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Article — Published Version

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Economic Inquiry

Provided in Cooperation with:

German Institute for Economic Research (DIW Berlin)

Suggested Citation: Chiappinelli, Olga (2020) : Decentralization and Public Procurement Performance: New Evidence from Italy, *Economic Inquiry*, ISSN 0095-2583, Wiley, Hoboken, Vol. 58, Iss. 2, pp. 856-880,
<https://doi.org/10.1111/ecin.12871>

This Version is available at:

<https://hdl.handle.net/10419/232013>

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DECENTRALIZATION AND PUBLIC PROCUREMENT PERFORMANCE: NEW EVIDENCE FROM ITALY

OLGA CHIAPPINELLI

We exploit a new dataset based on European Union (EU) procurement award notices to investigate the relationship between the degree of centralization of public procurement and its performance. We focus on the case of Italy, where all levels of government, along with a number of other public institutions, are involved in procurement and are subject to the same EU regulation. We find that (a) municipalities and utilities, which currently award among the largest shares of contracts, achieve lower rebates than other institutional categories; and (b) decentralization implies lower rebates only when it comes with weak competences of procurement officials. The evidence seems to suggest that a reorganization of the procurement system, both in terms of partial centralization and increased professionalization of procurement officials, would help improve award-stage procurement performance. (JEL H11, H57, H71, H77)

I. INTRODUCTION

Accounting for about 15%–20% of GDP in developed economies, public procurement is both a paramount economic phenomenon and a leading activity of governments (OECD 2017).¹ Thus, it is essential that governments design and implement sound public procurement policies and practices in order to achieve best value for money when purchasing goods and services needed to address public needs. This is particularly compelling in an era of economic instability and crisis, where the priority for governments is to consolidate public finances and clear fiscal space for other necessary policies.

I would like to thank Luigi Moretti, Giovanni Marin, Luigi Benfratello, Gyula Seres, Nolan Ritter, Paola Valbonesi, Tomaso Duso, Matthias Hunold, Francesco Decarolis, Nicola Dimitri, and Caterina Forti Grazzini for useful comments and suggestions. I also thank two anonymous referees for a number of very valuable suggestions that helped to improve the quality of the paper. I am also grateful to Martina Kraus for excellent research assistance. I acknowledge funding from the German Federal Ministry for Economic Affairs and Energy (research grant SEEE, funding number 03MAP316). The usual disclaimer applies.

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1. The average for OECD countries is 12% when excluding procurement by state-owned enterprises. When these purchases are also accounted for, the size of procurement can increase by an additional 2–13 percentage points of GDP (OECD (2017)).

A central issue in the debate on how to improve the performance of public procurement spending, is how much public procurement should be centralized, that is, whether purchasing activities should be mostly administered by central governments (or agencies) or rather delegated to subcentral levels of authority. In practice, although many countries have increased their degree of procurement centralization, often with the institution of a central agency concluding purchasing agreements on behalf of other public buyers, procurement largely remains decentralized.² In many OECD countries, local governments and other decentralized units account for a substantial percentage of

2. Centralization usually occurs in the form of the stipulation of so-called “framework agreements” signed by central procurement agencies on behalf of public purchasers. Framework agreements are agreements between one or more contracting authorities and one or more economic operators, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, quantity (see Dimitri, Piga, and Spagnolo 2006).

ABBREVIATIONS

CA: Contracting Authority
CPV: Common Procurement Vocabulary
EU: European Union
ISTAT: Italian National Institute of Statistics
MEAT: Most Economically Advantageous Tender
OLS: Ordinary Least Squares
TED: Tenders Electronic Daily

procurement spending (on average 63% in OECD [OECD 2017]).

Consequently, what is natural and relevant to ask is whether such a prevailing decentralization practice in procurement systems is justifiable on economic grounds or whether public purchasing should be rather more centralized and, if so, to what extent.

The aim of this paper is to contribute to answering this question. In particular, we exploit a new dataset based on mandatory contract award notices in the European Union (EU), to provide an empirical assessment of the relationship between procurement decentralization and procurement award-stage performance in Italy. The Italian case is appropriate and interesting in this context as all levels of government (central and subcentral), plus a number of other public institutions (e.g., local health authorities, universities, state-owned enterprises), are involved in the procurement of goods, services, and works, with all generally subject to the same rules, as far as EU-relevant procurement is concerned.

We consider the winning rebate (i.e., the winning bid expressed as a discount with respect to the auction base) as the relevant measure of procurement performance at the award stage and focus on the award of work contracts.³

Our main result is that municipalities and utilities (i.e., public enterprises in charge of water, energy, transport, and telecommunications services) achieve lower rebates than other institutional categories and, in particular, than more central levels of government. This is particularly relevant insofar as municipalities and utilities award among the largest shares of procurement contracts (respectively, 12% and 25% in our data). According to our main estimates, if a tender awarded by a municipality (resp. utility) were instead awarded by, for example, a region, the winning rebate would on average increase by around 14% (resp. 13%), which would result in an average per-tender saving of almost 2 million euros.⁴

3. Given the possibility of contract renegotiations at the execution stage, there is no guarantee that higher winning rebates (i.e., lower costs at the award stage) imply overall lower procurement cost. The TED data only contains information relative to the award stage, so we can only focus on ex ante procurement outcomes.

4. These calculations are computed using the fixed effects estimates in column 4 of Table 3 of the effect of the contracting authority being a region rather than a municipality (resp. utility) on the winning rebate, for a public contract with an average reserve price of about 14.5 million euros.

We find that even after controlling for other important determinants of the winning rebate, such as the auction characteristics, as well as geographical, economic, and social factors, significant differentials remain between institutional categories, suggesting that there are other unobservable factors differing between buyers types that impact the performance of procurement as measured by the winning rebate.

Investigating the possible determinants of these differentials, we find that the competences and monetary incentives of procurement officials in the contracting authorities may play a central role. In particular, we find that categories of contracting authorities where competences are, on average, higher, achieve higher rebates. Higher wages in the absence of competences do not improve performance (they might actually worsen it), while higher wages for competent officials can further improve performance.

What emerges from these results is that decentralization implies worse procurement performance only if it does not come with proper competences. This is the case for municipalities and utilities, while other decentralized purchasing units as public institutions, where competences are higher, seem to have a rather good performance. This is not necessarily a matter of size, such that larger authorities manage to concentrate more qualified bureaucrats, but also of other institutional factors that, for a given degree of centralization, drive some categories (e.g., public institutions) to employ more qualified people. Thus, under the reservations that our results cannot be directly given a causal interpretation and that they only refer to a stage of procurement (i.e., award stage) and to a sector (i.e., works contracts), the policy implication that seems to emerge from our analysis is that procurement should not necessarily be more centralized, rather just for those categories of authorities for which decentralization results in a lack of the professional competences needed to efficiently administer the procurement process, such as municipalities and utilities.

Our work mainly relates to two strands of the literature. The first is that of fiscal federalism and the political economy of the provision of public goods. At the heart of the decentralization issue in public procurement is a particular exemplification of the trade-off between responsiveness to local preferences and central internalization of interjurisdictional interdependencies, which underlies the provision of public goods

more generally (see e.g., Oates (1985); Besley and Coate (2003); Oates (2005)): on one hand, centralization of purchases creates potential savings both for purchase costs (since suppliers exploit economies of scale) and for process costs (e.g., tender advertisement and organization, and litigation). On the other hand, decentralization responds better to local specific needs, which is particularly important for the procurement of less standardized goods such as infrastructure (see e.g., Dimitri, Dini, and Piga 2006).

A substrand in this literature investigates whether local authorities are more prone to favoritism and corruption than central ones, due to invested political interests and lobbying of local suppliers, finding mixed evidence (see e.g. Fisman and Gatti (2002); Faguet (2004); Bordignon, Colombo, and Galmarini (2008); Coviello and Gagliarducci (2017)). Some other works find that performance can be lower at the local level because of lower accountability and larger informational asymmetries, as well as lower administrative capacity and less trained public officials (see e.g. Boadway, Horiba, and Jha (1999); Vagstad (2000); Reinikka and Svensson (2004); Besfamille (2004)).

This work also relates and contributes to the empirical literature on the determinants of public procurement outcomes, in particular to the emerging research agenda that focuses on the role of public buyers' characteristics, in terms of institutional aspects and bureaucratic competences.⁵

Previous works focusing on the relationship between the degree of centralization and procurement performance are limited and find mixed empirical evidence. The papers most closely related are Bandiera, Prat, and Valletti (2009) and Guccio, Pignataro, and Rizzo (2014). Bandiera, Prat, and Valletti (2009) consider purchases of standardized goods by different classes of public purchasers in Italy and adopt unit price as measure of procurement performance. They find a significant price variation between

different classes, with the central government paying the highest price, semi-autonomous bodies (e.g., local health authorities and universities) the lowest, and municipalities being the second most cost-efficient class. To understand the determinants of such variations they exploit a regulatory change involving the establishment of a national procurement agency, which allows them to disentangle the contribution of inefficiency (passive waste) and corruption (active waste) to price differentials.

Unlike Bandiera, Prat, and Valletti (2009), we focus on the procurement of public work contracts, which typically involves more complexity than the purchase of standard goods and services. Furthermore, our analysis focuses on procurement subject to EU regulation, which applies with no distinctions to all types of contracting authorities, while in their analysis different institutional categories may be subject to different procurement laws (see e.g., Decarolis and Giorgiantonio 2015). Therefore, while in their analysis the institutional variables are likely to capture potential differences in regulation, our setting allows us to disentangle the structural effects from the regulatory component.⁶

Guccio, Pignataro, and Rizzo (2014) focus on the time performance in the execution of public works by different levels of government in Italy. Even if our results cannot be directly compared with theirs, as they focus on the execution stage of procurement rather than award, they similarly find that local governments (and municipalities, in particular) are less efficient (i.e., incur higher delays with respect to the contracted project completion date) than the central government. However, they do not investigate the determinants of performance differentials.

Moreover, there are other papers that, albeit not focusing on the performance differentials across categories of purchasers, provide some marginal evidence on this issue. D'Alpaos et al. (2013), in a study about the opportunistic use of time overruns in public works, also find that municipalities, although awarding the largest

5. The empirical literature on determinants of procurement outcomes is broad, with different papers focusing on different aspects, including the role of auction criteria and formats (see e.g., Branzoli and Decarolis (2015); Bucciol, Chillemi, and Palazzi (2013); Decarolis (2014)), auction mechanism (see e.g., Bajari, McMillan, and Tadelis (2009)), publicity requirements (see e.g. Coviello and Mariniello (2014)), discretion (Coviello, Guglielmo, and Spagnolo (2018), Chong, Klien, and Saussier (2015)), firms' qualifications (see e.g., Moretti and Valbonesi (2015)). See Dimitri, Piga, and Spagnolo (2006) for a review.

