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EXPERTS AND ARBITRATION OUTCOMES: INSIGHTS FROM PUBLIC PROCUREMENT CONTRACT DISPUTES

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WORKING PAPERS

2022/04

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Title: EXPERTS AND ARBITRATION OUTCOMES: INSIGHTS FROM PUBLIC PROCUREMENT CONTRACT DISPUTES

Prima Edizione: Novembre 2022

ISBN: 978 88 68514 365

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Experts and Arbitration Outcomes: Insights from Public Procurement Contract Disputes

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Abstract

We explore the use of experts in arbitration proceedings by analyzing public procurement contract disputes in Italy. Balancing cost with accuracy, participants to a contract select arbitration when speedy dispute resolution is valued highly. Alternative dispute resolution mechanisms tend to give appointed arbitrators discretion in how to proceed. Consequently, principal-agent problems can arise. Using an IV approach, we show that the use of an expert causes a slowing down of the case resolution, without having an effect on the outcome of the dispute nor resolving uncertainty as measured by unanimous decisions by the panel of arbitrators. Conflict resolution mechanism designers should consider the alignment of incentives between the disputants and the service providers.

Keywords: Arbitration; Expert; Italy; Principal-agent problem; Procurement contract.
Jel Classification: C21; C26; J52.

Acknowledgements
Marco Vannini gratefully acknowledges support for this research from the University of Sassari under "Fondo di Ateneo per la ricerca 2019" and the Visiting Professor Programme of the University of Corsica. Claudio Detotto acknowledges the Visiting Professor Programme of the University of Sassari.

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1 Introduction

Disputes arise as a normal consequence of economic exchange. Throughout history societies have developed conflict resolution mechanisms to deal with these problems.[1] Modern governments create legal institutions as a public service. Regarding best mechanism design, there are numerous normative dimensions to consider. One important consideration is accuracy. While identifying a dispute's correct outcome is challenging, an institution that includes available evidence, uses professional representatives, and applies equally to all can be expected to lead to better outcomes. On the other hand, disputes are costly and the mechanisms created to resolve these disputes adds further costs. These costs not only include the monetary costs, such as fees and lawyer expenses, but also arise from the opportunity cost of delay. A balance between accuracy and cost must be struck.[2]

As the private marginal values on accuracy and cost likely vary across market participants, a public system of dispute resolution cannot be expected to satisfy all. Consequently, parties not too infrequently seek out alternative dispute resolution mechanisms. Arbitration is especially popular. Clauses within many types of contracts pre-commit the two sides to use arbitration to resolve any conflict that may arise. Parties who put more weight on cost mitigation are expected to prefer arbitration instead of using the publicly-provided courts.

One noteworthy example of this is contracts in Italy. The Italian courts are notorious for the backlog and delay. For example, the European Union measures the efficiency of courts across Europe. For the time needed to resolve civil and commercial disputes, Italy ranks last on the continent taking approximately 550 days on average to resolve such as case. This is more than a year longer than Germany for example [European Commission, 2019].[3] This can be harmful. For one, payment for services provided is withheld. Suppliers, though, incurred the costs to performing the contract and, hence, risk insolvency. Further, completion of performance can be halted due to the dispute. If a dispute arises during the construction of a building, for example, the timeline to completion can be put on hold. The purchaser loses out on the use of the building and the contractor has its labor's and equipment's use delayed. Hence, many contracts include the use of arbitration to provide a fast resolution.[4]

Here, we obtain access to a database of public procurement contract disputes in Italy. Many public works projects are outsourced to private contractors and the legal setting to resolve disputes that arise with these contracts has evolved over the years (see overview below). Since 2006, with the transposition of EU directives on public procurement into national law, the disputes at the execution phase of contracts can be resolved

[1] See McCannon [2018] for a discussion of arbitration in ancient Athens as an example.

[2] There are, of course, other normative considerations as well. Arbitration can provide private, rather than public, resolution of disputes. Formal court rulings, on the other hand, can contribute to precedence creation and act as a guide for future, similar transactions that reduce the overall level of disputes.

