscretProc$. Note that a below-minimum number of invited bidders does not automatically indicate abuse – it may instead result from a contract's urgency or a lack of qualified firms.

In terms of selection criteria, as we described earlier, auctions may be awarded based on a price-only system versus one that incorporates a wider set of considerations (i.e., Scoring Rule auctions).[7] Scoring rule auctions are well known to involve more discretion (and its potential abuse) than first price auctions (Burguet and Che [2004]).

[6]There was no minimum number of invitations up until December 2008. After that date, the law extending use of negotiations for contracts up to €500,000 also mandated that a minimum of five bidders be invited to participate. The subsequent extension in 2011 of the threshold to €1 million was accompanied by the requirement that 10 firms be invited to participate for contract values between €500,000 and €1 million. Finally, in 2016 the monetary thresholds were revised so that at least 5 invitations were mandated for contracts between €40,000 and €150,000, while 10 invitations applied for contracts between €150,000 and €1 million.

[7]A third alternative is also available, the so-called Average Bid Auction (ABA). The ABA is a variant of the first price auction in which the winner is the firm offering the lowest price among a subset of "non-excluded" offers. The ABA induces higher participation and subcontracting, as well as bid coordination (Conley and Decarolis [2016]), but for our analysis we simply view it as a non-discretionary awarding system. Hence, we will not treat it separately from the other first price auctions.

We thus define an auction as having a discretionary criterion (denoted by the variable $DiscretCrit$) if it is awarded via a scoring rule which, recall, allows for a range of non-price (and potentially subjective) parameters set at the procurement official's discretion.

To capture the two types of discretionary auctions we will emphasize, we define a summary measure, $Discretion$, which denotes auctions for which $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. While in principle $DiscretProc_{lowN}$ and $DiscretCrit$ can both occur simultaneously, this is rarely the case in practice since the regulations tend to favor negotiations for contracts of smaller value (or urgent), while the scoring rule system is mostly indicated for complex projects and requires more time to award the contract since a commission, and not just the RUP, evaluates the bids.

Beyond our measures of auction procedure and criterion, we include a number of other auction attributes as controls. Most importantly, we control for the auction reserve price ($Reserve$), which will enter linearly as a control in many of our specifications, as well as via a series of dummy variables for contracts in various reserve price ranges, which correspond to thresholds which triggered stricter rules and/or monitoring of an auction, with cutoffs of €$100,000$, $150,000$, $300,000$, $500,000$, $1,000,000$, and $1,500,000$. In particular, at these threshold values both the publicity requirements of the call for tenders and the set of potentially eligible bidders change.

The auction database provides us with additional information that we will exploit in the analysis. In particular, we observe the identity of the firm winning the auction, and the identities of those receiving subcontracts (if any). Information on each firm includes its name and the location where it was incorporated, as well as a unique social security identifier, which provides the link to the criminal investigations data. Finally, we also observe some standard procurement auction outcomes, including delivery time, price and (for about half of our sample of auctions) the total costs for completion. Data on the expected contractual duration as well as the effective total completion time allow us to construct a measure of contractual delay ($Delay$). Since $Delay$ can be positive or negative, and has extreme outliers, we perform an inverse hyperbolic sine transformation. The final price of the winning bid is expressed as a discount over the reserve price ($Discount$) and completion costs are calculated as the difference between the final price and awarding price, over the initial reserve price.

Finally, for each auction winner we also observe details on the use of subcontracting in fulfilling the contract. In particular, for each auction we observe the date that subcontracting was authorized by the RUP, the number and identity of all subcontractors, the amount subcontracted to each subcontractor, the category and object of each subcontract, and the total amount of each subcontract.

III.B.2 Criminal Investigations Data

A contribution of this study is to introduce a new measure of criminality in public procurement. As previously noted, in the procurement data we observe bidders' and subcontractors' identities. For each firm, we then obtained the full list of its owners and top managers through the Company Accounts Data System.[8] For each individual, their record of criminal investigations (which we will describe shortly) was coded, and this information was aggregated across firm-linked individuals to obtain a firm-level measure of potential criminal status. We use the same criminal investigations database to determine the suspected criminality of each RUP supervising contracts in our data.

Records of individuals' criminal investigations were analyzed for us by AISI (Italy's internal intelligence and security agency) using a centralized archive, the *Sistema D'Indagine Interforze* or SDI.[9] This database contains reports of all individuals investigated by any of the Italian police forces: state police (*Polizia di Stato*), finance police (*Guardia di Finanza*), military police (*Carabinieri*), and environmental police (*Guardia Forestale*). An entry in the SDI database typically occurs after a police force, based on a preliminary investigation, determines that there is sufficient evidence to open a formal investigation. This investigation might or might not lead to a court case and, if so, to a conviction. The resulting sample of suspect offenders thus includes individuals that were convicted, acquitted, or never charged. The latter two groups plausibly comprise a large number of offenders whose guilt could not be proven in court. Indeed, corruption cases are generally complex, and convictions relatively rare. This is particularly true in Italy, where the trial must go through three levels of judgment (*Primo grado*, *Appello*, and *Cassazione*) within a relatively short statute of limitation – between 6 and 12 years. For these various reasons, official data on (convicted) offenders may greatly understate the extent of corruption.[10]. AISI searched the SDI database for all managers and owners we identified as associated with each firm, and flagged those who had been investigated for corruption and other related crimes. Specifically, the following categories of crime were considered: corruption,

[8] This is a proprietary database maintained by CERVED Group. This information was collected for four separate years: 2006, 2011, 2014 and 2016. For each firm, the union of all owners and managers recorded in any of these four periods represents the set of individuals connected to the firm in our analysis.

[9] The SDI is a primary source of information that police officers and intelligence agencies use to identify potential targets for further investigation. The SDI data have been previously used in research by Pinotti [2017]. Our access to the data is enabled via an agreement between AISI and Bocconi University.

[10] Decarolis and Giorgiantonio [2019] analyze the universe of court sentences for corruption in public auctions finding that only 2% of the firms awarded public contracts were thus implicated. In the same set of auctions, our measure flags 15% of contract winners as potentially criminal (note that Decarolis and Giorgiantonio [2019] use a smaller and different set of auctions than the one used in our paper). While the SDI data do not suffer to the same extent from the under-reporting problem that afflicts judicial data, they may include some false positives. In practice, the frequency of false positives is likely very low, as police officers record suspect offenders in the SDI only in the presence of clear probable cause.

malfeasance and embezzlement; abuse of power and undue influence; and violations in public auctions.

Based on the individual-level records extracted from SDI, suspected criminals in 3,848 firms winning a contract over the period 2000-2016 were identified (9.8% of all firms winning at least one contract). We define *InvestigatedWinner* as an indicator variable denoting that an auction was won by a firm ever associated throughout our sample period (via employment or ownership) with at least one individual present in the SDI database. PPPP This measure thus varies only across firms and not over time. This approach is conservative, as the date at which suspect offenders are reported in the SDI provides little information – if any – on the date an offense was actually committed.

The SDI data also allow us to flag procuring agencies and public administrators as suspected of corruption. For each auction, we observe the agency procuring the contract and, within the administration, the RUP in charge of the specific contract. AISI searched the SDI database for all RUPs, flagging those suspected of the same types of crimes used to flag managers and owners (i.e., corruption, abuse of power, and so forth). Overall, 6% of the RUPs in our sample (managing 9.7% of all contracts) were flagged as "investigated." We use this list to flag auctions administered by an investigated RUP ($InvestigatedRUP$) and also administrations in which at least one investigated RUP was employed during our sample period (16% of all public administrations, denoted by $InvestigatedPA$, managing 40% of the contracts).

III.B.3 Data overview

We begin by presenting an overview of some of the main features of the data. While in the analysis we exploit within-municipality variation over time or (in some cases) within-region variation across municipalities, to provide a flavor of the broad geographic variation in the data we show in Table 1 some differences in procurement practices and outcomes for South, Central, and North Italy, based on auction-level data over our full sample period, 2000-2016. Given the South's long history with, and reputation for, corruption, it is perhaps unsurprising that the fraction of auctions overseen by procurement officials suspected of corruption is notably higher in the South relative to Central and Northern Italy (first row). In the second row, we show the mean fraction of auctions won by firms suspected of corruption. Again, there is a North-South gradient: investigated firms are more likely to win in the South relative to the North and Central regions, though the difference is much more modest than for RUPs. We next turn to the selection of auction type, in particular the selection of $Discretion = 1$ auctions. Notably, these are far more common in the (relatively less corrupt) North (third row). In the last two rows, we look at the North-South choice of discretion for auctions administered by investigated

procurement officials and clean (non-investigated) officials. Interestingly, across all areas investigated administrators select discretion more often.

Naturally, these patterns are merely presented as motivation – there are many factors that could account for the North-South differences we observe. We will attempt to account for these factors when we focus on within-PA variation in our regressions. But overall, the patterns in Table 1 offer descriptive evidence that is broadly consistent with the regression analysis reported in the next section and that can be readily interpreted within the conceptual framework described earlier.