6. The only other paper we are aware of that uses the TED data is Chong, Klien, and Saussier (2015), which focus on the impact of the quality of a country's institutions on procurement implementation and find that less transparent procedures are associated with lower levels of institutional quality across countries. In their analysis they regard inefficiency and corruption as exogenous, while we aim at investigating the determinants of performance differentials across institutional categories.

number of contracts, show higher cost-overruns than the average of the dataset; Decarolis (2014), investigating the impact of different auction formats on contract execution, shows that municipalities are typically associated with higher cost-overruns (with respect to provinces); Gucio, Pignataro, and Rizzo (2012) in a study about determinants of cost-overruns in public works, find that all institutional levels of purchasers tend to have lower adaptation costs than the central government, while the evidence about local governments is not significant.⁷

A few other related papers focus on the quality of public buyers from the side of competences and effectiveness of the bureaucracy.⁸

Best, Hjort, and Szakonyi (2017) focus on procurement of off-the-shelf goods acquired through electronic auctions in Russia and find that almost half of the price variation is due to the quality of procurement officials and organizations.⁹

Bucciol, Camboni Marchi Adani, and Valbonesi (2017) consider the procurement of standard medical devices in Italy, showing that the ability of the contracting authority, defined as the fixed effect on the difference between the price and the marginal cost of each item purchased, explains most of the price differential. The main determinants of ability are institutional characteristics and size. Interestingly, they find that hospitals, which have a more centralized procurement management and are more closely related to regional offices, have a better performance than local health authorities. While their results cannot be directly compared to ours, as the procurement context is very different, they also seem to suggest that procurement run at the regional level may be of better quality than at a more decentralized level.

Decarolis et al. (2018) consider the context of the U.S. federal procurement of works and services to study the impact of bureaucratic competence on ex post procurement outcomes,

finding that higher competence (in particular, higher cooperation vs. incentives and skills) is associated with significantly lower delays, cost overruns, and number of renegotiations.

The rest of the paper is organized as follows. In Section II, we characterize the Italian institutional background for public procurement, while in Section III we describe the data and the criteria to extract and prepare the sample of interest. In Section IV, we present the empirical model on the impact of the institutional type of the contracting authority on winning rebates and report estimation results (Section A). Next, we implement some robustness checks (Section B). In Section V, we discuss and test possible determinants of the rebate differentials: we first focus on the role of the administration of the procurement mechanism (Section A) and then on the competences and incentives channels (Section B). We conclude and discuss possible policy implications of our analysis in Section VI.

II. INSTITUTIONAL BACKGROUND

Italy is an interesting case study for analyzing variation in procurement performance across different degrees of procurement decentralization. All levels of government, plus a variety of other public institutions, are involved in the procurement of goods, services, and works. Furthermore, for the case of large tenders (i.e., tenders with a starting price higher than given thresholds), all categories of public buyers must follow EU procurement regulation as set by EU Directives 2004/17/EC (EC 2004a) and 2004/18/EC (EC 2004b).¹⁰ The main implication is that, as far as EU-relevant procurement is concerned, all public purchasers in Italy procure largely according to the same rules.¹¹ Hence, the differences in

7. However, this may be due to the fact that they put all levels of sub-central government (i.e., regions, provinces and municipalities) in the same category, which in our opinion is too loose of a classification scheme.

8. Other papers that look at the effect of broader institutional aspects on procurement outcomes are Coviello and Gagliarducci (2017), which identifies the effect of favoritism, and Coviello et al. (2018), which investigates the role of court efficiency.

9. They exploit a policy change (i.e., bid preferences for domestic suppliers) to casually estimate the impact of bureaucratic quality on price, showing that the policy implies larger savings where bureaucratic quality is lower.

10. These directives were transposed in Italian law by the Legislative Decree, April 12, 2006, n. 163, the so-called "Code of public contracts of works, supplies, and services." Information on thresholds is available at http://ec.europa.eu/growth/single-market/public-procurement/rules/current/index_en.htm. In 2014, new directives updated the regulation. These are Directive 2014/24/EU (EU 2014b), which repeals Directive 2004/18/EC, Directive 2014/25/EU (EU 2014c), which repeals Directive 2004/17/EC, and Directive 2014/23/EU (EU 2014a), which provides a new, separate regulation for concessions. In 2015 these directives were still in the process of being transposed into Member States legislation, so that the entire time-span of our analysis (2008–2015) falls under the old regulation.

11. In this case the Italian parliament must establish procurement rules according to the principles of the relevant EU legislation and subcentral governments have limited power to implement changes to the national legislation (see e.g., Decarolis and Giorgantonio (2015)).

performance are not attributable to differences in the rules, but rather to specific characteristics of different categories of public purchasers.

The EU regulation includes provisions, among other things, about (a) the public subjects allowed to act as contracting authorities; (b) the award procedures; and (c) the award criteria.

Regarding the subjects allowed to act as contracting authorities, it is provided that such subjects are: *central governments, local governments (i.e., regions, provinces, municipalities, mountain village councils), public institutions with noneconomic purpose, bodies of public law, publicly financed enterprises that real-ize works or produce goods or services that are not destined to free competition markets, concessionaires, and other private subjects* in some limited circumstances.

As for the award procedures, three main options are identified: *open procedure, restricted procedure, and negotiated procedure*, the latter having two suboptions that is, *negotiated with call for competition* and *negotiated without call for competition*.¹² Each procedure allows a varying degree of control over the award mechanism and of interaction with tenderers. In the open procedure, all interested suppliers can submit a tender. In the restricted procedure, there is a shortlisting stage before the tender stage, which enables the contracting authority to verify in advance whether potential suppliers have the appropriate experience and resources to meet its needs. In the negotiated procedure, the contracting authority instead invites a restricted number of firms with whom it negotiates the terms of the contract before the awarding. According to EU regulation, while the open and the restricted procedures can be used without restrictions, the negotiated procedure with call for competition should only be used in limited circumstances, and the negotiated procedure without call for competition can be used only in very exceptional cases, namely when no admissible offer was received in an open or restricted procedure, when a supplier is the sole source of the good or service required, in cases of extreme urgency, or when the precise specification can only be determined by negotiation.

12. Note that there is a fourth option, which is very rarely used, called *competitive dialogue*, which was introduced for addressing particularly complex procurement contracting situations, where the contracting authority needs to “dialogue” with potential suppliers before the award phase.

As for the award criteria, the regulation states that contracts are either awarded via the *lowest price* criterion or the criterion of the *most economically advantageous tender* (aka MET or MEAT), where some other criteria are considered beside price for the award of the tender (e.g., quality, environmental characteristics, etc.).¹³ In the former case, participants simply bid the price at which they are willing to implement the contract, in the form of a percentage reduction, so called “rebate,” with respect to the reserve price (i.e., the auction’s starting price as announced by the contracting authority). The winner is the participant offering the highest rebate. In the latter, participants submit a complex bid composed of an economic part, based on the offered rebate, and a technical part, detailing how the contract will be implemented with respect to the other (nonprice) criteria. The contracting authority sets a scoring rule (i.e., weights given to different components) and the contract is awarded to the participant who has the highest score. Therefore, in this case the highest rebate is not necessarily the winning rebate.¹⁴

III. DATA

The data we use are part of a unique dataset based on mandatory contract award notices published online on Tenders Electronic Daily (TED), which is the official online version of the Supplement of the Official Journal of the European Union.¹⁵ Contracting authorities in all EU Member States are obliged to publish contract notices (i.e., calls for tenders) and award notices online in TED for all contracts with a reserve price exceeding the EU public procurement thresholds.

The TED data contain the universe of EU-relevant public contracts on works, supplies, and services awarded in EU Member States

13. In the language of auction theory, the first case corresponds to a (reversed) first-price sealed-bid auction, while the latter to a scoring auction (see e.g., Klemperer (2004)).

14. As a matter of fact, this can also happen under the criterion of the lowest price, due to a complex mechanism called “average bid auction,” implemented to prevent firms from overbidding (i.e., to offer too high a rebate that would later jeopardize contract implementation): the bids that, after a preliminary trimming of the top/bottom 10% of the collected bids, exceed the average by more than the average deviation, are inspected and may be excluded, in which case the winning bid is the highest among the remaining bids. However, there is some evidence that average bidding tends to lowest price (first price) auction (see e.g., Galavotti, Moretti, and Valbonesi (2018)).

15. ©European Union 1998–2015, <http://ted.europa.eu>

between 2008 and 2015. The observation unit is the single contract award. For each observation the dataset includes the following information: name, address, and institutional category of the contracting authority; name and address of the winning firm; object of the contract according to the common procurement vocabulary (CPV) coding¹⁶; type of contract (supply vs. service vs. work); initial value of the contract (i.e., reserve price); final price of the contract (i.e., the price at which the contract is awarded); date of award of the contract; award criterion; award procedure; number of offers received; number of lots if the contract was divided in lots; whether an electronic auction was used; whether the tender was covered by the Government Procurement Agreement or related to EU-funded projects; and whether the contracting authority was operating on behalf of some other entity.

We focus on public works contracts awarded in Italy between 2008 and 2015. Based on available information, our measure of procurement performance is the winning rebate, defined as the percentage discount of the final price over the reserve price. More formally,
$$\text{rebate} = \frac{\text{reserve price} - \text{final price}}{\text{reserve price}} \times 100.$$
 The winning rebate is a standard measure of ex ante performance in procurement, indicating the extent to which the functioning of the award process, as administered by the contracting authority, allows the latter to achieve a discount with respect to the maximum price it would have been willing to pay (see e.g., Coviello and Gagliarducci (2017); Coviello and Mariniello (2014); Decarolis and Giorgiantonio (2015); Decarolis (2014)).

We restrict the analysis to works contracts (around 4% of awarded contracts – services contracts accounted for around 34% and supplies for around 42%), as the winning rebate is very likely to be endogenous in the case of supplies and services. This is because the reserve price is determined by an employee in the contracting authority who can overestimate or underestimate the value of the contract. Therefore, a high (low)

winning rebate may not indicate a good (bad) performance of the procurement process. This potential endogeneity problem is likely to be weaker in the case of works contracts (relative to services and supplies contracts) as for works there are reference prices based on menu costs (e.g., cost of asphalt per meter) (see e.g., Decarolis (2014); Galavotti, Moretti, and Valbonesi (2018)).

Another reason to limit the analysis to works contracts is related to the fact that when the tenders are awarded under the MEAT criterion, the rebate is only one part of the bid. In the case of works, where quality is more standard, the price component of the bid approximates quite well a bid only based on price, while in the case of services and supplies the firms can give strategically more or less weight to the price component depending on how sophisticated they anticipate the contracting authority will be in evaluating quality ex post.

The original sample, defined as including the TED data on public works contracts awarded in Italy, is a multiyear cross section comprising 5,026 contracts awarded from 2008 to 2015.

From the original sample, we extract the sample of interest according to the following criteria. First, as our measure of procurement performance is the winning rebate in each contract award, we only keep observations for which neither the reserve price nor the final price are missing.¹⁷ For the same reason, we exclude cases where it is not possible to clearly define the winning rebate, namely multi-lot contracts (where the contract is divided in parts [i.e., lots] that are awarded separately).