[3] https://ec.europa.eu/info/sites/default/files/justice_scoreboard_2019_en.pdf

[4] In fact, the European Scorecard shows that Italy has experienced the most dramatic reduction in the number of new civil and commercial cases that are filed in the public courts. The number of new cases has reduced by approximately 40% between 2010 and 2017. This contrasts with most other European countries who have experienced only negligible decreases (and for some, increases) in the number of cases entering the public courts.

by arbitration under the supervision and support of the Chamber of Arbitration set up within the Italian anti-corruption authority known as the ANAC. Quite a bit of leverage is given to the individuals selected as arbitrators in choosing how to manage the proceedings. Importantly, they chose whether to involve outside experts.

In recent years, both in Italy and in the rest of the world, the use of experts has been increasing. Correspondingly, concerns have been voiced that that, perhaps, their use is being abused. As noted in a commentary by De Berti [2011], "sometimes one has the impression that the need to appoint experts and expert witnesses is taken for granted"[5]. This stands in stark contrast to the ICC [2017] recommendation that "it is helpful to start with a presumption that expert evidence will not be required. Depart from this presumption only if expert evidence is needed in order to inform the arbitral tribunal on key issues in dispute." Therefore, from an institutional design perspective, it is important to understand the incentives that affect expert's use in arbitration.

We argue that one important decision that affects the speed at which arbitration resolves disputes is the choice to use an expert. For public procurement contracts, individuals can be employed to estimate costs, provide relevant information on construction practices, or weigh in on legal rules and procedural norms. The use of experts is optional. Ashenfelter and Dahl [2012] have commented previously on the use of party-appointed experts in labor-management contract disputes arguing that a Prisoner's Dilemma is created. Fees must be paid to these experts, which can help one side in the labor dispute. They show, though, that if both sides employ experts the dispute's costs escalate without a measurable impact on the outcome observed. For arbitration mechanisms such as what is used for public procurement contracts in Italy, the decision to bring in an expert comes from the arbitrators appointed to the dispute. We explore, from a principal-agent perspective, whether the use of experts adds to the delay. If so, then this would complement the escalated financial costs documented by Ashenfelter and Dahl [2012]. Rather than this inefficiency arising from a Prisoner's Dilemma problem between the disputants, the deadweight loss we identify arises from the principal-agent problem created by arbitrator discretion.

We use the set of public procurement contract disputes resolved in Italy between 2007 and 2020. Following an instrumental-variables approach, we explore the causal effect of using an expert. Our primary finding is that the expert's use dramatically increases the duration of the case (i.e., number of days between the filing of the dispute and its resolution). Further, we are unable to document any other change in the outcomes of the disputes. The determination of the arbitral award is unaffected by an expert's use and the likelihood that the panel of arbitrators reaches a unanimous decision is unaltered. Thus, the use of experts does not affect the outcome or its uncertainty, but does delay the process. If alternative dispute resolution mechanisms are intended as an option for participants who put a premium on cost reduction, rather than focusing primarily on accuracy, then institutional designers should consider addressing the principal-agent concerns created by

[5]Taken from De Berti [2011] on page 54. Also, we adopt the naming convention in this paper, as suggested by De Berti [2011] where, in arbitration, "experts" are appointed by the tribunal, while "expert witnesses" are appointed by the parties in the dispute.

discretion in the proceedings.

There is a plentiful literature exploring both theoretically and empirically the consequences of specific institutional features used in arbitration mechanisms. A primary concern has been contrasting conventional arbitration, where the arbitrator is free to make any award desired, to final-offer arbitration, where the arbitrator is bound to select one of the two final offers made by the disputants [Farber, 1980, Ashenfelter and Bloom, 1984]. Experimental research has compared mechanisms [Deck et al., 2007a,b]. The effect of strategic information transmission during the final-offer arbitration process has received quite a bit of attention [Farmer and Pecorino, 1998, 2003, 2013]. Marselli et al. [2015] and Gershoni [2021] consider the consequences of the use of a panel of arbitrators, rather than a sole arbitrator, on settlement rates. Even the mechanism used to select the arbitrators has been considered [Bloom and Cavanagh, 1986]. We contribute by exploring the use of tribunal-appointed experts. As mentioned, we complement the analysis of Ashenfelter and Dahl [2012] who remark on the Prisoner's Dilemma nature to disputants choosing whether to hire experts to support their case. Here, we evaluate the principal-agent problem that arises if the arbitrators are given discretion to use outside experts.[6] While Ashenfelter and Dahl [2012] show that the arbitral award is unaffected when both sides employ experts, we show that both uncertainty amongst the arbitrators and the ultimate award is unaffected, but the duration of the dispute is extended.