We next explore some basic patterns in the data across the sample period. In Figure 1, we show the frequency of different auction types as a fraction of all procurement auctions in a given year. We focus on three types of procurement systems: scoring rule ($DiscretCrit$); negotiated contracts ($DiscretProc$), and negotiated contracts in which fewer than the minimum number of invitations were sent ($DiscretProc_{lowN}$). The most striking feature in the data is the sharp increase in the fraction of negotiated procedures starting in 2008, when the maximum reserve price for negotiated contracts was increased from €100,000 to €500,000, and then to €1 million in 2011. This increase in negotiated contracts is accompanied by a corresponding decline in first-price auctions.[11]

In Figure 2, we focus on negotiated procedures specifically. We report their usage over time, distinguishing between procurement authorities with and without investigated RUPs. Interestingly, there is a persistent prevalence of negotiated procedures among "clean" PAs, even after the large expansion in the share of contracts awarded via negotiations in 2008. Next, in Figure 3, we turn to examining the frequency over time – for investigated and clean procurement authorities – for the two types of contracts that we will later show are more likely to be won by investigated firms: those awarded via auctions with a discretionary criterion (left panel) and discretionary procedures with few bidders (right panel). The left panel shows, in the earlier part of the sample, a relatively high prevalence of scoring rule auctions in PAs without any investigated procurement officials. This pattern is driven primarily by the prevalence of scoring rule auctions in Lombardy, a relatively low corruption area. After 2008, we observe a sharp decline in the share of scoring rule auctions (mostly replaced by negotiations) and a convergence in their usage in investigated and clean PAs. This shift roughly coincides with a change in the rules governing the use of scoring rule auctions – their usage had been limited to very

[11] Appendix Figure A.1 reports the total number and aggregate contract value of auctions in our sample over time. The declining trend observed for most of the years after 2003 results from the combination of various macroeconomic factors (lower public spending due to both internal and external spending constraints, especially for municipalities) and regulatory changes (the mandatory aggregation of demand through centralized buyers' authorities). Finally, the 2016 drop is driven by problems with the introduction of the new public procurement law, incorporating the EU Procurement Directives of 2014.

large, technical projects, but EU directives passed in 2004 (and implemented in 2006) drastically loosened the types of auctions that were eligible. The new rules account for the shift in composition of PAs using scoring rule auctions, while the drop in their use overall is, as noted, the result of a shift to negotiated contracts.

Turning to the use over time for discretionary procedures with few bidders (which are defined only for the period after which the law specifies a minimum number of invitations) the patterns in the two groups of cities are similar, though generally the fraction of discretionary procedure auctions is higher for clean PAs.

Finally, in Figure 4 we plot the share of contracts awarded to investigated firms, comparing the behavior of the two most discretionary auctions - negotiated procedures with fewer than the legally required number of bidders and scoring rule auctions - relative to all other procedures (including open price-only auctions and negotiated with the legally mandated number of bidders). Over the full sample period, we observe that discretion with few bidders and also discretion in criteria – both of which may foreclose auction competition – are associated with high rates of criminal winners, relative to other procedures. Naturally, we wish to control for a range of city and auction attributes in comparing various types of auction mechanisms, which we will do in our regression analyses in the next section.

Before proceeding to our regression results, we conclude this section with a presentation of the summary statistics for our data in Table 2. Panel (A) provides summary statistics at the auction-level for the whole sample of just over 200,000 auctions. Of these, 37% are done using negotiated procedures, and 83% of auctions use the price-only criterion. Investigated firms are awarded 17% of the contracts and investigated RUPs administer 10% of all auctions. The average number of bidders across all auctions is 27, but for negotiated procedures the average number of invited bidders is 7. Relative to an average reserve price of nearly €100,000, the final price is, on average, 7% higher than the figure that was agreed upon at the awarding stage, and the average delay is 63% relative to the originally specified contractual duration.

Panel (B) reports summary statistics at the level of the public administrations awarding contracts. We observe 14,667 administrations out of which 16% have at least one RUP suspected of corruption; 52% of public administrations are in the North, 35% in the South and 13% in the Center. In terms of administration type, local PAs award most contracts, with municipalities representing 69% of the PAs in the dataset (though they administer only 56% of auctions). Of the 7,195 municipalities observed, 68% have fewer than 5,000 inhabitants, while only 1% of municipalities have more than 60,000 inhabitants. The average administration awards 15 contracts over the sample period, with an average total value of nearly €1.5 million.

IV Results

We now turn to examine the relationship between the choice of auction mechanism to firms and officials suspected of corruption. We first examine the link from the type of auction to whether it is won by an investigated firm, and then turn to look at the choice of auction of investigated public officials. We will use the framework from Section II to interpret these patterns in terms of the tradeoff invoked by expanding discretion.

IV.A Discretionary auctions and investigated winners

We employ throughout variants on the following specification:

$$InvestigatedFirm_{xay} = \beta Discretion_{xay} + Controls_{xay} + \alpha_a + \gamma_y + \varepsilon_{xay} \quad (1)$$

for auction x conducted by contracting authority a in year y. We include contracting authority fixed effects to account for local difference in the choice of procurement mechanisms as well as (localized) differences in corruption; the year fixed effects absorb shifts over time in the prevalence of discretionary contracts as well as corruption. Finally, as controls we include a linear term for reserve price as well as a set of fixed effects for various size thresholds.[12] We use robust standard errors clustered at the level of the contracting authority throughout.

We present these results in Table 4. In columns (1) and (2) we show results using $DiscretProc_{lowN}$ and $DiscretCrit$ respectively as our measure of discretion, and in column (3) we include both as covariates. The coefficient on each variable is stable across all specifications, and significant at least at the 1% level in all cases. The coefficient on $DiscretProc_{lowN}$ of 0.02 implies that auctions employing negotiated procedures with "too few" invited bidders are associated with a 12% higher probability of being won by an investigated firm. The coefficient on $DiscretCrit$ is approximately half as large. In column (4) we add the variable, $DiscretProc$, as a covariate, which denotes auctions that are done via discretionary procedure, but with the requisite number of bidders. The coefficient on $DiscretProc$ is very small (0.0013), and we can reject at the 99% level that it is even half as large as the coefficient on $DiscretProc_{lowN}$. (We can reject at the 0.1% level that the two coefficients are equal). Finally, in column (5) we use the summary discretion measure, $Discretion$, pooling together both $DiscretProc_{lowN}$ and

[12] In practice, the point estimates we report below are quite insensitive to the inclusion/exclusion of these covariates. For example, if we include only year fixed effects as controls, the estimate is about 0.003 higher than what we report below, a difference of about 30 percent as compared to the fully saturated specifications.

DiscretCrit. The coefficient of 0.012 implies that discretionary auctions employing are associated with a 7% higher probability of being won by a criminal firm. Columns (6) – (10) repeat these analyses, limiting the sample to auctions administered by city councils, as this is the sample we will focus on in analyzing whether the patterns we document are robust to controls for municipal attributes. The patterns are broadly similar, though the coefficients on the two distinct discretion variables are much closer in magnitude, and the coefficient on the pooled discretion measure is larger.

The correlation between the choice of discretionary auction and the selection of an investigated firm as winner is robust to a range of considerations. In addition to procurement administration fixed effects, we may include region × year or even province × year fixed effects (a total of 1,770 additional fixed effects), and the point estimates remain quite similar. We may also amend the definition of *InvestigatedWinner* to make it more – or less – inclusive. In Appendix Table A.1, we show the results using a definition that focuses more narrowly on corruption (restricting attention only to firms investigated for (i) corruption, malfeasance and embezzlement or (ii) abuse of power and undue influence, but excluding those investigated for (iii) violations in public auctions) and in Appendix Table A.2, we expand the definition to include firms associated with individuals suspected of waste management crimes. The inclusion of the latter group is at the suggestion of anti-corruption authorities, who indicated to us that it is a common area for organized crime and corruption. In both cases, we observe broadly similar patterns to those reported in Table A.2.

If discretionary auctions are more likely to be won by firms suspected of corruption, it begs the question of why the central government permits their use, and has even encouraged their increased deployment since 2008. Presuming that the central government does not somehow collude with local bidders, one natural explanation is that there are benefits to discretion that must be weighed against any cost from misallocation or capture. The main official motivation for (twice) revising upward the threshold within which negotiated procedures can be freely used was speeding up administrative procedures. When using negotiations the administrative burden is lighter than with open auctions: PAs can publish shorter, less detailed calls for tenders, and these calls have shorter minimum mandatory publicity periods (about half of the 52 days period typically required for open tenders, but even less if certain conditions are met). The selection of the winning bid is also faster as typically the RUP directly selects the winner among a small set of bidders. At the opposite end of the spectrum, scoring rule auctions require creating ad hoc commissions to evaluate bids and select winners.

A different margin along which discretion can benefit PAs is by helping reducing the perverse adverse selection effects of open, competitive bidding. As mentioned ear-

lier, incomplete contracts e non-contractible quality are a major caracterizing feature of contract procurement. A first price open auction can be the worse allocation mechanism when even just one opportunistic firm participates. Although several institutional features in the system are geared toward limiting the problem of "too good to be true" bids, discretion in selecting participants and bids can be a powerful tool. It is indeed the pillar of private contracting. We provide some indication of these potential benefits of discretion in Table 5. The table presents the results of specifications that parallel those presented above, using the inverse hyperbolic sine of the contract's delay in implementation ($Asinh(Delay)$), the discount offered by the winning firm and the extra cost realized at the end of the contract as outcomes, in place of $InvestigatedFirm$.[13] While delay is a highly imperfect indication of performance – for example, it makes little sense to include $DiscretCrit$ as an explanatory variable, since execution time may be part of the scoring rule to evaluate contracts – in the absence of ex post quality evaluations of contracts, it nonetheless provides one objective indication of the winning firm's performance.

Table 5, column (1) includes $Discret$ as an explanatory variable, along with fixed effects for procurement administration and year, and flexible reserve price controls. As would be expected if discretion speeds the completion of a contract, the coefficient on $Discret$ is negative, though small in magnitude and only borderline significant ($p < 0.07$). We distinguish between $DiscretCrit$ and $DiscretProc_{lowN}$ in column (2), and find that there is a much stronger negative relationship for negotiated procedures – recall that, as we noted above, it is hard to interpret the relationship between discretionary criterion and delay, as completion time may be a component of the scoring rule used to evaluate bids. In column (3) we add a control for negotiated procedures – recall that this captures auctions in which bidders must be invited to participate in the auction, whereas $DiscretProc_{lowN}$ denotes negotiated procedure auctions in which "too few" participants are invited. Interestingly, once one accounts for whether an auction is a negotiated procedure – which itself is associated with much shorter delays – there is little incremental effect of $DiscretProc_{lowN}$ on delay.

The following columns of Table 5 repeat the regression analysis for the two other outcomes. We observe a clear negative and economically large impact of discretion on winning discounts: the coefficient on $Discret$ implies a 4 percentage point lower discount, relative to an average winning discount of 18 percent. Column 6 shows that most of the drop is associated with discretionary criterion and, to a lesser extent, discretionary procedures with too few bidders. Negotiated procedures more generally are associated with lower discounts, as indicated by the negative coefficient on $DiscretProc$, but the size of the effect is about half of that of the discretionary criterion. Thus, it appears

[13] All three outcomes are available only for a subsample of auctions.

that discretion has a direct impact on increasing the price paid by PAs by a significant amount. In the final section, we will relate this increase of public cost to the (potential) benefit for a corrupt RUP. Finally notice that the final price, inclusive of cost overruns, is essentially unaffected by the choice of discretion, as the estimated coefficients are either not significant or, in the case of discretionary criterion, significant but small in magnitude.