Third, we drop cases of award notices of tenders below EU regulation thresholds, as these fall under a different regulation. Fourth, observations for which the main award characteristics are missing (number of offers, award procedure and criterion, type of contract, CPV codes, and year of award) are dropped.

Further, we implement the following steps to prepare the data. First, we change the institutional categorization of contracting authorities with respect to that provided in the TED data. The original classification was inadequate for our purposes insofar as it was not precise enough in terms of local authorities (e.g., regions, municipalities, and provinces were put in the same category, while they are very different

16. The object of contract is defined by an 8-digit CPV code. The first two digits of the code indicate the macro category of the product and the rest of the code provides an increasingly detailed description of it (e.g., 45,000,000 indicates the macro category “Construction works”, while 45,100,000 indicates “Site preparation work”, and 45,110,000 indicates “Building demolition and wrecking work and earthmoving work.” For more details on the CPV coding see http://ec.europa.eu/growth/single-market/public-procurement/rules/cpv/index_en.htm

17. There are many missings in the data, probably due to scarce attention in the compiling of the original award notice documents.

entities in Italy) and somehow redundant to other categories.¹⁸ Similar to that adopted in Guccio, Pignataro, and Rizzo (2014), our new categorization of contracting authorities for Italy is a meaningful and not cumbersome one according to the discussion in Section II. It consists of the following categories: *central government*, *region*, *province*, *municipality*, public institution—to be divided in *semi-autonomous institution* and *other institution*—*public enterprise* and *utility*.¹⁹ *Central government* includes ministries and parliament. *Municipality* includes municipalities, mountain councils, and unions of municipalities.²⁰ By *semi-autonomous institution*, we refer to those public bodies with relative budgetary and administrative autonomy, namely local health authorities, public hospitals, and universities.²¹ *Other institution* includes all other public bodies that are not included in *semi-autonomous institution*.²² *Utility* includes all publicly owned companies in charge of water, energy, transport, and telecommunications services (e.g., “Enel,” “Anas,” “Ferrovie dello Stato,” “Poste Italiane,” etc.). *Public enterprise* includes all other (mostly) publicly funded companies that are in charge of public services other than utilities (e.g., waste collection).

Second, we reduce the original TED classification of award procedures to a more synthetic

but comprehensive one: open, restricted, negotiated, and no call (the latter referring to those cases where a contract was awarded without a prior call for competition).²³

Third, from initial CPV codes we create 45 macro product categories. We restrict the analysis to sectors in which all institutional categories of contracting authority have at least five awards. Last, since in the original data there is only information on the town of the contracting authority and the winning firm, we use postal codes to create further geographical variables, namely the province of the contracting authority and of the winning firm.

As a result of this cleaning and preparation procedure, our final sample comprises 840 observations of awards of public works contracts, across 8 industrial macro-sectors (as identified by the CPV codes), awarded between 2008 and 2015 in 167 Italian towns by contracting authorities belonging to different institutional classes.

A. Descriptive Statistics

Tables 1 and 2 summarize the descriptive statistics of our data. The average of winning rebate is 23.7%, with a standard deviation of 15.6%. The minimum rebate is 0% and the maximum 75.7%. Figure A1 in the Appendix A plots the empirical distribution of winning rebate.

Our regressor of interest is the institutional category of the contracting authority (*CA type*). In our sample, the majority of contracts (31%) were awarded by public institutions (8% by semi-autonomous institutions, and 23% by other institutions), followed by utilities (25%), public enterprises (17%), municipalities (12%), provinces (7%), regions (7%), and the central government (3%). A similar ranking holds in terms of total value of awarded contracts.²⁴ The average value of the awarded contracts (*reserve price*) is about 14.5 million euros. Public enterprises, institutions, and utilities awarded the largest contracts, followed by regions and central government. Provinces and municipalities

18. The original TED classification had 12 categories: *central government*, *armed forces*, *local authorities*, *water*, *energy*, *transport and telecommunications sectors*, *European Union institution/agency*, *other international organization*, *body governed by public law*, *other*, *not applicable*, *National or federal Agency/Office*, *Regional or local Agency/Office*, *not specified*. We drop from the analysis contracts awarded by European bodies and those for which the contracting authority was neither specified nor possible to identify through keyword searches.

19. The category relative to private concessionaires (e.g., those in charge of building and managing highways) that must follow EU regulations when acting as contracting authorities was dropped from the analysis because of too few observations.

20. Small municipalities (i.e., municipalities with less than 5,000 inhabitants according to the definition in the Italian law (L. n. 158/2017)) are largely under-represented in the TED data (and in our sample as well), due to the fact that EU regulations only apply to contracts above relatively large threshold values, which are rarely awarded by small municipalities. Thus, our analysis is likely to reflect medium-large municipalities, rather than small ones (which would be more representative of the Italian local context).

21. We borrow this definition from Bandiera, Prat, and Valletti (2009).

22. In our sample these include, among the others: institutions for public residential housing, Chambers of Commerce, nursing homes, research institutes, sport federations, the National Institute for the Workers Insurance (Inail), the National Institute for Social Security (Inps), the National Statistical Institute (Istat), and the Bank of Italy.

23. The original TED classification had nine categories: *accelerated negotiated procedure*, *accelerated restricted procedure*, *award of contract without prior publication of a contract notice*, *competitive dialogue*, *negotiated procedure*, *negotiated without a call for competition*, *open procedure*, and *restricted procedure*.

24. As shown in Table 2, 33% of the value was awarded by institutions (respectively 7% by semi-autonomous institutions and 26% by other institutions), followed by utilities (27%), public enterprises (20%), municipalities (7%), regions (6%), provinces (5%), and the central government (2%).

TABLE 1
Summary Statistics, Works Contracts

Variable	Mean	Std. Dev.	Min.	Max.	N
Dep. variable					
Win. rebate (%)	23.67	15.62	0	75.68	840
CA type					
Central government	0.03	0.16	0	1	840
Region	0.07	0.25	0	1	840
Province	0.07	0.26	0	1	840
Municipality	0.12	0.32	0	1	840
Public institution					
Semi-auto. institution	0.08	0.26	0	1	840
Other institution	0.23	0.42	0	1	840
Public enterprise	0.17	0.37	0	1	840
Utility	0.25	0.43	0	1	840
Auction characteristics					
Offers number	13.71	12.83	1	78	840
Reserve price	1,452.46	1,245.65	480.65	7,115.2	840
Award procedure:					
Open	0.70	0.46	0	1	840
Restricted	0.22	0.42	0	1	840
Negotiated	0.03	0.17	0	1	840
Negotiated without call	0.05	0.22	0	1	840
Award criterion					
MEAT	0.49	0.5	0	1	840
Lowest price	0.51	0.5	0	1	840
Price weight	67.3	34.2	5	100	840
Local win	0.26	0.44	0	1	840

Notes: Reserve price is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables, see Appendix A.

Source: Our elaboration on TED data.

awarded the smallest contracts. From these figures, it is clear that works procurement is largely decentralized in Italy, with public institutions, enterprises, and local levels of government playing a central role.

The average number of bidders participating in the auctions (*offers number*) is 13.7.²⁵ Competition is rather low: 12.3% of the auctions received only 1 offer, around 30% of the auctions 4 offers or fewer, while 50% of the auctions 10 offers or fewer. In 26% of the cases, the winning firm is located in the same province as the contracting authority (*local win*).

As for the award procedures, 70% of the tenders were awarded via the open procedure, while the restricted procedure was used in 22% of the cases. The negotiated procedure was used in 8% of the cases, the majority of which were without a prior call for competition. The latter figure shows an abnormally high usage of the negotiated procedure, which according to the regulatory prescription, should be used only in very specific cases. In particular, the negotiated procedure without a call for competition (which was used in

5% of the awards) is frequently used despite the legal requirement that it should only be used in exceptional cases (typically, emergencies). Half of the contracts were awarded with the lowest price criterion and half with the MEAT criterion.

As for the object of the contracts, the great majority of tenders concerned construction works (96.5%). Awards were uniformly distributed over the years and geographically.

IV. EMPIRICAL ANALYSIS

We are interested in estimating the relationship between the institutional class of the contracting authority and the winning rebate, used as a measure of *award-stage* procurement performance. Table A1 in the Appendix A presents the summary statistics of rebate by institutional type and shows some preliminary evidence about the relation of interest. Average winning rebate is lowest for utilities and highest for central government. Municipalities display lower rebates than all other governmental levels. Public enterprises and semi-autonomous institutions also show lower rebates than other categories. This ranking is confirmed by Figures A2 and A3.

This preliminary evidence seems to suggest that some decentralized units have a relatively lower procurement performance, relative to more central ones. Next, we perform a regression analysis to estimate the effect of the institutional class of the contracting authority on the winning rebate, while controlling for other important factors that may influence the latter.

We estimate different versions of the following specification:

$$(1) \quad \text{rebate}_{irts} = \alpha + CA' \beta + X'_i \delta + \gamma_r + \eta_s + \theta_t + \varepsilon_{irts},$$

where rebate_{irts} is the winning rebate in tender i , awarded in town r and in year t , with contract object relative to industrial sector s . CA is a vector of eight dummies, one for each institutional class of contracting authority. In all specifications the omitted category for the institutional class is *utility*. β is the vector of coefficients of interest. X_i is a vector of characteristics of the tender i , γ_r are town fixed effects, η_s are sector fixed effects, θ_t are year fixed effects, ε_{irts} is the usual white noise component.

Vector X_i of auction controls includes the following variables: the reserve price (*reserve price*), which accounts for heterogeneity between purchases, to control for the fact that firms can

25. We exclude outliers with none or more than 100 bidders.

TABLE 2
Reserve Price by CA Type, Works Contracts

CA type	N	Sum	Mean	SD	p50	Min	Max
Central gov.	23	28,210.08	1,226.53	993.98	791.81	483.63	4,047.24
Region	55	68,387.64	1,243.41	1,077.87	775.45	485.42	6,543.31
Province	62	65,507.33	1,056.57	740.01	756.64	480.65	3,830.97
Municipality	99	85,994.72	868.63	482.18	710.44	491.31	3,646.45
Semi-auto. institution	63	87,572.92	1,390.05	1,275.03	915.04	493.04	6,049.66
Other institution	193	313,300.88	1,623.32	1,416.16	1,009.7	484.43	6,683.56
Public enterprise	139	240,080.28	1,727.20	1,378.97	1,314.99	491.34	7,115.2
Utility	206	331,012.05	1,606.85	1,296.50	1,112.97	483.83	6,630.21
Total	840	1,220,065.9	1,452.46	1,245.65	945.92	480.65	7,115.2

Notes: Values are expressed in 10,000 euros and 2010 equivalents.