Multiple authors have investigated the public procurement contracting environment. There is a small literature investigating the costliness of these contracts [Nakabayashi, 2013]. Relatedly, Vannutelli [2022], also using data from Italy, explores mayor's use of auditors to monitor costs. The decision to publicly announce these contracts is impactful [Coviello and Mariniello, 2014]. We contribute to this by adding an analysis of the use of arbitration to resolve public procurement contract disputes.

In Section 2 we describe the contracting environment and arbitration mechanism used in Italy. The data set studied is described in Section 3 and Section 4 describes the identification strategy. Section 5 presents the main results. Section 6 concludes.

2 The Italian Context

2.1 Public Procurement Contracts in Italy

Public procurement contracts in Italy are regulated by the Public Contract Code of 2006 (hereafter PCC) modified into the New Public Contract Code (NPCC) in 2016. The NPCC is based on harmonized EU rules and definitions. Public contracts are contracts for pecuniary interest concluded in writing between one or more economic operators (EOs) and one or more contracting authorities (CAs) and having as their object the execution of works, the supply of products, or the provision of services.[7]

[6] Webb and Wagar [2018] evaluate an expedited arbitration mechanism used in Canadian labor-management disputes and show that it quickens the dispute's resolution.

[7] According to the NPCC (art. 3), EO is any natural or legal person, public entity, group of such persons and/or entities, including any temporary association of undertakings, entity without legal personality which offers the execution of works and/or a work, the supply of products or the provision of services on the market. CO means the state public administrations, the

In line with the European Directives, the NPCC reiterates the principles behind public procurement in the EU and establishes rules for procurement by CAs with respect to public contracts whose value falls either above or below the European thresholds (art. 35 and 36). Thresholds amounts vary with the CA's typology and the object of the contract (e.g., works, products, services, or designs).[8]

When awarding public contracts, CAs can choose ordinary procedures or, conditional upon the occurrence of specific requirements, special procedures. The former can be either open (i.e., any interested EO may submit a tender in response to a call for competition) or restricted (i.e., any EO may submit a request to participate in response to a call for competition, but only invited EOs, selected on the basis of the information provided as specified in the call, may submit a tender). The latter include: (i) competitive procedures with negotiation; (ii) negotiated procedure without prior publication of a contract notice; (iii) competitive dialogue; and (iv) innovation partnerships.[9] In case of public contracts below the European monetary thresholds, CAs may skip ordinary procedures and use instead direct award (below €40,0000) or negotiated procedures with consultation of a minimum number of EOs (up to €1,000,000).

Although an independent body charged with regulatory and oversight functions existed since 1994, when the first attempt to reform public works in Italy - the Merloni Law - set up the AVLP (Autorità per la vigilanza sui lavori pubblici), a full blown authority only developed within the PCC. This extended the functions of the authority to all types of procurement and eventually lead to the establishment of the Anti-Corruption Authority (ANAC, Autorità Anticorruzione) in 2014. Being an independent administrative authority implementing the Merida Convention, ANAC integrates two tracks: procurement reform and anticorruption policy. Its mission is to prevent corruption everywhere in the public administration. As a result, along with the supervision and control of public contracts, it provides a number of services including those of the Chamber of Arbitration.

As a consequence, public procurement contracts involving municipal governments/CAs and private enterprises/EOs will have contracts that are formed using ordinary, open procedures or special, restricted processes. This distinction will be important in our upcoming econometric analysis as the contracting environment will be used as an instrument.