IV.B Investigated administrators and the choice of discretion

In Table 6, we explore the choice of discretion as an auction mechanism. We begin with results that most closely parallel those of the preceding section, with public administration fixed effects. In columns 1 and 2, the dependent variables are $DiscretProc_{lowN}$ and $DiscretCrit$ respectively, while column 3 employs $Discretion$ that is the union of the preceding two. In all cases, the coefficient on $InvestigatedRUP$ is positive (significant at least at the 5% level), indicating a higher use of discretionary auctions; comparing columns 1 and 2, the point estimate is more than twice as high for discretionary criterion auctions, though the base rate of discretionary criterion auctions is also much higher.

In the remainder of the table, we introduce $InvestigatedPA$ as a covariate. Since this variable varies only at the PA-level, we can include only coarser fixed effects. In Table 6 we employ fixed effects for each of the country's 20 regions, and in Appendix Table A.5 we use a finer partition, with fixed effects for each of 110 provinces. In columns 4 and 5 we include $InvestigatedRUP$ and $InvestigatedPA$ respectively as covariates, with $Discretion$ as the outcome variable. Note that, by definition, these variables are positively correlated ($\rho = 0.45$). It is intriguing, therefore, that their coefficients are of opposite sign (significant at the 1% level). Specifically, PAs that have had at least one administrator suspected of corruption are 7.7% less likely to use discretionary auctions (a coefficient of 0.017 relative to a base rate for $Discretion$ of 0.22) while, for a given city council, a corrupt administrator is 8.6% more likely to use a discretionary auction (0.019/0.22). In column 6, we include both variables – as might be expected given their strong positive correlation, in this specification the magnitude of each coefficient increases, nearly doubling for both $InvestigatedRUP$ and $InvestigatedPA$. Columns 7 and 8 repeat the specifications from column 6, which include both $InvestigatedPA$ and $InvestigatedRUP$, but using our two distinct discretion variables as the outcomes, $DiscretProc_{lowN}$ and $DiscretCrit$. In these specifications, the relationships between both variables and discretion are driven by the selection of $DiscretCrit$ auctions (though we refer back to column 1 to emphasize that, with finer fixed effects, there is a discernable positive relationship between $InvestigatedRUP$ and the choice of discretionary

procedures).[14]

IV.C Contract-Value Based Limits on Discretion

In the previous section, we found that negotiated contracts with many bidders – which constitute the vast majority of auctions with discretion – were won by investigated firms at the same rate as open price-only auctions. While negotiated contracts with "too few" bids and scoring rule auctions were won more often by investigated firms, we also observed that regional governments may take steps to limit the use of these mechanisms in locales that are vulnerable to corruption.

These findings naturally raise the question of whether the limits to discretion imposed by national regulations are too strict. We can explore this issue by examining the consequences of the loosening of rules on the use of negotiated procedures during the late 2000s. While our earlier discussion emphasized the role of a local (regional) monitor that could set the minimum required expected benefit from discretion in order to activate it ($\hat{d}^*$, in the model of section 2), national rules often set strict monetary thresholds on contract values to determine which ones may be awarded via discretionary methods. This type of rule is typical in procurement regulations, and indeed a similar setup is present in the US for accessing the Simplified Acquisition Procedure system.[15]

The motive behind this form of regulation can be easily understood if one presumes that the national regulator does not even observe the signal of the value of discretion for a specific project, and we further augment our basic model to assume that the benefits to the agent from stealing increase with project size.[16] In this augmented framework, setting a maximum project value beyond which discretion is forbidden can serve to limit the risks from stealing.

Note, however, that this additional rigidity imposed at the national level comes at the cost of limiting discretion for local administrations and RUPs that would use it for public benefit. This rigidity may further be excessive (relative to the social welfare optimum) if

[14] In the Appendix, we show results analogous to those in Table 6, using as the dependent variable $DiscretProc_{highN}$, i.e., negotiated contracts with the legally mandated number of bidders. We find no relationship between investigated RUPs or PAs and this outcome.

[15] In the US, since the Federal Acquisition Streamlining Act of 1994, Simplified Acquisition Procedures (SAP) were introduced to promote efficiency and economy in contracting by reducing administrative costs and unnecessary burdens for agencies and contractors. Under the SAP, contracting officers can select private contractors in more informal ways, for instance by getting oral (rather than written) quotes and selecting the winner without the need for a formal comparative assessment among quotes. The SAP applies to purchases of supplies or services whose anticipated dollar value does not exceed the Simplified Acquisition Threshold, which has increased over time, reaching $150,000 as of 2014, and making purchases under the SAP an ever larger portion of federal procurement.

[16] Under this modification, the optimal stealing would become $s^* = \frac{v}{2e_a}$, where v is the baseline project size, as in Section II.

political economy considerations lead to a large weight on theft by national bureaucrats and politicians. For example, reelection concerns may lead a politician to limit stealing per se – beyond its impact on project outcomes – because of the negative publicity from revelations of corruption in public works.[17] A similar argument may be applied to a bureaucrat with career concerns and reduced performance incentives: discretion will be under-utilized if it increases the probability that an official will face a corruption investigation which, in the Italian context, would defer any promotion until acquittal, without sufficient offsetting rewards.[18]

We can get a rough sense of whether the threshold for discretion was plausibly set too tightly in the earlier part of our sample by exploring the consequences of the looser constraints. Figure A.2 illustrates this evolution: after falling from €300,000 to €100,000 in the 2006, the threshold for use of negotiated procedures increased to €500,000 in 2008, and then to €1 million in 2011. As we noted earlier, this change led to a marked shift toward the use of negotiated procedures in the latter part of our sample.

Overall, these changes led to only a modest increase in either of the auction types that we have flagged as associated with corruption. For example, comparing auctions held prior to 2008 versus those held 2011 and later, the fraction of auctions for which $DiscretProc = 1$ or $DiscretCrit = 1$ increases from 20.5% to 23.6%: while discretionary procedure auctions increased substantially (from 0% to 12.7%) this increase was largely offset by a substitution away from discretionary criterion (scoring rule) auctions. Taken at face value, our regression coefficients imply a 1.5 percentage point increase in auctions won by investigated firms for the incremental 3.1% of auctions conducted via discretionary procedure or criterion. This calculation leads to a 0.05% increase in investigated winners overall (0.031×0.015).

The preceding calculation presumes a stable relationship linking the use of discretionary auctions to investigated winners. If we allow the coefficient on $Discretion$ to vary over time by adding the interaction terms $Discretion \times I(2008 \leq Year \leq 2010)$ and $Discretion \times I(Year \geq 2011)$, in a regression predicting $InvestigatedWinner$, their

[17] The responsiveness of politicians to corruption scandals has been documented, in particular, through a series of papers exploiting the richness of Brazilian data on corruption audits, including Avis et al. [2017] and Ferraz and Finan [2011]. The former study documents a significantly lower rate of corruption in municipalities in which mayors can run for reelection, while the latter estimates a structural model of agency which illustrates that the reduction in corruption after an audit comes primarily from the perceived non-electoral costs of engaging in corruption.

[18] This is the well-known problem of low-powered incentives for public employees, which has been documented across many countries and institutions (see, for instance the analysis of Indian bank nationalizations by Banerjee et al. [2004]). The problem may be exacerbated by the initial selection of individuals choosing to become bureaucrats (as analyzed, for instance, through a randomized study of initial public sector wage offers in Mexico by Dal Bo et al. [2013]) as well politicians (see the recent review by Dal Bo and Finan [2018]).

coefficients are small (0.004 and -0.004 respectively) and do not approach statistical significance, suggesting that we cannot reject a comparable relationship over time.

Recall that the increase in negotiated procedure auctions *with* the legally mandated number of bidders is about 50% between 2008 and 2011. Thus, if these led to even small efficiency gains relative to open first-price auctions, it would more than offset the loss from the very small increment in corrupted auctions.

V Additional Evidence: Tools to Limit Corruption

To the extent that the limited use of discretion we observe in $InvestigatedPA = 1$ administrations is an indication of steps taken to minimize local corruption (as we argue in the introduction), it may be natural to consider other tactics that a central authority might take to reduce opportunities self-dealing in vulnerable PAs. In this section, we present additional evidence concerning two common policies to curb corruption: job rotation and limits to subcontracting. Both policies are extensively used in public procurement regulations, but limited evidence on their efficacy is available. Moreover, while there is a long and established theoretical literature on job rotation, there is no prior theoretical (or empirical) work documenting the link between corruption and subcontracting.

V.A Administrator turnover in investigated municipalities

Staff turnover is used in many settings to ensure independence of officials. Rotation of audit partners, for instance, was made compulsory for US public companies by the Sarbanes-Oxley Act of 2002. Intuitively, rotation can break the links between a corrupt public official and firms with which he may collude and, moreover, rotation of officials can speed up and/or facilitate revelations of corruption.[19]

Although there are no formal provisions governing public official turnover in Italian procurement law, rotation as an anti-corruption tool has often been invoked in policy debate. We explore its usage within our data through a set of city-level analyses relating $InvestigatedPA$ to the average number of auctions handled by each RUP. Our measure, $Turnover$, captures the average fraction of a PA's auctions during our sample period that are handled by a given individual. In particular, if we define δ_{ia} as the share of all contracts for public administration a that are awarded by official i, then our measure of

[19] See Choi and Thum [2003] for a formal argument on the conditions in which rotation will have these effects and, more generally, for references on models of "horizontal competition" between public agents as a corruption fighting tool.

turnover is the complement of an HHI concentration index:

$$Turnover_a = 1 - [\sum_j \delta_{ja}^2 / 10,000] \quad \text{for} \;\; j = \{1, ..., J_a\} \tag{2}$$

where j indexes each of the J_a officers in administration a throughout our sample period. We take one minus the concentration index so that the measure is increasing in turnover, i.e., $Turnover_a$ is higher if a given contract is less likely to be handled by an official that oversees a large fraction of a's overall contract volume.