Source: Our elaboration on TED data.

offer higher rebates on larger contracts because of economies of scale; the number of offers (*offers number*), which measures the degree of competition in the auction and is expected to have a positive impact on the winning rebate; the award procedure (four dummies: *open* [omitted category], *restricted*, *negotiated*, *nocall*), to account for the fact that less open procedures will reduce the number of bidders, thus negatively impacting the rebate; the award criterion, to account for the fact that basing the award decision solely on the price increases the rebate relative to the case where quality is also taken into account, and the more so the larger is the weight given to the price component relative to the quality one (we include alternatively one dummy indicating whether the contract was awarded with the lowest price criterion (*lowest*) and one variable indicating the weight given to the price component of the bid (*price weight*)); and a dummy to control whether the winner was in the same province as the contracting authority or not (*local win*). The expected impact of this variable on rebate is ex ante unclear. On the one hand, local firms may reflect their lower transportation and logistics costs in their bid, which would make a local win impact positively on rebate. On the other hand, local firms could win even if they are not the most competitive supplier because the CA may prefer local firms even if they are not the best available suppliers, which could negatively affect rebates.

Town fixed effects, that is, a set of dummies for Italian towns, capture unobservable local characteristics that are constant (or slowly changing) over time. These include the levels of social capital, corruption, accountability, and other long-term institutional characteristics that can affect procurement performance and, thus,

rebate. Further, in the absence of data on annual expenditure of CAs, town fixed effects allow to control for size effects, which may be important, since larger towns may have more potential competitors in auctions, and larger CAs, which may systematically award larger contracts.²⁶ Sector fixed effects, that is, a set of dummies for all the macro industrial sectors, control for sector or market specific time-invariant characteristics. Year fixed effects, that is, a set of indicators for the year of award (2008–2015), control for possible time effects.

These cross-sectional (at the region and at the sector level) and over-time variations lie at the heart of identification of the relationship of interest, which is the impact of the institutional category of the contracting authority on the winning rebate. We estimate model (1) using ordinary least squares (OLS) and clustering the standard errors at sector level.

A. Empirical Evidence

Table 3 reports the results from estimating four different specifications of Equation (1). Column 1 includes only the regressors of interest, that is, the set of dummies for the institutional class of the contracting authority and town, year, and sector fixed effects. Column 2 also includes auction controls. Column 3 further includes the interaction term between institutional category of

26. Given the limited sample size, there is a trade-off in our analysis between accurateness in capturing local factors and risk of saturating the model, which would raise concerns for the goodness of fit of the model and reliability of estimates. This is why in Section B we run a robustness check where we substitute town with province fixed effect and show that estimates remain qualitatively the same, suggesting that saturating the model with town fixed effects does not seem to create a major issue for our analysis.

TABLE 3
Winning Rebate over CA Type, Works Contracts (OLS)

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)
CA type				
Central gov.	15.067*** (0.255)	1.436** (0.579)	5.552*** (1.075)	6.187*** (1.142)
Region	16.501*** (0.135)	6.110*** (0.315)	12.431*** (0.852)	13.232*** (0.890)
Province	12.936*** (0.533)	4.205*** (0.532)	15.100*** (0.288)	15.786*** (0.365)
Municipality	11.529*** (0.354)	3.241*** (0.352)	-1.975*** (0.532)	-1.164* (0.576)
Semi-auto. institution	7.983*** (0.292)	0.157 (0.581)	4.760** (0.831)	5.271*** (0.836)
Other institution	11.507*** (0.239)	5.462*** (0.301)	11.607*** (0.722)	12.035*** (0.765)
Public enterprise	9.139*** (0.124)	5.218*** (0.335)	6.060*** (0.836)	6.167*** (0.865)
Auction controls				
Reserve price		0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)
Offers number		0.523*** (0.010)	0.440*** (0.019)	0.430*** (0.020)
Lowest price		3.807*** (0.363)	3.785*** (0.689)	
Price weight				0.069*** (0.011)
Negotiated		-4.460*** (0.978)	-6.469*** (0.936)	-6.481*** (0.949)
Nocall		-15.745*** (0.736)	-15.396*** (0.740)	-15.635*** (0.739)
Restricted		-5.992*** (0.073)	-5.676*** (0.064)	-5.777*** (0.059)
Local win		-0.500*** (0.137)	-0.971*** (0.075)	-0.816*** (0.092)
Town FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
CA type × town FE	No	No	Yes	Yes
Lincom tests				
Central gov. – Municipality	3.538*** (0.381)	-1.805*** (0.407)	7.526*** (0.545)	7.351*** (0.567)
Region – Municipality	4.972*** (0.424)	2.869*** (0.257)	14.406*** (0.341)	14.396*** (0.336)
Province – Municipality	1.407 (0.762)	0.964 (0.786)	17.074*** (0.259)	16.951*** (0.224)
Other inst. – Semi-auto. Inst.	3.524*** (0.304)	5.305*** (0.308)	6.847*** (0.345)	6.764*** (0.329)
Adjusted R^2	0.245	0.498	0.529	0.533
Observations	840	840	840	840

Notes: Standard errors robust to clustering at the sector level are in parentheses. The omitted category for the CA type is *utility*. The omitted category for award procedure is *open*. Reserve price is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$.

Source: Our elaboration on TED data.

the contracting authority and town fixed effects, which allows the impact on rebate of local unobservables, such as quality and accountability of local institutions, to differ depending on the type of purchaser. Column 4 replaces the dummy variable on lowest price criterion with a variable measuring the relative weight given to the price component of the bid in the award decision. The latter is a more precise way of capturing the impact of the two different award criteria (lowest price vs. MEAT) on the winning rebate.²⁷ For all four specifications the estimation results of a selection of *Lincom* tests on the significance of differences between institutional coefficients are reported.²⁸

Results in the baseline specification (1) suggest that utilities are by far the least efficient category and that municipalities perform worse than more central levels of government. According to this preliminary evidence, other decentralized buying units, such as semi-autonomous institutions and public enterprises, also seem to be comparable to, or worse than, municipalities in terms of performance.

Taking into account auction characteristics as well as the interaction between institutional categories and geographical effects quantitatively and qualitatively changes the baseline estimates, indicating that not including them in the analysis would cause omitted variable bias. Estimates in specification (3) and (4) confirm that municipalities are worse than more central governmental purchasers.²⁹ The best governmental categories are regions and provinces, as confirmed by

the tests in Table A2 in the Appendix A. Additionally, public institutions seem to be efficient in administering procurement of works, even though having more budget autonomy, contrary to expectations, does not seem to induce higher performance, but rather sensibly worsen it. Utilities are strongly confirmed to be the worse non-governmental category. This is important because a large share of contracts (25% in our data) is awarded by utilities.

The controls included in columns 2–4 have the expected significance and sign. Using a restricted or a negotiated procedure rather than an open procedure, has a strong and negative impact on average winning rebate. Clearly, using the lowest price as the award criterion increases rebate relative to the case where quality is also taken into account (column 3), and the more so the larger is the weight given to the price component (column 4).

The coefficient of *reserve price* is significantly not different from zero, possibly due to the fact that size effects may be already captured by geographical fixed effects.³⁰ In addition, the coefficient of *offers number*, albeit with the expected sign and significance, seems to have a weak effect (one more bidder in the tender induces an increase in average winning rebate of less than 1%), probably because the effect is already captured by the award procedure. The fact that the contract was awarded to a firm in the same province of the contracting authority (*local win*) negatively affects the rebate, suggesting that local winners do not reflect their competitive advantage in terms of lower transportation costs in their offers. Interestingly, when restricting the analysis to contracts awarded with the lowest price criterion (see e.g., columns 2 and 4 of Table 4), the sign of the coefficient changes from negative to positive. This might be interpreted as some evidence of favoritism toward local providers, in the sense that contracting authorities might actually adopt the MEAT criterion to discretionally include quality requirements that restrict competition and favor a specific local bidder—a reason why the latter do not reflect their expected competitive advantage in the bid, but only in the case where the MEAT criterion is used.

27. We are thankful to an anonymous referee for suggesting this alternative modelization. For the MEAT awards for which the detail on relative weight is missing, we use the average of price weight to keep sample size. However, it might be argued that winning rebate is an imprecise measure of performance when criteria other than the price are also considered for the award of the contract, as rebate is the result of different choices under different award criteria. For this reason, in Section B, we run a robustness check where we exclude the contracts awarded with the MEAT criterion.

28. The full set of *Lincom* tests on institutional coefficients estimated in Table 3 is reported in Table A2 in the Appendix.

29. This result is robust to replacing the class *municipality* with two alternative subcategorizations, the former distinguishing large municipalities (defined as municipalities with more than 100,000 inhabitants) from other municipalities, and the latter distinguishing between municipalities that are also a “Capoluogo di Regione” (Regional Capital Town) and municipalities that are not. Results (available upon request) show that large municipalities do not seem to have a comparative advantage relative to small municipalities and that municipalities that are Capoluogo do not perform better than municipalities that are not, while performing significantly worse than regions. Overall, this evidence suggests that the lower performance of municipalities relative to less decentralized levels of government is not (only) due to size.

30. Size effects could also be captured by institutional categories, if different categories of contracting authorities award systematically contracts of different values and different classes of firms select themselves on the categories of buyers. We run a robustness check in Section B to exclude this possibility.

TABLE 4
Winning Rebate over CA Type, Works Contracts (OLS): Robustness to Potential Endogeneity

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)
CA type				
Central gov.	6.187*** (1.142)	19.032*** (0.420)	7.034*** (1.315)	19.660*** (0.449)
Region	13.232*** (0.890)	15.236*** (0.380)	14.328*** (1.012)	15.333*** (0.460)
Province	15.786*** (0.365)	2.203*** (0.471)	17.045*** (0.382)	2.354** (0.528)
Municipality	-1.164* (0.576)	-3.961*** (0.251)	0.574 (0.701)	-3.249*** (0.241)
Semi-auto. institution	5.271*** (0.836)	19.381*** (0.249)	6.068*** (0.942)	20.366*** (0.240)
Other institution	12.035*** (0.765)	14.437*** (0.170)	11.600*** (0.845)	13.682*** (0.134)
Public enterprise	6.167*** (0.865)	5.356*** (0.536)	7.050*** (1.006)	5.498*** (0.558)
Auction controls				
Reserve price	0.000*** (0.000)	-0.001*** (0.000)	-0.000 (0.000)	-0.001*** (0.000)
Offers number	0.430*** (0.020)	0.238*** (0.019)	0.402*** (0.023)	0.216*** (0.019)
Price weight	0.069*** (0.011)		0.086*** (0.013)	
Negotiated	-6.481*** (0.949)	-14.539*** (0.590)	-7.442*** (0.934)	-14.928*** (0.683)
Nocall	-15.635*** (0.739)	-18.498*** (0.849)	-16.514*** (0.736)	-19.035*** (0.884)
Restricted	-5.777*** (0.059)	-10.147*** (0.454)	-5.797*** (0.083)	-10.422*** (0.548)
Local win	-0.816*** (0.092)	2.590*** (0.223)	-0.705*** (0.130)	2.642*** (0.289)
Town FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
CA type × town FE	Yes	Yes	Yes	Yes
Lincom tests				
Central gov. – Municipality	7.351*** (0.567)	22.993*** (0.652)	6.460*** (0.617)	22.909*** (0.655)
Region – Municipality	14.396*** (0.336)	19.197*** (0.353)	13.754*** (0.344)	18.581*** (0.450)
Province – Municipality	16.951*** (0.224)	6.164*** (0.605)	16.471*** (0.330)	5.603*** (0.625)
Other inst. – Semi-auto. inst.	6.764*** (0.329)	-4.944*** (0.143)	5.532*** (0.428)	-6.684*** (0.184)
Adjusted R^2	0.533	0.685	0.538	0.680
Observations	840	431	794	409

Notes: Standard errors robust to clustering at the sector level are in parentheses. Column 1 reports the estimates of the model in column 4 of Table 3. Columns 2 and 4 exclude contracts awarded with the MEAT criterion. Columns 3 and 4 exclude contracts with a reserve value larger than 40 million euros. The omitted category for the CA type is *utility*. The omitted category for award procedure is *open*. *Reserve price* is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$.