2.2 Arbitration Mechanisms

Arbitration concerning disputes in the execution phase of public works in Italy dates back to 1865. Recently, it has been criticized consistently as favoring the private contractors over the contracting authorities. Allega-

local public authorities, the other non-economic public authorities, the bodies governed by public law, the associations, the unions, the consortia, whatever called, formed by one or more such authorities. The PCC was a result of the transformation of legislative decree 2004/17/EC and 2004/18/EC. The NPCC implemented legislative decree 50/2016.

[8]For details on EU procurement thresholds see https://ec.europa.eu/growth/single-market/public-procurement/rules-implementation/thresholds.

[9]Whereas procedures (i) and (iii) can be used when the procurement cannot be met without adoption of readily available solutions, or the deliverable is particularly complex or, in response to an ordinary procedure, only irregular or unacceptable tenders are submitted, procedure (ii) is allowed where no tenders or no suitable tenders or no requests to participate or no suitable requests to participate have been submitted in response to an ordinary procedure, or the deliverable can be supplied only by a particular EO (e.g., a unique work of art), or in case of extreme urgency. CAs may recur to (iv) when they need to develop innovative products, services or works not available on the market.

tions of corruption or lack of integrity[10] were widespread [Gambetta, 2018] and the substantial bills of some arbitration panels often shocked the public. So much so that Law 24 December 2007 banned arbitration on disputes concerning government procurement contracts.

This was appalling, given that with the PCC created expectations about stable rules on public contracts that seemed to be coming true. However, the ban's implementation was postponed. The final solution was to rescue procurement arbitration by modifying the relevant articles of the PPC in conjunction with Legislative Decree n. 53/2010. It applied the supervening directive 2007/66/EC, which amended the review procedures concerning the award of public contracts.

The main features of the new regime, which allows arbitration as an ordinary litigation remedy alternative to trial before a court, are as follows: (1) the CA shall indicate in the call for tender, or in the notice/invitation for procedures without a call, the intention to adopt an ex ante arbitration clause[11]; (2) ex-post arbitration agreements are forbidden; (3) each party nominates the arbitrator of its choice from among professionals with special expertise on the the topic of the contract; (4) the third arbitrator, i.e., the Chairman of the arbitration board, shall be chosen by the parties from among professionals that are not only experienced but also independent and have not served as party-appointed arbitrator or lawyer in arbitral proceedings regulated by the PCC over the previous three years; and (5) irrespective of the value of the dispute, the remuneration of the arbitration panel plus the secretary cannot in any case exceed €100,000.

The amended PCC confirmed the role of the Chamber of Arbitration in (a) record-keeping of public contracts arbitrators and experts; (b) curating the code for arbitration; and (c) appointing the third arbitrator in case of disagreement between the parties and administrating the associated dispute. Function (a) is particularly important in that, in case of (c), the Chamber of Arbitration must select the Chairman from a short-list of registered arbitrators[12] on the basis of predetermined and objective criteria. Whereas the latter, based on competence and seniority, has been stable over the years, the sampling procedure to form a comprehensive short-list has been frequently revised in order to keep up with the variable number of registered arbitrators and the over-representation of the legal professions in the register.

Further amendments to the PCC have been introduced with the "Anticorruption Law" (Law 6 November 2012, n. 190). Most notable among these[13] was the retroactive rule requiring mandatory prior motivated

[10] Integrity as defined by OECD refers to the use of funds, resources, assets, and authority, according to the intended official purposes, to be used in line with public interest

[11] The successful tenderer can reject the arbitration clause, which in such case shall not be included in the contract.

[12] Professionals willing to be enter the arbitration list must apply to the Chamber, submitting a CV and any documentation to be eligible. Pursuant to art. 242, paragraph 6 of the PPC, the following categories can be enrolled in the list of arbitrators of the Chamber of Arbitration: (i) ordinary magistrates, accounting magistrates and State attorneys in service designated by their competent body, as well as State attorneys and ordinary magistrates not in service; (ii) attorneys registered with ordinary and special bars who are authorized to practice before superior courts who have the requisites for the appointment as counsellor to the Court of Cassation; (iii) experts who have a college degree in engineering and architecture who are authorized to exercise the profession for at least ten years and who are registered with the relative professional register; and (iv) tenured university professors in legal and technical subjects and managers of the public administrations, holding the same degrees, with specific skills in the field of public contracts for works, services and supplies.