$Turnover$ is a public-administration-level variable, which is the level at which we run this analysis. We are primarily interested in its relationship to our PA-level measure of suspected corruption, $InvestigatedPA$, and control also at a fine level for geography, via the following specification:

$$Turnover_a = \beta InvestigatedPA_a + Population_a + Region_{R(a)} + \epsilon_a \tag{3}$$

In this specification, *Population* is a set of dummy variables for each 5,000 person interval for municipalities with population less than 100,000, and dummy variables for each 100,000 person interval between 100,000 and 1,000,000 (the municipalities of Rome and Milan, each with population greater than a million, are the omitted category). *Region* is a set of dummy variables for each of Italy's 20 regions (the results are virtually identical when we include 110 province fixed effects below). We present these analyses in Table 7. We focus on our sample of municipalities, since turnover is so strongly correlated with the size of a PA, and in this sample we can control flexibly for population. In the first column, we include only $InvestigatedPA$ and population fixed effects. The coefficient on $InvestigatedPA$ is 0.079, significant at the 0.001% level, indicating that in cities with at least one public official suspected of corruption, our $Turnover$ variable is 23.7% higher (0.075, relative to a mean of 0.35 for $Turnover$). The estimated effect increases to 0.078 in column 1 when we include fixed effects for each of Italy's 20 regions, and is virtually unchanged when we add 110 province fixed effects in column 3. In column 4 we add third-order polynomials for population, as well as a control for the average number of discretionary auctions in the municipality. These additions have little effect on the estimated relationship between $InvestigatedPA$ and $Turnover$.

Finally, in the next four columns, we repeat the same analysis but using the share of contract values. Hence, instead of the number of contracts awarded by a RUP relative to the overall number of contract in the PA, we calculate the total value of all contracts awarded by a RUP over the overall value of contracts awarded by the PA. To avoid issues related to differential winning discounts, we use the initial reserve price instead of the

winning (or final) price. The results are nearly identical to those in the first four columns.

V.B Subcontracting by criminal firms

Subcontracting is a distinctive feature of contract procurement that is often asserted (and found in court cases) to be a channel for bribes and kickbacks. In particular, payments to subcontractors, recorded on the main contractor's books as legitimate works but never (fully) performed by the subcontractor, may be used to generate cash for corrupt payments and conceal bribes. Thus, we might expect an association between investigated winners and investigated subcontractors. Yet there is a legitimate efficiency-based rationale for subcontracting, especially for complex jobs involving heterogenous tasks.[20]

This tradeoff inherent in the use of subcontracting may account for the divergent approaches taken by Italian regional governments in constraining its use: as documented in Decarolis and Giorgiantonio [2015], over the sample period that we analyze, several northern regions (Valle d'Aosta, Bolzano, Friuli Venezia Giulia, and Veneto) passed laws that expanded the scope for subcontracting beyond that which was allowed by the national legislatur. At the same time, Sicily's regional procurement law introduced *more* stringent rules (relative to national standards) to limit subcontracting, specifically mentioning its known association with corruption and criminal infiltration.[21] We do not have systematic contract-level information on whether a specific call for tenders included limits to subcontracting. However, for a small set of 244 municipalities, we obtained this information from Decarolis and Giorgiantonio [2019]. The estimates analogous to those reported for turnover (see Appendix Table A.7) are also positive, albeit insignificant (e.g., the t-statistics are generally below 1). While consistent with a positive association between more at-risk administrations and greater limits to subcontracting, we have insufficient data to explore this possibility withi any rigor.[22]

Our data offers a unique possibility to examine the extent to which subcontracts are

[20]For both a discussion of the subcontracting regulations in Italy and a model of the efficiency-enhancing features of subcontracting see Branzoli and Decarolis [2015].

[21]More precisely, while the national legislation allows subcontracting whenever expressly provided for in the call for tenders and limited to 30% of the total contract value, the regional laws involved the following modifications documented in Decarolis and Giorgiantonio [2015]: "since 2005, Valle d'Aosta has provided that – in the presence of certain requirements – subcontracts whose value is less than €15,000 are not subject to prior authorization from the contracting authorities; until October 2009, Bolzano established that the use of subcontracting was admissible up to 40% of the total contract value, and not 30% as required by national legislation; Veneto provided that the use of subcontracting was admissible up to 40% of the total contract value."

[22]In their analysis of red flags for corruption obtained from a detailed analysis of individual calls for tenders, Decarolis and Giorgiantonio [2019] find that the presence of additional limits to subcontracting is among the markers that predict the future occurrence of corruption.

indeed associated with suspected criminal behaviour. To the extent that $InvestigatedWinner$ captures whether a firm is more likely to engage in self-dealing, we assert that, all else equal, investigated firms will engage in more subcontracting, and furthermore, given the between-firm collusion required in corrupt subcontracting relationships, we hypothesize that, conditional on subcontracting, investigated firms will tend to give subcontracts to other investigated firms.

The graphical evidence in Figure 5 is clearly suggestive of the relevance of the latter hypothesis. In terms of both the probability that the contract will involve at least one investigated subcontractor (left panel) and the share value of subcontracts to investigated firms over the overall subcontract value (right panel), the evidence in the left panel of Figure indicates that investigated winners disproportionately select investigated subcontractors. This graphical evidence is bolstered by the analyses presented in Table 8. Since the extent of subcontracting will naturally vary by contract size and complexity, we introduce successively more controls to account for various auction attributes. The dependent variable, $InvestigatedSubcontractor$, indicates that at least one subcontract was assigned to a firm suspected of corruption. Note that, since these analyses condition on the existence of at least one subcontract, the sample size is far smaller than in our earlier regressions. The patterns indicate an extremely strong correlation between suspected corruption of the winning firm and that of its subcontractors. The point estimate on $InvestigatedWinner$ indicates that corrupt firms are 3-5 percentage points more likely to subcontract to another corrupt firm, which represents a 45-70 percent increase relative to the base rate of subcontracting to investigated firms of 8 percent for clean (non-investigated) winners.

We explore other subcontracting outcomes in Table 9. We begin with an indicator variable for any subcontracting as the dependent variable in column 1; there is no significant relationship with $InvestigatedWinner$ for this "extensive" margin measure. When we look at the intensive margin in column 2 and 3 – based on subcontracting value as a fraction of total contract value, and number of subcontractors – we do observe that both are higher for investigated winners. Thus, overall, we find some evidence that subcontracting in general is higher in contracts won by investigated firms. In the remaining three columns, we present alternative measures of subcontracting to suspected criminal firms, to complement our results in Table 8: the fraction of investigated subcontractors as a fraction of the overall number of subcontractors (column 4) and the share of subcontract value going to investigated firms as a fraction of total subcontract value (column 5). In all cases we find a strong and positive relationship with $InvestigatedWinner$.

Finally, we investigate whether the relationship between $InvestigatedWinner$ and $InvestigatedSubcontractor$ is mechanically induced by investigations of particular con-

tracts. In particular, one may be concerned that when an auction winner is suspected of corruption, the investigation automatically extends to all subcontractors. If this were the case, we should observe a strong, proportional increase in the number of investigated subcontractors as the total number of contractors increases, but *only* in the presence of a contract winner that is itself under investigation. Figure A.6 displays a binned scatterplot of the average number of investigated subcontractors as a function of the total number of subcontracts (weighted by the reserve price for the overall contract), for $InvestigatedWinner = 0$ and $InvestigatedWinner = 1$ contracts separately. There is a clear positive and linear relationship for both groups, which argues against investigations spreading outward from the contract winner itself.

Our findings on subcontracting have several candidate explanations. It may be that, in accordance with the judicial evidence, a corrupt firm seeks corrupt subcontractors because it needs to create false invoices to facilitate theft of project funds. Other, not mutually exclusive explanations, are also plausible. One possibility is that a subcontractor may learn whether the principal contractor is engaged in corruption. Hence, having a corrupt firm as subcontractor minimizes the chances that such a firm will leak this information to enforcement authorities. Alternatively, it might be that corruption and collusion go hand in hand: members of bidding rings are more likely to be corrupt, and dynamic considerations for maintaining the cartel also lead members to share revenues with cartel members via subcontracting. Regardless of the precise mechanism(s), it appears likely that the choices of regional regulators – tighter subcontracting rules in the South, and looser rules in the North – were consistent with the different features of subcontracting in high versus low corruption areas.

VI Conclusions

We present evidence which suggests that discretion, to the extent that it limits competition, is associated with higher suspected corruption in procurement. We show that these auctions are chosen more often by officials who suspected of corruption, and less often in public administrations in which at least one procurement official has been investigated for corruption. The model that we present for organizing these results – a well-meaning central monitor who curtails the use of discretion in areas more prone to corruption – also fits with patterns we document on turnover among procurement administrators, and also rules on subcontracting.

We see several main takeaways from our findings. First, given the central role played by competition in the patterns we document, our results argue against certain classes of models which emphasize bribery as a means of competing with other bidders (e.g.,

TK), and those which model corruption as the outcome of a competitive (and efficient) bidding process in which the best firm is willing to bribe the most to secure a contract. Second, presuming there is enough competition (i.e., sufficient bidders), rigid constraints on auction officials' discretion (e.g., via minimum contract size thresholds) may be costly tools that, at least based on our measure, have modest impact on corruption. In our view, this result is unexpected, particularly for a country like Italy, which has been traditionally characterized by high levels of corruption, given its level of development.

We also see a number of avenues for future research. For example, we wish to better understand the costs invoked by rules to limit corruption – i.e., constraints on discretion and subcontracting, and higher bureaucratic turnover – as a step to further clarifying the tradeoffs that result from anti-corruption policies. Furthermore, in this first assessment of the link between discretion and corruption, we have taken a broad view of the data. Future work may help to better understand the specific mechanisms that underly the correlations we document – for example why there is such strong "matching on probity," as suggested by our subcontracting results.