Source: Our elaboration on TED data.

Therefore, even if results in Table 3 cannot be automatically given a causal interpretation and under the reservation that winning rebates only provide a partial picture of the quality of procurement administration, there seems to be a systematic statistically significant evidence that there is a general performance mismatch in the Italian system of public procurement, in the sense that the institutional categories that are responsible for among the largest procurement volumes in Italy (i.e., municipalities and utilities), are also the least efficient in procuring. This is in line with the findings of some of the related literature (see e.g., Guccio, Pignataro, and Rizzo (2014); Decarolis (2014)).

Moreover, the estimates seem to report that significant differentials remain in the efficiency between institutional categories, even after controlling for other important determinants of rebate, such as the auction characteristics, geographical factors, and social factors. This suggests that there are other structural factors differing between CA types that impact procurement performance, as measured by the winning rebate. In Section V we shed light on these determinants. Before that, in Section B, we highlight some issues that might affect our analysis and results, and run a number of robustness checks.

B. Robustness Checks

As already noted, an issue that could affect our analysis is that winning rebate as a performance measure could be prone to endogeneity when the contract is awarded with the MEAT criterion (i.e., quality is also taken into account for the award). In this case bidders can give more or less weight to the price component depending on how sophisticated they anticipate the authority will be in evaluating quality *ex post*. In particular, they might weight the price relatively more if they anticipate that the buyer will not be able to check quality *ex post*. We argue that in the case of works, this problem should not be that severe because quality is rather standard, and, therefore, the price component in a bid based on both price and quality is a rather good proxy of a bid based only on price. Furthermore, we have partially controlled for the potential issue by including in the main regression a variable that takes into account the relative weight given to price in the award decision. However, some concerns may still remain.

Therefore, as a first robustness check, we run the same regression as column 4 in the main

analysis (whose result are reported in column 1 of Table 4 for ease of comparison) but restrict to the subsample of contracts awarded with the lowest-price criterion. Results, reported in column 2 of Table 4, show that most of the institutional coefficients are qualitatively the same and quantitatively larger, suggesting that institutional effects are clearer and higher when the performance measure is cleaner. The predictive power of the model also improves. A result emerging from this new estimation is that public institutions with a semi-autonomous management are efficient in procurement, and, in particular, more efficient than other institutions.³¹ This is in line with the expectation that a higher reliance on own budget increases the pressure for a contracting authority to administer procurement efficiently, as in the existing literature (see Bandiera, Prat, and Valletti (2009); Guccio, Pignataro, and Rizzo (2014)).

Another issue that might affect our results is that different categories of bidders could select themselves into tenders held by different institutional categories. For example, if larger bidders offer larger rebates because they can exploit economies of scale (for a given contract value) and some institutional categories attract systematically larger bidders than others, we would see higher winning rebates not because of the institutional effect but because of a size effect. For example, municipalities could display lower rebates than government only because they attract smaller firms. In fact, as mentioned and shown in Table 2, some CA types, especially municipalities, award smaller contracts, on average, than other categories. Thus, there is some evidence of stochastic dominance of municipalities on the size of the contract. While this problem could be easily solved by including some indicator of the firm size or firm fixed effect, neither of these solutions is viable in our case.

Therefore, as a second robustness check, we estimate the model of interest (in the specification of column 4 of Table 3) restricting to contracts whose value is not larger than the largest contract awarded by municipalities in the sample. This way we consider more homogeneous awards (similar checks are implemented by Bucciol, Chillemi, and Palazzi (2013); Decarolis (2014); Guccio, Pignataro, and Rizzo (2014)). The results of this check are reported in columns 3 and 4 of

31. The full sets of *Lincom* tests on the differences between institutional coefficients estimated in Tables 4 and 5 are available upon request.

Table 4, which consider the full sample and only contracts awarded with the lowest price criterion, respectively. Coefficients of the institutional regressors are robust, showing that size effects are not a concern in our analysis.³²

As a further robustness check, we replace the town dummies with the province dummies as alternative geographical fixed effects, in order to see whether, and to which extent, saturation of the model represents an issue for our estimates. Results, reported in columns 1 and 2 of Table 5 show that the coefficients of interest largely remain qualitatively the same, suggesting that a narrower definition of geographical fixed effects, while allowing for a more precise and informative control of local aspects, would not severely jeopardize the robustness of the analysis, at least as far as the relative performance of institutional classes is concerned.

As an additional check, we change the clustering of errors from the sector to the town level. Results, reported in columns 3 and 4 of Table 5, show that estimates are generally robust, but more in the specification where only contracts awarded with the lowest price criterion are considered (column 4).

Finally, we check whether allowing the impact on rebate of the administration of the procurement process—in terms of choice of award procedure and criterion—to vary across different institutional categories has a major impact on main results. For this purpose, in column 5 of Table 5, we include the interaction terms between

institutional categories and procedure dummies and criterion dummy, respectively, while in column 6 we only include the first set of interaction terms. Regressors of interest are largely qualitatively robust but more in the specification with lowest-price awards only. This confirms that in that case our model of interest fits better the data, and estimates are cleaner and more robust.

V. DETERMINANTS OF REBATE DIFFERENTIALS

In previous sections, we presented evidence that some decentralized categories of contracting authorities, in particular municipalities and utilities, achieve lower winning rebates, on average, than other categories when awarding contracts for public works. These differentials remain even after controlling for other important determinants of rebate, such as the auction characteristics as well as geographical, economic, and social factors, suggesting that there are other characteristics differing between institutional categories of buyers that impact the performance of procurement.

The aim of this section is to investigate such mechanisms. We first consider the auction implementation channel, namely whether categories that achieve lower rebates are systematically choosing procedures that restrict competition and/or adopting criteria other than the lowest price to award contracts, which, *ceteris paribus*, would each result in lower rebates. Second, we consider whether rebate differentials can be explained by structural characteristics related to the set of competences and incentive frameworks that vary between different institutional categories.

A. The Choice of Award Procedure and Criteria

Tables 6 and 7 report the relative adoption of, respectively, different award procedures and different award criteria by institutional type of contracting authority. It is possible to see that all governmental authorities award a large majority of contracts via open procedures (more than 90% for each level), using restricted procedures in the remaining cases.³³

Nongovernmental authorities generally show more variety in the use of award procedures, with public institutions (especially those without

32. Another issue that might emerge in our setting, is that both the award criterion and the award procedure could be endogenous, in the sense that given categories of contracting authorities might systematically choose a given award criterion or procedure (or combination of the two) under specific circumstances. This could make the estimates of our regressors of interest inconsistent. This issue should be relatively weak in our context, as EU legislation does not prescribe different mechanisms for different types of buyers or sizes of contracts, differently from national regulation (see e.g., Bucciol, Camboni Marchi Adani, and Valbonesi (2017)). However, it could still be the case that given mechanisms are used in given circumstances. In order to exclude that this represents a major concern in our analysis, we follow an approach similar to Bucciol, Chillemi, and Palazzi (2013) and we run a Heckman selection model (estimated with a two-step procedure), focusing on one dimension of the process (the award procedure) conditional on the other (the award criterion). In particular, we treat the award criterion (lowest criterion vs. MEAT) as endogenous and we assume the award procedure to be exogenous for a given award criterion. We prefer this conditioning rather than the alternative one (endogenous award procedure and exogenous award criterion) as censoring on four procedures would limit subsample size substantially. We find that the lambda coefficient of sample selection is not significantly different from 0, suggesting that endogeneity is not a major concern. Estimation results are available upon request.

33. In the observed period, provinces use once the negotiated procedure and once the negotiated without call procedure.

TABLE 5
Winning Rebate over CA Type, Works Contracts (OLS): Other Robustness Checks

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)	(5) Win. Rebate (%)	(6) Win. Rebate (%)
CA type						
Central gov.	5.878*** (1.044)	18.556*** (0.380)	6.187 (5.387)	19.032*** (5.907)	-4.869*** (1.330)	18.005*** (0.374)
Region	13.946*** (0.729)	15.412*** (0.356)	13.232*** (3.828)	15.236*** (1.421)	6.006*** (1.001)	9.967*** (0.782)
Province	3.077** (1.006)	4.930*** (0.345)	15.786*** (1.880)	2.203 (1.398)	4.053*** (0.675)	-1.494** (0.474)
Municipality	0.279 (0.456)	7.083*** (0.358)	-1.164 (2.588)	-3.961** (1.883)	-13.139*** (0.480)	-4.539*** (0.387)
Semi-auto. institution	5.872*** (0.699)	20.243*** (0.182)	5.271 (3.656)	19.381*** (5.336)	-2.606** (0.971)	16.599*** (0.101)
Other institution	11.605*** (0.715)	13.994*** (0.169)	12.035*** (3.256)	14.437*** (2.259)	1.943** (0.706)	8.094*** (0.281)
Public enterprise	5.729*** (0.827)	4.670*** (0.468)	6.167*** (1.129)	5.356*** (1.102)	0.212 (1.960)	1.556** (0.537)
Auction controls						
Reserve price	0.000*** (0.000)	-0.001*** (0.000)	0.000 (0.000)	-0.001* (0.000)	-0.000 (0.000)	-0.001*** (0.000)
Offers number	0.452*** (0.020)	0.242*** (0.017)	0.430** (0.191)	0.238 (0.174)	0.341*** (0.022)	0.205*** (0.023)
Price weight	0.083*** (0.010)		0.069 (0.048)			
Lowest price					0.833 (1.118)	
Negotiated	-6.068*** (0.913)	-15.332*** (0.580)	-6.481 (5.509)	-14.539** (6.189)	-13.273*** (0.399)	-16.158*** (0.755)
Nocall	-15.737*** (0.771)	-18.823*** (0.837)	-15.635*** (1.594)	-18.498*** (1.581)	-19.061*** (0.841)	-20.310*** (1.271)
Restricted	-5.400*** (0.061)	-9.866*** (0.409)	-5.777*** (0.651)	-10.147*** (0.998)	-15.867*** (0.454)	-16.534*** (0.939)
Local win	-1.322*** (0.216)	1.966*** (0.203)	-0.816 (1.931)	2.590 (2.145)	-0.517*** (0.126)	2.662*** (0.244)
Town FE	No	No	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
CA type × town FE	No	No	Yes	Yes	Yes	Yes
CA type × province FE	Yes	Yes	No	No	No	No
CA type × procedure	No	No	No	No	Yes	Yes
CA type × lowest	No	No	No	No	Yes	No
Lincom tests						
Central gov. – Municipality	5.599*** (0.617)	11.473*** (0.234)	7.351* (3.857)	22.993*** (5.821)	8.270*** (0.883)	22.544*** (0.749)
Region – Municipality	13.667*** (0.336)	8.329*** (0.661)	14.396*** (2.162)	19.197*** (2.653)	19.145*** (0.526)	14.506*** (0.504)
Province – Municipality	2.799*** (0.608)	-2.153*** (0.245)	16.951*** (2.269)	6.164*** (1.906)	17.193*** (0.203)	3.046*** (0.485)
Other inst. – Semi-auto. inst.	5.732*** (0.273)	-6.249*** (0.109)	6.764*** (0.862)	-4.944 (3.219)	4.549*** (0.665)	-8.505*** (0.278)
Adjusted R ²	0.508	0.683	0.533	0.685	0.565	0.699
Observations	840	431	840	431	840	431

Notes: Standard errors robust to clustering at the sector level (columns 1–2 and 5–6) or at the town level (columns 3 and 4) are in parentheses. Columns 2, 4, and 6 exclude contracts awarded with the MEAT criterion. The omitted category for the CA type is *utility*. The omitted category for award procedure is *open*. *Reserve price* is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$.