[13] An almost complete list includes: (i) mandatory prior authorization by the governing body of the contracting authority, to include the arbitration clause in the public contract or notice; (ii) prohibition from participating in arbitral panels for judges, State's attorneys and tax commissions members; (iii) obligation that both parties, in a dispute between public administrations, shall choose their arbitrators solely from among public chief officers; (d) recommendation that the public party in a dispute between a public administration and a private company shall preferably appoints a chief officer as its arbitrator; and (e)

authorization, by the contracting authority's governing body, to include the arbitration clause in the public contract or notice. This was the straw that broke the camel's back. Since then, arbitration disputes plunged steadily. Even official reports by ANAC had to acknowledge "the flight from arbitration".

On 18 April 2016, the Italian Government approved the Legislative Decree n. 50 implementing the new public procurement directives[14] of the European Parliament and of the European Council of 26 February 2014. Under the NPCC all public procurement arbitration disputes shall be administered by the Chamber of Arbitration, which shall nominate and appoint the Chairman of the arbitration board and shall appoint the arbitrators nominated by the parties. Moreover, upon the proposal of the arbitration board, the Chamber of Arbitration shall determine, by means of a specific resolution, the fees of the arbitrators within the limits set by the law. Finally, stricter rules will apply for being appointed as arbitrator/chair.[15]

The role of experts in arbitration disputes varies significantly depending on the nature of the legal system. Courts proceedings in common law countries are adversarial in nature, each party to the case tends to appoint their experts in order to support their claims with the risk of triggering "a battle of experts of doubtful neutrality, or even of declared partiality, the prize going to the more articulate and convincing one, not necessarily to the one telling the truth, the whole truth and nothing but the truth" [De Berti, 2011, p.55]. By contrast, in accordance with the inquisitorial system, in civil law countries experts are appointed by the court, respond to the judges, and must be an independent third party, neutral, and impartial. After the hearings, the judges may decide to adhere to or deviate from the expert's conclusions. Here, opponents are muted and the battle of experts cannot be staged, but it goes without saying that "there is no real guarantee that the choice of the court falls on a real expert in that particular field: the appointed expert may indeed be perfectly neutral, but may be also perfectly wrong" [De Berti, 2011, p.56]. When the parties belong to different legal traditions, as in many international commercial disputes, the arbitration practice favors an hybrid approach. With some notable exceptions (e.g., France and Switzerland among the civil law countries), once a proceeding is seated in a State, most jurisdictions apply the same national law to both domestic and international arbitration. Despite the varied legal landscape, since the adoption by the United Nations Commission on International Trade Law in 1976 of a unified legal framework for arbitration, known as the UNCITRAL Model Law, some harmonization has taken place. Most European member countries [European Parliament, 2014] have based or reshaped their arbitration laws in light of the UNCITRAL Model Law (and its amendments), which has a Civil Law orientation. The latest revision of the rules[16] allows either type of experts to participate in arbitral proceedings, but the tribunal-appointed experts will be subject to

determination by the public party of the maximum fee to be paid to the chief officer acting as arbitrator plus the provision that any difference between the fees actually paid to the arbiters and the predetermined maximum amount shall be entered into the balance sheet of the contracting authority.

[14]Directives 2014/23/EU, 2014/24/EU and 2014/25/EU on public procurement and awarding concession contracts, procurement by entities operating in the water, energy, transport and postal services sectors and on the reorganization of the Public Procurement Regulation.

[15]In particular, ordinary magistrates, administrative accountants and military personnel (regardless of whether they are in service), as well as State attorneys and prosecutors (regardless of whether they are in service), and members of tax commissions, cannot be appointed.