Overall, this evidence is hence in line with our earlier discussion of a benevolent local regulator that seeks to reduce opportunities for corruption. Interpreted through the lens of our simple model, turnover may be seen as a tool that does not impede the use of discretion, though it may invoke comparable tradeoffs, as high turnover potentially limits the accumulation of task-specific knowledge, learning by doing, and trust that increase with experience.

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Figure 1: Procedures and Criteria Over Time

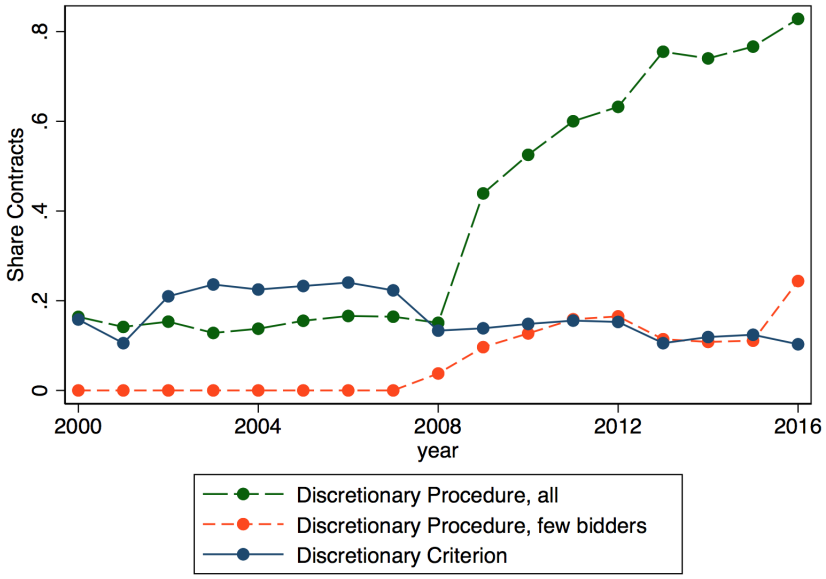
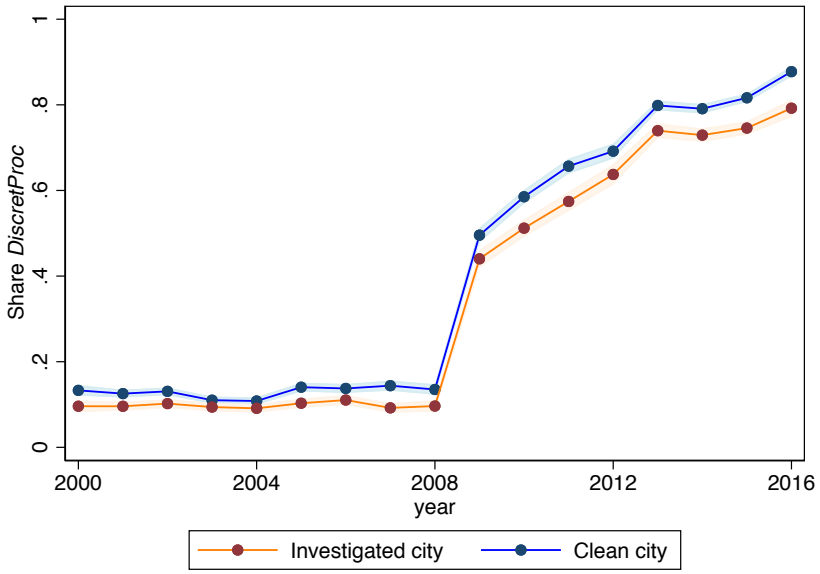
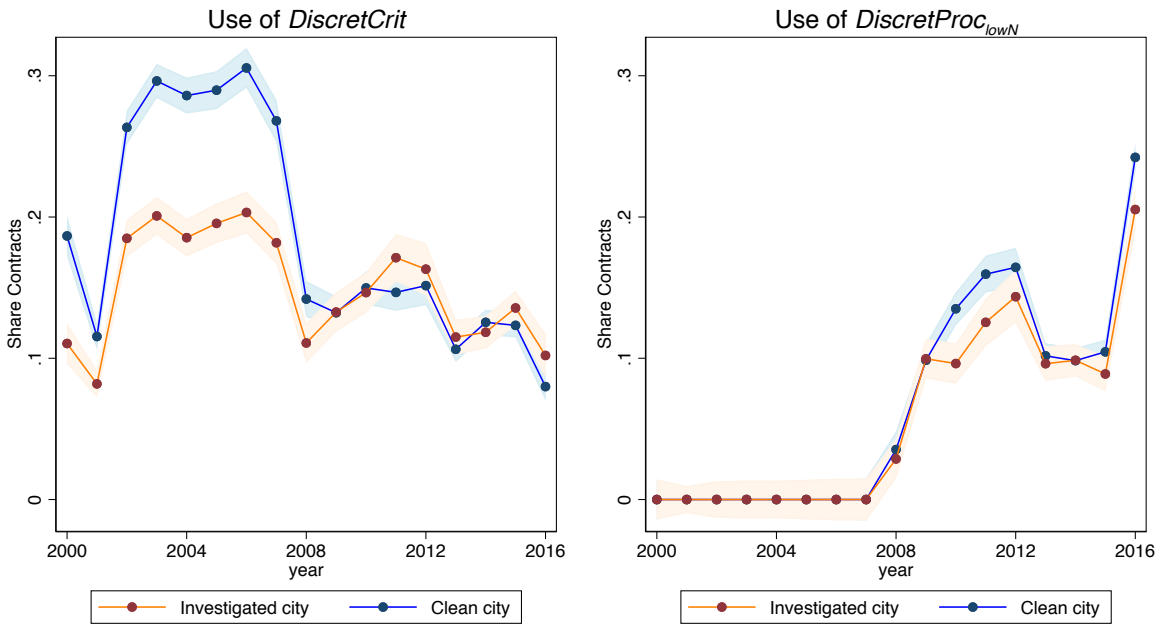


Figure 2: Use of negotiated procedures, by Investigated City



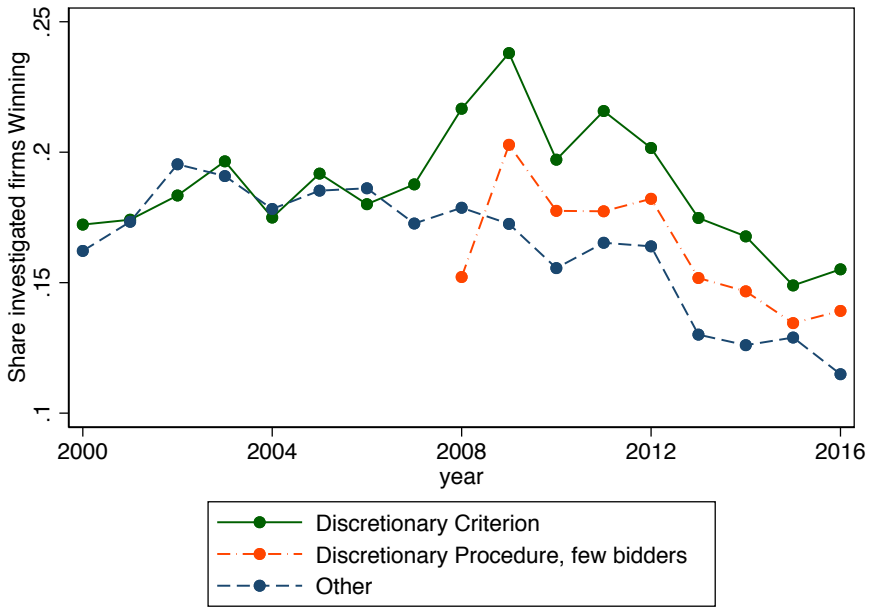
The graph depicts the share of contracts awarded through negotiated procedure, over time, by criminal and non-criminal PAs, restricting attention to cities only.

Figure 3: Discretion, by Investigated City



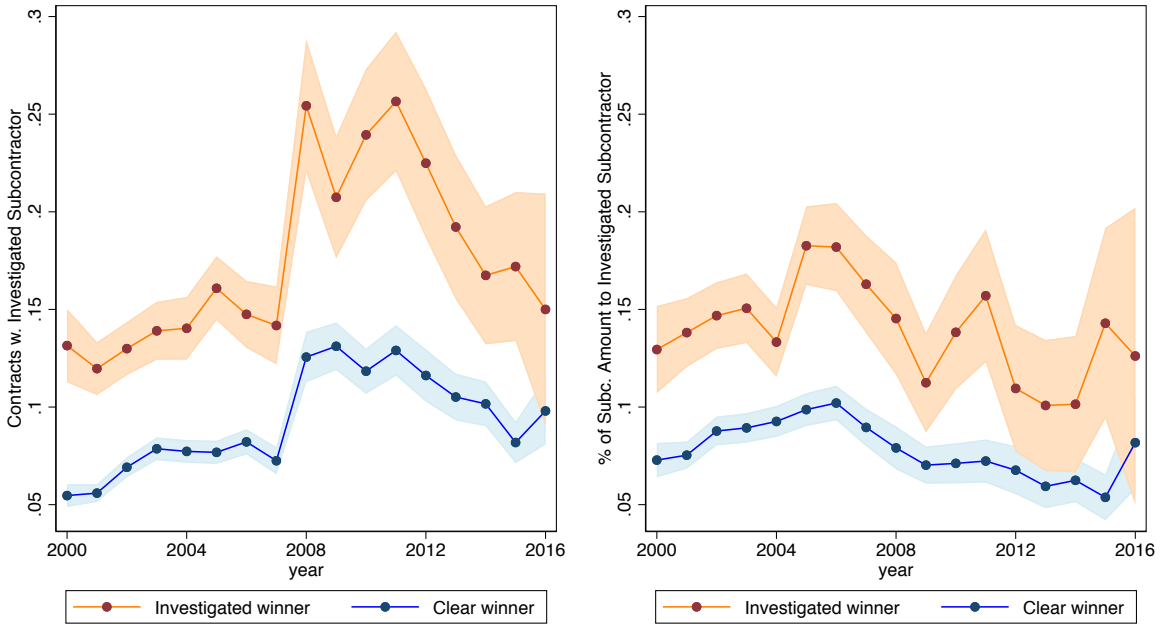
The graph depicts the share of contracts awarded through, respectively, Discretionary Criterion (left) and Discretionary Procedures (right), over time, by criminal and non-criminal PAs, cities only. On the right, graph starts in 2008 as $DiscretProc_{lowN}$ is not defined before 2008 because no rule on the minimum number of bidders existed.