Source: Our elaboration on TED data.

TABLE 6
Award Procedure (Number and %) by CA Type, Works Contracts

CA Type	Negotiated	Nocall	Open	Restricted	Total
Central gov.	0 (0%)	0 (0%)	22 (95.65%)	1 (4.35%)	23 (100%)
Region	0 (0%)	0 (0%)	52 (94.55%)	3 (5.45%)	55 (100%)
Province	1 (1.61%)	1 (1.61%)	57 (91.94%)	3 (4.84%)	62 (100%)
Municipality	0 (0%)	0 (0%)	92 (92.93%)	7 (7.07%)	99(100%)
Semi-auto. institution	0 (0%)	0 (0%)	57 (90.48%)	6 (9.52%)	63 (100%)
Other institution	1 (0.52%)	0 (0%)	135 (69.95%)	57 (29.53%)	193 (100%)
Public enterprise	2 (1.44%)	12 (8.63%)	76 (54.68%)	49 (35.25%)	139 (100%)
Utility	22 (10.68%)	30 (14.56%)	94 (45.63%)	60 (29.13%)	206 (100%)
Total	26 (3.10%)	43 (5.12%)	585 (69.64%)	186 (22.14%)	840 (100%)

Source: our elaboration on TED data.

TABLE 7
Award Criterion (Number and %) by CA Type,
Works Contracts

CA Type	Lowest Price	MEAT	Total
Central gov.	8 (34.78%)	15 (65.22%)	23 (100%)
Region	21 (38.18%)	34 (61.82%)	55 (100%)
Province	29 (46.77%)	33 (53.23%)	62 (100%)
Municipality	34 (34.34%)	65 (65.66%)	99(100%)
Semi-auto. institution	14 (22.22%)	49 (77.78%)	63 (100%)
Other institution	90 (46.63%)	103 (53.37%)	193 (100%)
Public enterprise	86 (61.87%)	53 (38.13%)	139 (100%)
Utility	149 (72.33%)	57 (27.67%)	206 (100%)
Total	431 (51.31%)	409 (48.69%)	840 (100%)

Source: Our elaboration on TED data.

budget autonomy), public enterprises, and utilities relying quite frequently on the restricted procedure. Importantly, both public enterprises and utilities use negotiated procedure and negotiated without call for not negligible percentages, despite the legal prescription that their use—especially of the latter—should be restricted to limited circumstances.

This preliminary evidence suggests that different categories of contracting authorities tend to adopt different award procedure choices. In some cases, this seems to play a role in explaining why some categories systematically achieve lower rebates than others. For example, the high reliance on procedures that substantially reduce competition seems to explain why utilities achieve the lowest rebates. However, procedure choices cannot explain why municipalities achieve lower rebates than other levels of government, especially regions, and why institutions, especially those without budget autonomy, achieve relatively high rebates despite a substantial use of the restricted procedure.

As for the adoption of award criteria, all governmental levels as well as institutions use MEAT relatively more often than the lowest price, while the reverse holds for utilities and public enterprises. The choice of the award criterion does not seem to have a relevant role in explaining why municipalities and provinces have lower rebates than more central levels of governments, or why utilities—the category that considers the least nonprice characteristics in the award—systematically perform worse than public enterprises and institutions.

Next, following Chong, Klien, and Saussier (2015), we run regressions to understand how the likelihood of choosing each of the award procedures and award criterion depends on the type of contracting authority, while controlling for other factors that could drive the choice of the procedure. We run different estimations of the following model:

$$(2) \quad \text{choice}_{irts} = \alpha + CA' \beta + \text{reserve}_i \mu + \gamma_r + \eta_s + \theta_t + \varepsilon_{irts},$$

where choice_{irts} is the choice of award procedure or criterion (depending on specifications) in tender i , awarded in town r and in year t , with contract object relative to industrial sector s . CA is the usual vector of institutional dummies and reserve_i is the reserve price of tender i . This is included in the regression to proxy for the complexity of the project, which could contribute to the choice of the procedure. For example, restricted and negotiated auctions could be preferred for more complex projects (see e.g., Bajari, McMillan, and Tadelis 2009). We use OLS and cluster the errors at the sector level.³⁴

34. We preferred OLS to either probit or logit regressions as the high number of fixed effects created convergence problems for the latter.

Regression results, reported in Table 8, largely confirm preliminary evidence, namely that all governmental authorities are relatively more likely to choose open procedures and less likely to choose restricted or negotiated procedures (especially municipalities and central government), while, even when controlling for other possible determinants of such choice, public enterprises and institutions are more likely to adopt restricted and negotiated procedures. Utilities and public enterprises are the most likely to adopt negotiated procedures without call. As for the choice of the award criterion, institutions with budget autonomy and local government levels are confirmed to be less likely to base their decision on price only. This evidence is in line with findings of Chong, Klien, and Saussier (2015). Interestingly, the size of the contract does not seem to influence the choice of the award mechanism.

While differing systematically between different types of contracting authorities, choices of award procedure and criterion do not seem to be sufficient for explaining why utilities and municipalities achieve lower rebates than other categories, like regions and institutions. Next, we turn to investigate other possible mechanisms that can explain better rebate differentials.

B. The Competence and Incentives Channels

Public procurement is a complex activity, especially in the case of infrastructure. It requires knowledge and abilities at each procurement stage. At the planning stage, the ability to properly choose and design the project, as well as to estimate its costs (see e.g., Flyvbjerg (2009)); at the award stage, the ability to choose the right award criterion and award procedure in each context; and at the execution stage, the ability to monitor the execution and evaluate ex post quality (see e.g., Guccio, Pignataro, and Rizzo (2014)). Public officials may lack these competences and experiences. This may be especially true at decentralized levels, where purchasing units are typically too small to be able to concentrate and afford specialized and trained procurement officials.³⁵

Further, even if procurement officials had the skills to efficiently run the procurement process and minimize costs, they may lack the incentives

to do so (see e.g., Bandiera, Prat, and Valletti (2009)). This could be the case because they are paid low salaries or because the contracting authority relies on external funds. This may be true, for example, for municipalities, which receive most of their financing from central government transfers, as well as public enterprises and utilities, which receive large shares of capital from municipalities or other levels of government.

In this section we investigate the role of professional competences and monetary incentives of procurement officials in explaining rebate differentials.

Competences and incentives will typically vary across categories of purchasers. Therefore, under the conjecture that more competent and/or better incentivized officials administer the procurement process more efficiently, we expect to observe better procurement performance (i.e., higher winning rebates) for categories of contracting authorities where officials are, on average, more competent and/or better incentivized.

To test the two channels, we use measures of competences and incentives in different categories of contracting authorities and estimate their impact on winning rebates.

As a measure of competence, we use average literacy in different categories of public purchasers. This data is taken from the National School of Administration (Tronti, Della Rocca, and Gawronski, 2013), which regularly conducts surveys on the competences of the public employees.³⁶ Literacy, defined as the “ability to read, write and understand text, expressed by behaviors such as: read and understand short documents such as reports, letters or memos; use a personal computer, calculators or other computerized instruments; write notes or fill in forms correctly (e.g., short reports, letters, memos or e-mail); read information, directives, forms, notices, warnings, email; read and understand long documents such as reports, manuals, articles

35. Unlike other countries (e.g., United Kingdom), in Italy there is not a specific “procurement official” professional profile and there are no specific education and training programs in place.

36. The methodology used, called the job requirements approach, considers different measures of competences and builds indexes on how frequently these competences are called upon during work by employees in different contracting authorities. The same methodology is used by the OECD for the Survey of Adult Skills PIAAC (<http://www.oecd.org/skills/piaac/>). The survey seeks to assess the requirements necessary for the interviewee to do his/her job, in terms of intensity and frequency with which the competences are put in practice for implementing some tasks (e.g., use of electronic spreadsheets, reading books, writing letters, etc.) in the job place.

TABLE 8
Choice of Award Mechanism and Criterion over CA Type, Works Contracts (OLS)

Dep. Variable	(1) Nocall	(2) Negotiated	(3) Restricted	(4) Open	(5) Lowest Price
CA type					
Central gov.	-0.203*** (0.004)	-0.018*** (0.003)	-0.330*** (0.003)	0.551*** (0.006)	-0.590*** (0.023)
Region	-0.166*** (0.010)	0.005 (0.004)	-0.328*** (0.003)	0.490*** (0.007)	-1.012*** (0.009)
Province	-0.168*** (0.027)	0.028** (0.010)	-0.416*** (0.009)	0.557*** (0.016)	-0.365*** (0.016)
Municipality	-0.180*** (0.006)	-0.179*** (0.003)	-0.610*** (0.002)	0.969*** (0.004)	-0.928*** (0.007)
Semi-auto. institution	-0.187*** (0.008)	-0.004 (0.003)	-0.306*** (0.002)	0.497*** (0.006)	-0.853*** (0.009)
Other institution	-0.179*** (0.005)	-0.027*** (0.003)	0.165*** (0.004)	0.042*** (0.009)	-0.482*** (0.020)
Public enterprise	-0.039** (0.012)	-0.005 (0.005)	0.167*** (0.012)	-0.123*** (0.020)	-0.145*** (0.030)
Reserve price	-0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Town FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
CA type × town FE	Yes	Yes	Yes	Yes	Yes
Lincom tests					
Central gov. – Municipality	-0.023*** (0.003)	0.161*** (0.006)	0.280*** (0.004)	-0.418*** (0.007)	0.337*** (0.030)
Region – Municipality	0.014* (0.007)	0.184*** (0.004)	0.282*** (0.010)	-0.479*** (0.003)	-0.085*** (0.016)
Province – Municipality	0.012 (0.023)	0.207*** (0.007)	0.194*** (0.017)	-0.413*** (0.007)	0.563*** (0.023)
Other inst. – Semi-auto. inst.	0.008 (0.006)	-0.023*** (0.005)	0.470*** (0.003)	-0.456*** (0.004)	0.371*** (0.016)
Adjusted R^2	0.130	0.227	0.169	0.308	0.391
Observations	840	840	840	840	840

Notes: Standard errors robust to clustering at the sector level are in parentheses. *Nocall* is a dummy = 1 if the contract is awarded with the negotiated without call procedure. *Negotiated* is a dummy = 1 if the contract is awarded with the negotiated procedure. *Restricted* is a dummy = 1 if the contract is awarded with the restricted procedure. *Open* is a dummy = 1 if the contract is awarded with the open procedure. *Lowest price* is a dummy = 1 if the contract is awarded with the lowest price criterion. The omitted category for the CA type is *utility*. *Reserve price* is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$.