[16]https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/arb-rules-revised-2010-e.pdf art.27, 28 and 29

a strict screening process for qualification, independence and impartiality. Our investigation gives an insight into the role of these latter type of experts, admittedly impartial adviser rather than partisan litigators.

3 Data

From the text of the contract disputes filed at the Chamber of Arbitration, we are able to create a number of measurable variables. First, we create three outcome variables. Each document includes the date that the dispute was initiated and the date at which the award was announced. Thus, the number of days between these two dates makes up our *Duration* variable. Second, the votes of the three arbitrators is recorded. We create an indicator variable equal to one if the three arbitrators reach a unanimous decision. This is our variable *Unanimous*. Third, we record the outcome of the dispute. The amount (in Euros) is provided. This makes up our variable *Award*. We normalize this by the initial amount claimed. That is, suppose that one party initially claims that A Euros should be paid in the contract, while the other party claims that only B should be paid for the services rendered. If the arbitrators award a payment of C, then we record the outcome as $Award = \frac{C}{A+B}$. Thus, one can interpret the award outcome as the proportion of the total dispute that is chosen.[17] It is important to normalize the outcome by the total dispute size to disentangle the relative "victory" of one party from the stakes involved, which will be included as a control variable *Value*. A common observation is that arbitrators tend to "split the baby" making an award at the midpoint of the demands made by the disputants. An outcome further from a 50-50 split potentially signals that one side has made a stronger case than the other.

A number of control variables can also be derived. An important aspect in explaining dispute duration is the complexity of the claim. Measuring this dimension is problematic. We propose a proxy of this variable by calculating the number of queries filed during the dispute. The variable *Queries* represents the sum of the queries of the two parties. The rationale is that the complexity of a dispute increases with the number of inquiries and interrogations made by the two parties. Since participation to a dispute involves both opportunity costs and money, in the case of the private party we proxy the former with the variable *Revenue*; i.e., the company's average annual revenues over the three-year period before the dispute, and the latter with *Equity*; i.e., the equity-to-asset ratio (= *Net Worth*/*Total Assets*) which captures the health of the company's balance sheet.

Further, we use the population of the municipality where the CA is located as a measure of the number of individuals who are expected to benefit from the execution of the public contract, *Population*.[18] Also, it represents the size of the municipality, which proxies strong legal skills and the ability to draft comprehensive contracts. This aspect is relevant since a well-formed contracts reduces the risk of misunderstandings and costly litigation. Furthermore, we control for the local environment where the municipality operates. We

[17] Occasionally, only one side makes a claim. We interpret this as a dispute where one side is asking for an additional payment and the other is claiming a zero modification to the contract. Hence, we would treat $B = 0$.

[18] Population data comes from the Italian National Institute of Statistics.

employ the corruption index of Italian provinces as measured by Nifo and Vecchione [2014]. We expect that more corrupt municipalities may experience more disputes and CAs in corrupt municipalities may be less efficient. Finally, we create an indicator variable for whether the contract is for a public works project, *Public Works*.[19]

Given our interest in exploring the role of expert witnesses, three additional explanatory variables are considered. We create an indicator variable *Expert* which is equal to one if an outside expert was used in the arbitration proceedings. Further, we create an indicator variable *Open Tendering* which is equal to one if the municipality chose to use an open awarding procedure. Finally, counting for each arbitration panel the number of members with a technical background (like engineers and architects), we generate the variable *Technical Panel*. As discussed in the upcoming section, we argue that these are valid instruments for the involvement of experts. The descriptive statistics for these variables are provided in Table 1.

4 Identification Strategy

Our objective is to identify the causal impact of the use of an outside, tribunal-appointed expert on the outcome of an arbitration proceeding. We consider three distinct outcome variables. The identification concern is that the use of an outside expert is endogenous. The arbitrators choose to use an expert. It may very well be that the circumstances under which one is chosen to be used may be causing the outcomes observed, rather than the use of the expert directly.

To deal with the endogeneity problem, we use an instrumental variables approach. Specifically, we will use two instruments for the use of an expert: (i) the process by which the contractor was selected by the CA; and (ii) the knowledge on technical aspects within the panel.