Figure 4: Share Investigated Winners, by type of procedures



The graph depicts the share of contracts with winners who are classified as criminals over the total number of contracts awarded with a given procedure.

Figure 5: Subcontracting by Investigated Winners



Share of contracts with criminal subcontractors (left), and the share of total subcontracted amount given to a criminal subcontractor (right).

Table 1: Summary Statistics by Area

	(1) South	(2) Center	(3) North
Investigated RUP	0.164	0.122	0.0697
	(0.370)	(0.328)	(0.255)
Investigated Firm	0.175	0.161	0.168
	(0.380)	(0.367)	(0.374)
Discr. Auction	0.149	0.125	0.298
	(0.356)	(0.331)	(0.457)
Discr. Auction, Investigated RUP	0.178	0.138	0.323
	(0.382)	(0.345)	(0.468)
Discr. Auction, Clean RUP	0.143	0.124	0.303
	(0.350)	(0.329)	(0.460)

The sample refers to the universe of contracts awarded by cities or other local authorities. 27 % of contracts awarded in the South, 23 % in the Center and 50% in the North.

Table 2: Summary Statistics for the Full Data

A. Auction Level

	(1) Mean	Median	S.D.	N
Discretion	0.22	0.00	0.42	211,507
DiscretCrit	0.17	0.00	0.38	211,507
$\text{DiscretProc}_{lowN}$	0.06	0.00	0.24	211,507
DiscretProc	0.37	0.00	0.48	211,507
Price Only Auction	0.83	1.00	0.38	211,507
investigated Firm	0.17	0.00	0.38	200,092
Investigated RUP	0.10	0.00	0.30	211,507
No. Bidders	26.93	10.00	41.64	210,405
No. Invited Bidders	7.48	4.00	16.78	103,205
Reserve Price (mil)	0.92	0.30	14.14	195,718
Winning Discount	18.22	16.88	11.58	192,362
Extra Cost (wrt Base)	7.01	3.37	13.85	83,088
Contractual Duration	239.91	180.00	224.98	144,942
Delay (days)	135.08	73.00	220.48	108,663

B. Administration Level

	(1) Mean	Median	S.D.	N
Investigated PA	0.16	0.00	0.37	14,024
Total N. Auctions, by PA	15.06	4.00	68.25	14,024
Total Value (in bil), by PA	148.00	17.89	2,061.68	14,024
PA_type==Central Admin	0.02	0.00	0.14	14,024
PA_type==Other Local PA	0.05	0.00	0.22	14,024
PA_type==Cities	0.57	1.00	0.50	14,024
PA_type==Transportations	0.03	0.00	0.16	14,024
PA_type==Hospitals & University	0.17	0.00	0.38	14,024
PA_type==Other	0.17	0.00	0.37	14,024
Population==Pop. up to 5k	0.67	1.00	0.47	7,004
Population==5-10k	0.16	0.00	0.37	7,004
Population==10-20k	0.09	0.00	0.29	7,004
Population==20-60k	0.06	0.00	0.23	7,004
Population==60-250k	0.01	0.00	0.11	7,004
Population==above 250k	0.00	0.00	0.04	7,004

Notes: $DiscretProc$ denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. $DiscretCrit$ denotes scoring rule auctions. $Discretion$ denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$.

Table 3: Summary Statistics for identification

	All PAs	Cities		
	(1)	(2) South	(3) Center	(4) North
Total PAs	14,384	2,374	937	4,098
Total PA, > 1 Auction	10,439	2,140	863	3,573
At least 1 Discret	6,845	1,372	530	2,653
At least 1 DiscretCrit	5,993	1,290	473	2,226
At least 1 DiscretProc$_{lowN}$	3,214	341	224	1,593
PA w. Variance in Discret	6,387	1,323	526	2,495
PA w. Variance DiscretCrit	5,667	1,243	470	2,125
PA w. Variance in DiscretProc$_{lowN}$	3,156	341	223	1,581

Notes: $DiscretProc$ denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. $DiscretCrit$ denotes scoring rule auctions. $Discretion$ denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$.

Table 4: Auction-Level Regressions, Investigated Winner

	all					cities				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DiscretCrit	0.0122***		0.0132***	0.0133***		0.0191***		0.0199***	0.0197***	
	[0.00325]		[0.00328]	[0.00328]		[0.00400]		[0.00401]	[0.00403]	
$\text{DiscretProc}_{lowN}$		0.0215***	0.0229***	0.0222***			0.0127**	0.0152***	0.0163***	
		[0.00495]	[0.00500]	[0.00512]			[0.00592]	[0.00589]	[0.00583]	
DiscretProc				0.00183	0.00326				-0.00321	-0.00336
				[0.00316]	[0.00312]				[0.00425]	[0.00423]
Discretion					0.0147***					0.0199***
					[0.00304]					[0.00367]
Dep. Var. Mean	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Observations	199089	199089	199089	199089	199089	107994	107994	107994	107994	107994
R-sq	0.118	0.118	0.118	0.118	0.118	0.130	0.129	0.130	0.130	0.130

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 5: Auction-Level Regressions, Outcomes

	Delay (Asinh)			Winning Discount			Extra Cost		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Discretion	-0.142***			-4.031***			-0.312		
	[0.0469]			[0.267]			[0.282]		
$\text{DiscretProc}_{lowN}$		-0.259***	-0.129*		-3.965***	-3.023***		0.396	0.492
		[0.0766]	[0.0756]		[0.422]	[0.356]		[0.509]	[0.520]
DiscretCrit		-0.0778	-0.0837		-3.971***	-4.117***		-0.640**	-0.656**
		[0.0538]	[0.0535]		[0.241]	[0.251]		[0.268]	[0.270]
DiscretProc			-0.340***			-2.426***			-0.276
			[0.0635]			[0.356]			[0.215]
Dep. Var. Mean	3.296	3.296	3.296	18.11	18.11	18.11	7.035	7.035	7.035
Observations	107067	107067	107067	191053	191053	191053	81439	81439	81439
R-sq	0.250	0.250	0.251	0.443	0.444	0.448	0.219	0.219	0.219

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 6: Auction-Level Regressions, Choice of Procedure

	(1) Discretion	(2) DiscretProc$_{lowN}$	(3) DiscretCrit	(4) Discretion	(5) Discretion	(6) Discretion	(7) DiscretProc$_{lowN}$	(8) DiscretCrit
Investigated RUP	0.0298***	0.00996**	0.0210***	0.0189***		0.0339***	0.000439	0.0330***
	[0.00805]	[0.00402]	[0.00766]	[0.00650]		[0.00854]	[0.00419]	[0.00780]
Investigated PA					-0.0170***	-0.0257***	0.00372	-0.0291***
					[0.00639]	[0.00754]	[0.00461]	[0.00598]
Dep. Var. Mean	0.222	0.222	0.222	0.222	0.222	0.222	0.0589	0.169
Observations	206421	206421	206421	166768	166768	166768	166768	166768
R-sq	0.325	0.257	0.321	0.210	0.210	0.211	0.131	0.196
Geog. FE	PA	PA	PA	Region	Region	Region	Region	Region

Notes: *DiscretProc* denotes negotiated procedures. *DiscretProc*$_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either *DiscretProc*$_{lowN} = 1$ or *DiscretCrit* $= 1$. All regressions include Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$.

Table 7: City-Level Regressions, Turnover

	N. of Contracts				Contract Value			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investigated PA	0.0749***	0.0781***	0.0772***	0.0719***	7542.8***	7681.3***	7447.3***	6882.1***
	[0.00782]	[0.00796]	[0.00808]	[0.00802]	[784.4]	[805.0]	[816.8]	[809.0]
% Discretionary				-0.000131				-34.70***
				[0.000129]				[11.92]
Dep. Var. Mean	0.316	0.316	0.316	0.316	-72241.7	-72241.7	-72241.7	-72241.7
Observations	6712	6712	6712	6712	6712	6712	6712	6712
R-sq	0.208	0.248	0.265	0.285	0.226	0.252	0.271	0.295
Geog. FE		Region	Prov.	Prov.		Region	Prov.	Prov.

Notes: All regressions include Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$.

Table 8: Auction-Level Regressions, Investigated Subcontractors

	(1)	(2)	(3)	(4)	(5)	(6)
Investigated Firm	0.0510***	0.0514***	0.0494***	0.0494***	0.0342***	0.0342***
	[0.00358]	[0.00361]	[0.00362]	[0.00362]	[0.00326]	[0.00326]
Discretion		0.00486	0.00326		0.00293	
		[0.00462]	[0.00460]		[0.00409]	
Investigated RUP		-0.000862	-0.000438	-0.000518	-0.000402	-0.000350
		[0.00637]	[0.00621]	[0.00621]	[0.00644]	[0.00642]
Investigated PA		0.00463	0.00379	0.00389		
		[0.00500]	[0.00495]	[0.00496]		
$\text{DiscretProc}_{lowN}$				-0.0176**		-0.0216***
				[0.00847]		[0.00806]
DiscretCrit				0.00734		0.00727
				[0.00502]		[0.00445]
Dep. Var. Mean	0.0818	0.0818	0.0818	0.0818	0.0818	0.0955
Observations	80601	78462	78462	78462	96971	96971
R-sq	0.0567	0.0571	0.0608	0.0609	0.150	0.150
Geog. FE	Region	Region	Region	Region	PA	PA

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 9: Auction-Level Regressions, Other Subcontracting Outcomes