Source: Our elaboration on TED data.

or books,” appears to be a meaningful proxy for the general competence of bureaucrats.³⁷

To test the incentive channel, we use data from the Italian National Institute of Statistics (ISTAT) on average yearly wage of employees in each institutional category.³⁸

Values on literacy and yearly earnings by category of contracting authority are reported in Table 9.

37. The other measurements used in the survey are: problem solving, group work, autonomy, mathematical competences, care, analysis and programming, and international interaction.

38. Data, expressed in base year 2010, are available at http://dati.istat.it/Index.aspx?DataSetCode=DCSC_RETRCONTRIC

We next estimate different specifications of the following model:

$$(3) \quad \text{rebate}_{irts} = \alpha + \text{channel}\beta + X'_i\delta + \gamma_r + \eta_s + \theta_t + \varepsilon_{irts},$$

which is the same as model (1), other than the fact that the regressor of interest is now *channel*, which is a variable capturing each of the two possible channels of rebate differentials across institutional categories: average literacy (when we test the competence channel) and average earnings (when we test the incentive channel) per category of contracting authority. We use OLS and cluster the errors at the sector level.

TABLE 9
Channels by Institutional Class of CA

CA Type	Literacy	Wage
Central gov.	49.1	25,595
Region	52.1	23,760
Province	52.1	23,760
Municipality	48.9	23,760
Semi-auto. institution		
Universities	46.6	28,112
Health authorities, hospitals	45.5	28,112
Other institution	52	26,883
Public Enterprise	48.9	33,786
Utility	48.9	35,674

Notes: literacy is a frequency index (%) on office-related behaviors that proxy bureaucratic capabilities levels, average per CA type. *Wage* is the yearly wage of employees (in euros and 2010 equivalents), average per CA type. For a full description of variables see Appendix A.

Source: Our elaboration on National School of Administration (Tronti, Della Rocca, and Gawronski, 2013) and ISTAT data.

Estimation results are reported in Table 10. Columns 1 and 2 report estimates for the test of the competence channel, respectively for the full sample, and for the subset of contracts awarded with the lowest price criterion. Competence has a significant effect on the winning rebate, indicating that some of the observed performance differential is explained by the fact that categories of contracting authorities with better qualified officials perform better in procurement. This result seems to be in line with Decarolis et al. (2018) who also find that better competences, including higher employees' skills, positively affect procurement performance.³⁹

For government levels, it appears that more central levels may have higher procurement performance than municipalities because they have better competences. This is probably due to size, in the sense that more centralized units (e.g., regions and central government) are larger and are, therefore, able to concentrate more qualified and specialized human resources than municipalities. This conjecture seems to be in line with results in Buccioli, Camboni Marchi Adani, and Valbonesi (2017) who find that larger purchasing bodies are more efficient in health-related procurement.⁴⁰

39. They consider three different dimensions of competence in procurement team—employee's skills, (nonmonetary) incentives for good performance, and cooperation among team members—finding that the latter has the largest effect on procurement performance.

40. They measure the purchasing body's size by health personnel cost or health purchases.

As for nongovernmental purchasers, better qualified human resources can explain why public institutions perform better than utilities and public enterprises.⁴¹ In this case, the explanation does not seem to be related to size, but probably to some other structural factors that make public institutions employ more competent bureaucrats. The competences channel also seems to explain why semi-autonomous institutions, which rank lowest in terms of literacy, perform worse than other public institutions.

It is important to notice that our analysis neglects the procurer's experience in running the award stage (e.g., in terms of numbers of procurement auctions run in a given contract category or in terms of variety of procured goods), which other papers find to be an important driver of competence and, in turn, of higher procurement performance (see e.g., Best, Hjort, and Szakonyi (2017); Decarolis et al. (2018)).

Columns 3 and 4 report estimates of the incentive channel test. Results seem to suggest that having larger incentives in terms of higher wages does not improve the rebate performance, possibly even worsens it (we find a small and negative effect). For example, utilities and public enterprises, which are the categories paying the highest wages, do not seem to be able to provide enough pressure for their employees to implement efficient procurement processes. This suggests that when competences are very low, as in the utilities and public enterprises cases, higher incentives in terms of higher wages do not provide sufficient pressure to administer efficiently the procurement process and are not sufficient to guarantee good performance.⁴² To test this last conjecture, we add the interaction between literacy and wage to the model (columns 5 and 6), finding that not only does the sign of wages turns positive, but also that the coefficients of both literacy and wage become larger. This evidence confirms that (a) paying higher wages to officials lacking competence does not improve (possibly worsens) their procurement performance; and (b) the effects of competences and wages reinforce each other: increasing the remuneration

41. The survey only includes public institutions, meaning that no values are reported for utilities and public enterprises. We adopt the conjecture that the competences endowment in these bodies is the same as municipalities.

42. This result seems to some extent to diverge from Buccioli, Camboni Marchi Adani, and Valbonesi (2017) who find that more resources devoted to personnel (relative to health purchases), especially nonhealth personnel, improve procurement performance of health-related procurement.

TABLE 10
Winning Rebate over Channels, Works Contracts (OLS)

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)	(5) Win. Rebate (%)	(6) Win. Rebate (%)
Literacy	2.455*** (0.079)	3.228*** (0.042)			11.821*** (0.808)	0.489 (0.354)
Wage			-0.962*** (0.068)	-1.600*** (0.045)	20.167*** (1.527)	0.379 (0.620)
Literacy × wage					-0.430*** (0.031)	-0.044** (0.012)
Auction controls	Yes	Yes	Yes	Yes	Yes	Yes
Town FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Literacy × town FE	Yes	Yes	No	No	No	No
Wage × town FE	No	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.510	0.665	0.518	0.686	0.523	0.685
Observations	840	431	840	431	840	431

Notes: Standard errors robust to clustering at the sector level are in parentheses. Columns 2, 4, and 6 exclude the contracts awarded with the MEAT criterion. Full estimation results are reported in Table A3 in Appendix A. *Literacy* is a frequency index (%) on office-related behaviors that proxy bureaucratic capabilities levels, average per CA type. *Wage* is the yearly wage of employees (in euros and 2010 equivalents), average per CA type. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$. Our elaboration on TED, NSA, and ISTAT data.

of officials who are competent improves procurement performance.

VI. CONCLUSION

In this paper, we used a new dataset of EU procurement award notices (TED) to provide new evidence on the relationship between the degree of centralization of a procurement system and its performance. For this purpose, we focused on the procurement of public works in Italy, which is a convenient case study, insofar as all levels of governments (plus a number of other categories of public institutions) are involved in procurement and substantially follow the same rules as far as EU-relevant procurement is concerned.

We considered the winning rebate as the relevant measure of award-stage procurement performance, finding the following results. First, municipalities and utilities systematically achieve lower rebates than other institutional categories, in particular than more central levels of government. This is particularly relevant insofar as municipalities and utilities award large shares of procurement contracts. This result also suggests that it is important to focus on the procurement performance of nongovernmental buyers, such as utilities, which are neglected because most of the fiscal federalism debate

centers on the performance of governmental levels (in particular, to show that municipalities are worse performers than more central levels).

Second, decentralized authorities do not, in general, perform more poorly than more central ones. While municipalities and utilities perform badly, other decentralized purchasing units, such as public institutions, seem to perform well.

Third, rebate differentials between different categories remain even after controlling for other important determinants of rebate, such as auction and local characteristics, suggesting that some institutional factors that differ by category play a role.

Fourth, competences are likely to be an important determinant of performance differentials. For a given degree of centralization, categories with more competent officials perform better on average. Higher incentives (in terms of higher remuneration) improve performance only if they come along with higher competence.

With the reservations that our results cannot be readily interpreted in causal terms and that they refer only to a sector of procurement (i.e., public works) and a stage of the procurement process (i.e., award stage), the policy implications that seem to emerge from our analysis are that (a) it is crucial to improve competences of procurement officials. This can be achieved through the

“professionalization” of the public buyer, which should include both specific education programs and increased remuneration, thus fostering incentives for efficient administration and reducing the temptation for corruption; and (b) achieving better competences only partially implies the need for more centralization. On the one hand, some categories of purchasers, probably because of the limited size or low budget autonomy (e.g., municipalities, utilities) do not manage to attract qualified human resources. Therefore it might be better to shift their procurement needs to more central levels of administration, like regions, which are likely to have better competences. This partial centralization would allow for some degree of purchase aggregation—which would enable suppliers to exploit economies of scale—but at the same time avoid that small and medium enterprises are strongly handicapped with respect to larger competitors—a risk that can occur for big tenders often awarded at the central level. On the other hand, other decentralized units that already have a good endowment of competences, because of budget autonomy or some other institutional factors, should probably continue to administer their own procurement.

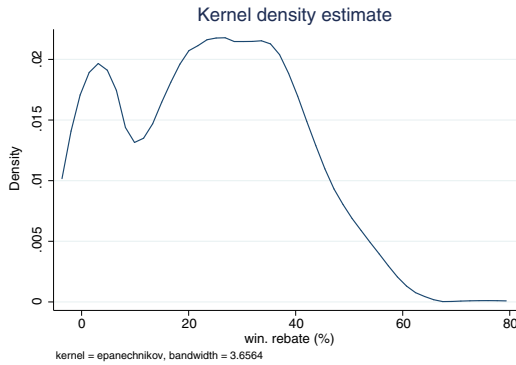
APPENDIX A

DEFINITIONS OF THE VARIABLES

- *Winning rebate* is the winning bid expressed as discount (%) over the auction's reserve price. Data is our elaboration on TED.
- *CA type* is a set of dummy variables indicating the different categories of contracting authorities. Data is our elaboration on TED:
 - *central government* is a dummy variable = 1 if the contract is awarded by central government (i.e., ministries and parliament)
 - *region* is a dummy variable = 1 if the contract is awarded by a region
 - *province* is a dummy variable = 1 if the contract is awarded by a province
 - *municipality* is a dummy variable = 1 if the contract is awarded by a municipality, a mountain council or an union of municipalities
 - *semi-autonomous institution* is a dummy variable = 1 if the contract is awarded by a local health authority, a public hospital or an university
 - *other institution* is a dummy variable = 1 if the contract is awarded by a public institution not included in the previous category
- *utility* is a dummy variable = 1 if the contract is awarded by a firm that is in charge of public services in utilities sectors (i.e., water, energy, transport, and telecommunications)
- *public enterprise* is a dummy variable = 1 if the contract is awarded by a firm that is in charge of public services in sectors other than the utilities sectors
- *Reserve price* is the starting value of the tender set by the CA in 10,000 euros (2010 equivalents). Data is from TED.
- *Offers number* is the number of bids received in the auction. Data is from TED.
- *Award procedure* is a set of dummies for the type of award procedure. Data is our elaboration on TED:
 - *open* is a dummy variable = 1 if the contract is awarded with the open procedure
 - *restricted* is a dummy variable = 1 if the contract is awarded with the restricted procedure
 - *negotiated* is a dummy variable = 1 if the contract is awarded with the negotiated procedure
 - *nocall* is a dummy variable = 1 if the contract is awarded with the negotiated procedure without prior call for competition
- *Award criterion* is a set of dummies for the award criterion. Data is from TED:
 - *lowest price* is a dummy = 1 if the contract is awarded with the criterion of the lowest price
 - *MEAT* is a dummy = 1 if the contract is awarded with the criterion of the Most Economically Advantageous Tender
- *Price weight* is the percentage value of the weight given to the price component of the bid in the award rule. It is =100 if the contract is awarded with the lowest price criterion. Data is our elaboration on TED.
- *Local win* is a dummy = 1 if the winning firm is registered in the same province of the CA. Data is our elaboration on TED.
- *Year FE* is a set of 8 dummy variables indicating the year of award. Data is from TED.
- *Sector FE* is a set of 8 dummy variables indicating macro categorization of contract objects. Data is our elaboration on TED.
- *Province FE* is a set of 110 dummy variables indicating the province of the contracting authority. Data is our elaboration on TED.
- *Town FE* is a set of 167 dummy variables indicating the municipality of the contracting authority. Data is from TED.
- *Literacy* is a frequency index (%) on behaviors adopted in the work place by procurement officials (read and understand short documents such as reports, letters or memos; use a personal computer, calculators or other computerized instruments; write notes or fill in forms correctly (e.g., short reports, letters, memos or e-mail); read information, directives, forms, notices, warnings, email; read and understand long documents such as reports, manuals, articles or books) on average in different categories of CA. Data is from National School of Administration.
- *Wage* is the average yearly wage of employees in each institutional categories, expressed in base year 2010. Data is from ISTAT.

FIGURE A1

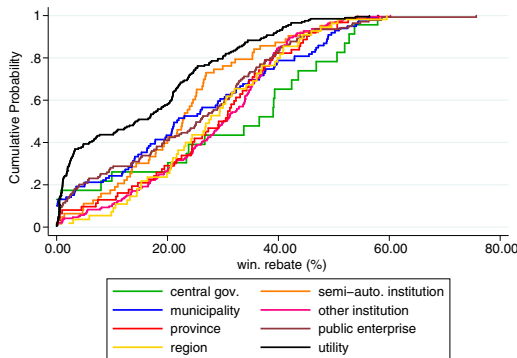
Kernel Density of Winning Rebate, Works Contracts



Source: Our elaboration on TED data.

FIGURE A2

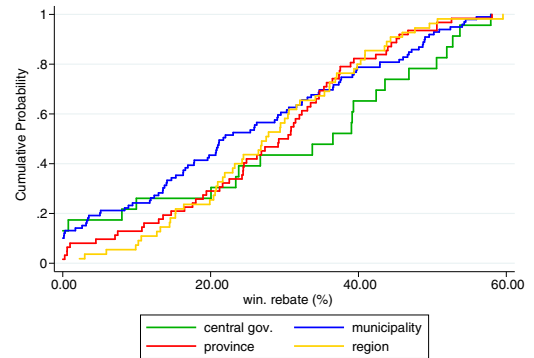
Empirical Cumulative Distribution of Winning Rebate by CA Type, Works Contracts



Source: Our elaboration on TED data.

FIGURE A3

Empirical Cumulative Distribution of Winning Rebate by Governmental CA Type, Works Contracts



Source: Our elaboration on TED data.

TABLE A1

Winning Rebate (%) by CA Type, Works Contracts

CA Type	N	Mean	SD	p50	Min	Max
Central gov.	23	30.44	19.45	36.54	0.00	57.90
Region	55	27.93	12.96	27.52	2.25	59.55
Province	62	27.63	14.32	29.86	0.00	58.07
Municipality	99	24.59	17.45	21.73	0.00	57.94
Semi-auto. institution	63	22.88	13.30	22.73	0.00	54.28
Other institution	193	28.17	13.05	30.12	0.00	60.21
Public enterprise	139	24.15	16.71	25.91	0.00	75.68
Utility	206	15.84	14.49	14.37	0.00	56.41
Total	840	23.67	15.62	24.11	0.00	75.68

Source: Our elaboration on TED data.

TABLE A2

Full Set of *Lincom* Tests Relative to Estimations of Table 3

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)
Central gov. – Municipality	3.538*** (0.381)	–1.805*** (0.407)	7.526*** (0.545)	7.351*** (0.567)
Region – Municipality	4.972*** (0.424)	2.869*** (0.257)	13.363*** (0.341)	14.396*** (0.336)
Province – Municipality	1.407 (0.762)	0.964 (0.786)	17.074*** (0.259)	16.951*** (0.224)
Semi-auto. inst. – Municipality	–3.546*** (0.515)	–3.084*** (0.373)	6.735*** (0.331)	6.436*** (0.296)

TABLE A2
Continued

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)
Other inst. – Municipality	–0.022 (0.297)	2.221*** (0.247)	13.581*** (0.236)	13.200*** (0.236)
Public ent. – Municipality	–2.390*** (0.383)	1.977*** (0.335)	8.035** (0.402)	7.332*** (0.401)
Central gov.-Region	–1.434*** (0.297)	–4.674*** (0.321)	–6.879*** (0.304)	–7.045*** (0.318)
Province-Region	–3.563*** (0.483)	–1.905** (0.669)	2.669*** (0.575)	2.554*** (0.535)
Semi-auto. inst.-Region	–8.519*** (0.290)	–5.953*** (0.308)	–7.671*** (0.049)	–7.961*** (0.069)
Other inst.-Region	–4.995*** (0.251)	–0.648*** (0.185)	–0.824** (0.331)	–1.197*** (0.326)
Public ent.-Region	–7.363*** (0.139)	–0.892*** (0.136)	–6.370*** (0.214)	–7.065*** (0.226)
Central gov.-Province	2.131** (0.714)	–2.769** (0.837)	–9.548*** (0.800)	–9.599*** (0.788)
Semi-auto. inst.-Province	–4.954*** (0.562)	–4.048*** (0.826)	–10.340*** (0.557)	–10.515*** (0.486)
Other inst.-Province	–1.430** (0.508)	1.257* (0.632)	–3.493*** (0.469)	–3.751*** (0.437)
Public ent.-Province	–3.798*** (0.519)	1.013 (0.598)	–9.039*** (0.577)	–9.619*** (0.537)
Central gov.-Semi-auto. inst.	7.085*** (0.227)	1.279*** (0.141)	0.792* (0.340)	0.916** (0.378)
Other inst.-Semi-auto. inst.	3.524*** (0.304)	5.305*** (0.308)	6.847*** (0.345)	6.764*** (0.329)
Public ent.-Semi-auto. inst.	1.156*** (0.191)	5.061*** (0.354)	1.300** (0.175)	0.896*** (0.184)
Central gov.-Other inst.	3.561*** (0.318)	–4.026*** (0.290)	–6.055*** (0.386)	–5.848*** (0.414)
Public ent.-Other inst.	–2.368*** (0.202)	–0.244 (0.265)	–5.546*** (0.485)	–5.868*** (0.496)
Central gov.-Public ent.	5.929*** (0.202)	–3.782*** (0.395)	–0.509 (0.477)	0.020 (0.504)

Notes: Standard errors robust to clustering at the sector level are in parentheses. The omitted category for the CA type is *utility*. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$.

Source: Our elaboration on TED data.

TABLE A3
Winning Rebate over Channels, Works Contracts (OLS). Full Estimation Results

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)	(5) win. Rebate (%)	(6) Win. Rebate (%)
Literacy	2.455*** (0.079)	3.228*** (0.042)			11.821*** (0.808)	0.489 (0.354)
Wage			–0.962*** (0.068)	–1.600*** (0.045)	20.167*** (1.527)	0.379 (0.620)
Literacy × wage					–0.430*** (0.031)	–0.044** (0.012)

TABLE A3
Continued

Dep. Variable	(1) Win. Rebate (%)	(2) Win. Rebate (%)	(3) Win. Rebate (%)	(4) Win. Rebate (%)	(5) win. Rebate (%)	(6) Win. Rebate (%)
Auction controls						
Reserve price	0.000** (0.000)	-0.001*** (0.000)	0.000*** (0.000)	-0.001*** (0.000)	0.000*** (0.000)	-0.001*** (0.000)
Offers number	0.505*** (0.009)	0.376*** (0.022)	0.472*** (0.015)	0.290*** (0.028)	0.472*** (0.014)	0.279*** (0.029)
Negotiated	-6.722*** (0.829)	-14.980*** (0.713)	-5.697*** (0.767)	-14.302*** (0.965)	-6.174*** (0.762)	-14.288*** (0.984)
Nocall	-17.064*** (0.549)	-18.451*** (0.841)	-15.616*** (0.511)	-17.498*** (0.925)	-15.679*** (0.526)	-17.610*** (0.935)
Restricted	-6.682*** (0.067)	-10.152*** (0.390)	-5.489*** (0.056)	-9.551*** (0.408)	-5.629*** (0.028)	-9.484*** (0.418)
Price weight	0.065*** (0.005)		0.078*** (0.007)		0.074*** (0.007)	
Local win	-0.499*** (0.111)	3.074*** (0.326)	-0.408*** (0.081)	3.323*** (0.334)	-0.285** (0.098)	3.374*** (0.350)
Town FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Literacy \times town FE	Yes	Yes	No	No	No	No
Wage \times town FE	No	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.510	0.665	0.518	0.686	0.523	0.685
Observations	840	431	840	431	840	431

Notes: Standard errors robust to clustering at the sector level are in parentheses. Columns 2, 4, and 6 exclude the contracts awarded with the MEAT criterion. *Literacy* is a frequency index (%) on office-related behaviors that proxy bureaucratic capabilities levels, average per CA type. *Wage* is the yearly wage of employees (in euros and 2010 equivalents), average per CA type. The omitted category for award procedure is *open*. *Reserve price* is expressed in 10,000 euros and in 2010 equivalents. For a full description of variables see Appendix A. Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$. Our elaboration on TED, NSA, and ISTAT data.

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