	(1) Subcontracting	(2) % Amount Subc. (wrt base)	(3) N. Subcontracts	(4) % investigated among Subc.	(5) % Subc. Amount to Investigated
Investigated Firm	-0.000360	0.0132***	0.108***	0.0145***	0.0305***
	[0.00287]	[0.00129]	[0.0357]	[0.00166]	[0.00406]
Investigated RUP	-0.0145*	-0.00201	-0.0207	0.00209	0.00252
	[0.00846]	[0.00291]	[0.0726]	[0.00389]	[0.00846]
$\text{DiscretProc}_{lowN}$	-0.0500***	-0.00309	-0.0241	-0.0136**	-0.0219***
	[0.00681]	[0.00450]	[0.190]	[0.00542]	[0.00821]
DiscretCrit	-0.00999	0.0116***	0.387***	-0.00272	-0.00386
	[0.00673]	[0.00267]	[0.0636]	[0.00233]	[0.00491]
Dep. Var. Mean	0.493	0.109	2.565	0.0423	0.0949
Observations	195158	96635	96971	96971	52370
R-sq	0.375	0.183	0.347	0.146	0.172

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Appendix

Figure A.1: Total Procurement Contracts and Amounts over time

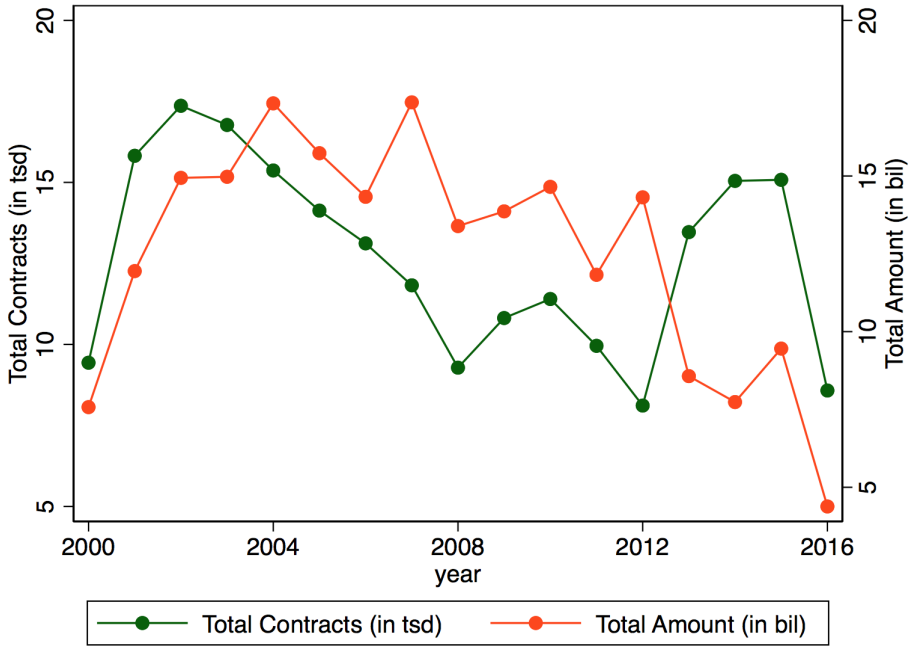


Figure A.2: Contract Value Max. Threshold for Negotiated Procedures

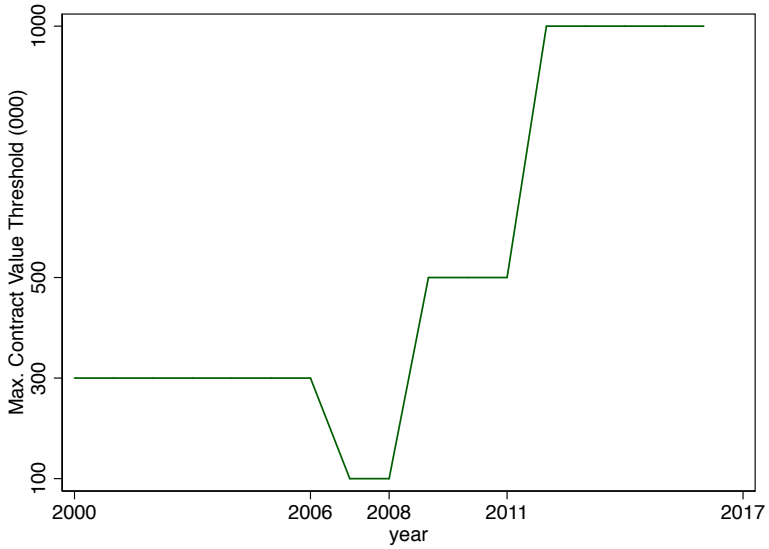


Figure A.3: Share Investigated Winners over time

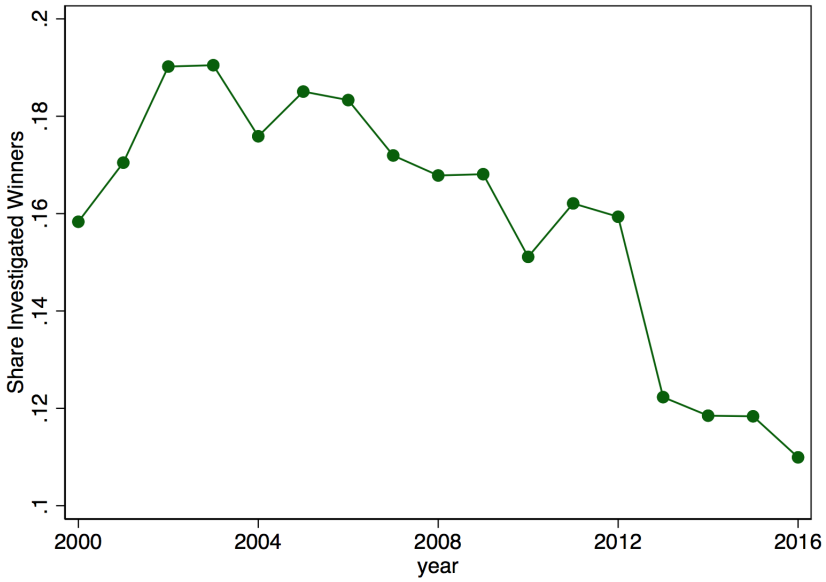


Figure A.4: Use of negotiated procedures, by Investigated PA

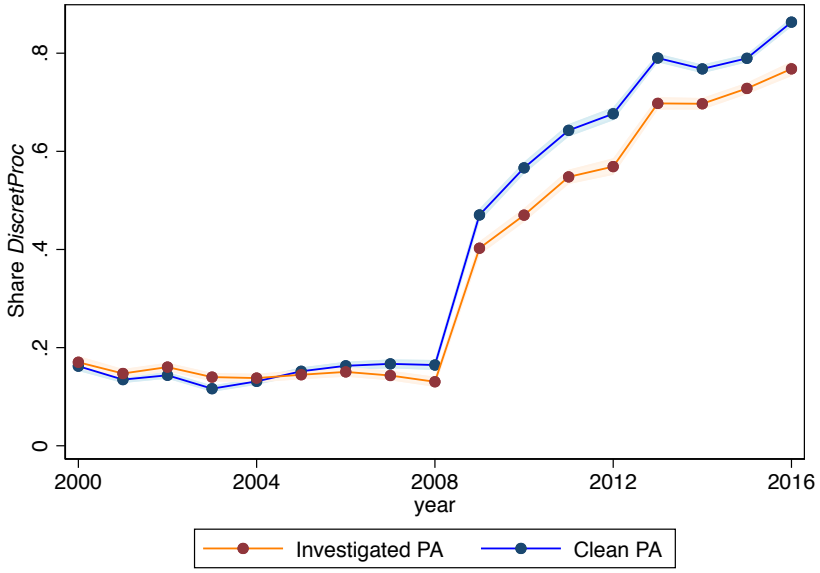


Figure A.5: Discretion, by Investigated PA

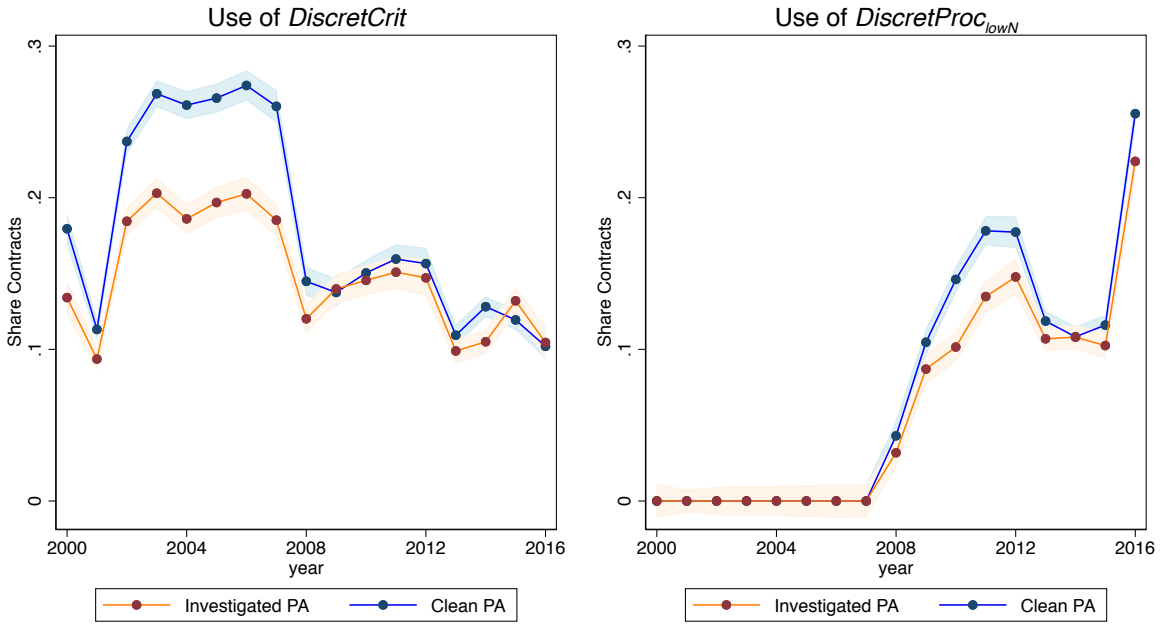


Figure A.6: Share of Investigated Subcontractors, by number of Subcontracts and Investigated Winner

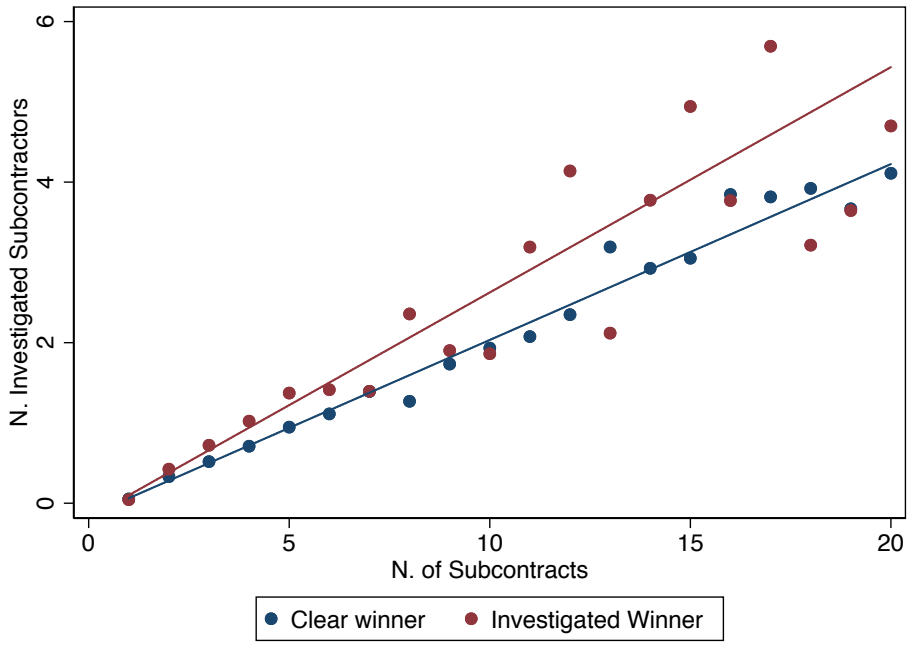


Table A.1: Auction-Level Regressions, Investigated Winner - Restrictive Definition

	all					cities				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DiscretCrit	0.00983***		0.0107***	0.0109***		0.0143***		0.0149***	0.0150***	
	[0.00275]		[0.00281]	[0.00281]		[0.00324]		[0.00326]	[0.00326]	
$\text{DiscretProc}_{lowN}$		0.0181***	0.0193***	0.0163***			0.00979***	0.0117***	0.0110***	
		[0.00408]	[0.00418]	[0.00426]			[0.00345]	[0.00352]	[0.00364]	
DiscretProc				0.00773***	0.00864***				0.00209	0.00180
				[0.00230]	[0.00228]				[0.00287]	[0.00277]
Discretion					0.0119***					0.0148***
					[0.00253]					[0.00281]
Dep. Var. Mean	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Observations	199089	199089	199089	199089	199089	107994	107994	107994	107994	107994
R-sq	0.103	0.103	0.103	0.104	0.103	0.112	0.112	0.112	0.112	0.112

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.2: Auction-Level Regressions, Investigated Winner - Broad Definition

	all					cities				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DiscretCrit	0.0170***		0.0181***	0.0182***		0.0203***		0.0210***	0.0212***	
	[0.00369]		[0.00371]	[0.00372]		[0.00470]		[0.00470]	[0.00470]	
$\text{DiscretProc}_{lowN}$		0.0212***	0.0231***	0.0206***			0.0125*	0.0152**	0.0143**	
		[0.00557]	[0.00559]	[0.00588]			[0.00714]	[0.00711]	[0.00723]	
DiscretProc				0.00650*	0.00719**				0.00278	0.00224
				[0.00378]	[0.00362]				[0.00504]	[0.00496]
Discretion					0.0180***					0.0201***
					[0.00337]					[0.00424]
Dep. Var. Mean	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Observations	199089	199089	199089	199089	199089	107994	107994	107994	107994	107994
R-sq	0.138	0.138	0.138	0.138	0.138	0.148	0.148	0.148	0.148	0.148

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.3: Auction-Level Regressions, Outcomes (Cities Only)

	Delay (Asinh)			Winning Discount			Extra Cost		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Discretion	-0.156***			-4.313***			-0.530*		
	[0.0508]			[0.388]			[0.272]		
$DiscretProc_{lowN}$		-0.462***	-0.334***		-3.153***	-2.418***		0.276	0.242
		[0.0825]	[0.0862]		[0.571]	[0.401]		[0.438]	[0.428]
DiscretCrit		-0.0417	-0.0586		-4.667***	-4.829***		-0.776**	-0.768**
		[0.0601]	[0.0595]		[0.316]	[0.342]		[0.301]	[0.310]
DiscretProc			-0.358***			-2.105***			0.108
			[0.0626]			[0.601]			[0.309]
Dep. Var. Mean	3.296	3.296	3.296	18.11	18.11	18.11	7.035	7.035	7.035
Observations	58071	58071	58071	104628	104628	104628	46276	46276	46276
R-sq	0.260	0.260	0.261	0.437	0.439	0.442	0.249	0.249	0.249

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.4: Auction-Level Regressions, Section 4c

	all					cities				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DiscretCrit	0.0137***		0.0151***	0.0150***		0.0248***		0.0259***	0.0261***	
	[0.00432]		[0.00433]	[0.00432]		[0.00526]		[0.00528]	[0.00528]	
DiscretCritX(2008-2010)	0.00146		0.000633	0.000855		-0.00746		-0.00791	-0.00873	
	[0.00868]		[0.00863]	[0.00860]		[0.0120]		[0.0120]	[0.0119]	
DiscretCritX(Post2011)	-0.00625		-0.00716	-0.00679		-0.0173**		-0.0183**	-0.0196**	
	[0.00751]		[0.00746]	[0.00748]		[0.00864]		[0.00867]	[0.00863]	
$DiscretProc_{lowN}$		0.0284***	0.0302***	0.0295***			0.0282**	0.0314**	0.0339**	
		[0.0103]	[0.0103]	[0.0101]			[0.0144]	[0.0142]	[0.0140]	
$DiscretProc_{lowN}X(Post2011)$		-0.00900	-0.00949	-0.00919			-0.0206	-0.0209	-0.0220	
		[0.0118]	[0.0118]	[0.0117]			[0.0154]	[0.0153]	[0.0152]	
DiscretProc				0.00137	0.00317				-0.00470	-0.00355
				[0.00314]	[0.00312]				[0.00419]	[0.00420]
Discretion					0.0143***					0.0257***
					[0.00432]					[0.00525]
DiscretX(2008-2010)					0.00489					0.00170
					[0.00699]					[0.00935]
DiscretX(Post2011)					-0.00110					-0.0166**
					[0.00617]					[0.00693]
Dep. Var. Mean	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
Observations	199089	199089	199089	199089	199089	107994	107994	107994	107994	107994
R-sq	0.118	0.118	0.118	0.118	0.118	0.130	0.129	0.130	0.130	0.130

Notes: *DiscretProc* denotes negotiated procedures. $DiscretProc_{lowN}$ denotes negotiated procedures with fewer than the legally mandated number of bidders. *DiscretCrit* denotes scoring rule auctions. *Discretion* denotes auctions for which either $DiscretProc_{lowN} = 1$ or $DiscretCrit = 1$. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.5: Auction-Level Regressions, Choice of Procedure, Prov FE

	(1) Discretion	(2) Discretion	(3) Discretion	(4) $DiscretProc_{lowN}$	(5) DiscretCrit	(6) Discretion	(7) $DiscretProc_{lowN}$	(8) DiscretCrit
Investigated RUP	0.0199***		0.0297***	0.000803	0.0298***	0.0320***	0.00769	0.0260**
	[0.00719]		[0.00930]	[0.00483]	[0.00867]	[0.0110]	[0.00509]	[0.0105]
Investigated PA		-0.00457	-0.0156**	0.00218	-0.0190***			
		[0.00518]	[0.00685]	[0.00488]	[0.00617]			
Dep. Var. Mean								
Observations	110269	110269	110269	110269	110269	110052	109511	109511
R-sq	0.231	0.231	0.231	0.144	0.214	0.326	0.248	0.320

Notes: All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.6: Auction-Level Regressions, Choice of $DiscretProc_{highN}$ procedures

	(1)	(2)	(3)	(4)
Investigated RUP	0.00513		-0.00179	-0.00855
	[0.00654]		[0.00776]	[0.00810]
Investigated PA		0.00984	0.0105	
		[0.00778]	[0.00906]	
Dep. Var. Mean	0.222	0.222	0.222	0.222
Observations	110269	110269	110269	109511
R-sq	0.405	0.405	0.405	0.487
Geog. FE	Region	Region	Region	PA

Notes: $DiscretProc_{highN}$ denotes negotiated procedures with at least the legally mandated number of bidders. All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table A.7: City-Level Regressions, Limits to Subcontracting

	(1)	(2)	(3)	(4)	(5)	(6)
Investigated PA	0.0534	0.0492	0.0581	0.0538	0.0534	0.0492
	[0.0643]	[0.0638]	[0.0639]	[0.0635]	[0.0643]	[0.0638]
ln_pop		6.938		6.644		6.938
		[4.255]		[4.190]		[4.255]
ln_pop2		-0.732		-0.707		-0.732
		[0.468]		[0.460]		[0.468]
ln_pop3		0.0244		0.0239		0.0244
		[0.0165]		[0.0161]		[0.0165]
avgdiscret		-0.00346***		-0.00330***		-0.00346***
		[0.000980]		[0.000974]		[0.000980]
Dep. Var. Mean	0.224	0.224	0.220	0.220	0.224	0.224
Observations	223	223	223	223	223	223
R-sq	0.0916	0.143	0.0935	0.140	0.0916	0.143
Geog. FE	Prov.	Prov.	Prov.	Prov.	Prov.	Prov.

Notes: All regressions include PA and Year fixed effects, a linear control for Reserve Price and 5 dummies for different contract size thresholds (up to 100k, 100-150k, 150-300k, 300-500k, 500k-1mil, 1-1.5mil, over 1.5mil) as well as controls for contract characteristics: 4 dummies for category type (Civil Building, Roadworks, Specialized Works or Others) 1 dummy for whether the contract was awarded under Urgency and 1 dummy for whether the object of the contract entailed Maintenance). Robust Standard Errors clustered at the PA level are in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.