As described, contracting authorities have the discretion to have a competitive bidding process used to take in proposals from different service providers in an open tendering procedure. Instead, they can directly contract with a private enterprise to provide the public service using a restricted tendering process. We argue that the open tendering procedure is highly correlated with the decision to use an outside expert in an arbitration process if a dispute arises. While a contracting authority is more likely to use a restricted tendering process when it has repeated business with a particular service provider, an open bidding process is more likely to be used for relatively novel public projects. Therefore, the process used in selecting the supplier is a measure of the uniqueness of the project. Consequently, when a dispute arises with the public procurement contract, the dispute is more likely to involve new arrangements, non-typical projects, and other concerns that are not easily accessible. It is these new circumstances that are expected to cause arbitrators to be more interested in seeking out outside testimony. This is argument is in line with the findings of Coviello and Mariniello [2014] who show that whether their is a public advertising for a public procurement contract as doing so affects not only the number of bidders, but their identity.

[19] Alternatively, procurement contracts are used to hire services such as consulting and legal aid, as two examples.

Even the background of the members of the panel could be associated with the likelihood of using an expert during the arbitration process. Although the panel might benefit from a mixture of expertise, the great majority of the panelists are lawyers. Few have technical backgrounds such as property development, construction, engineering, and architecture.[20] This strong homogeneity creates the need to use an outside expert in order to acquire knowledge on technical aspects of the case. For this reason, the number of panelists coming from technical backgrounds is taken as a proxy of panel's knowledge on this matter.

We feel that both the process used to select the service provider and the panel's background are unlikely to be directly associated with the outcome of the arbitration. There is no reason to believe that the manner in which the contract and the panel were formed will affect how long it takes for arbitrators to reach a decision in a dispute if one arises, how likely it is that the panel of arbitrators agree with each other on the proper outcome of the dispute, and the relative success of the two parties to the dispute. These outcome variables relate to the process led by the arbitrators. Thus, we argue that these instruments satisfy the exclusion restriction.

Strong, suggestive evidence exists in the data. The left panel of Figure 1 compares the mean value of the three outcome variables for those disputes that had contracts formed after an open tendering procedure (light gray) and without an open tending procedure (dark gray). The right panel of Figure 1 compares the mean value of the outcome variables for differing number of arbitrators on the panel that have technical expertise.

The way in which each municipality selects its service provider is strongly unrelated with each of the arbitration outcome variables. The same reasoning holds true for the number of technical expert panelists. Thus, the exclusion restriction holds.

Further, there is evidence that we have a strong instrument. The left panel of figure 2 depicts the proportion of the observations where a expert witness is used. The sample is partitioned into those which used an open tending process and those that did not. The right panel of figure 2 does the same for the composition of the arbitration panel.

Use of an open-tendering process is associated with a statistically significant reduction in the proportion of observations which involve tribunal-appointed experts. In addition, there is a monotonically decreasing relationship between the number of technical experts on the arbitration panel and the proportion of observations that utilize experts. Therefore, we will use *Open Tendering* and *Technical Panel* as instruments for *Expert*. Initially, we estimate

$$Y_{irt} = \alpha_1 Expert_{irt} + X_{irt}\alpha + \rho_{ir} + \tau_{it} + \epsilon_{irt}. \tag{1}$$

where Y_{irt} is the outcome variable of interest (either duration, award, or unanimity) for observation i which arises from a municipality in region r in year t. X_{irt} is all the control variables provided in Table 1. We

[20] Nearly 98% of the disputes have at least a lawyer in the panel, while we observe at least a surveyor, engineer, or architect in about the 15% of cases.

will include region fixed effects to account for variation in economy, governance, and culture (to name a few) across the country and year indicator variables to account for macroeconomic events or amendments to institutional features. This naive OLS regression does not account for the endogeneity of the use of expert witnesses though. Hence, in a first stage we estimate

$$Expert_{irt} = \beta_1 TechnicalPanel_{irt} + \beta_2 OpenTendering_{irt} + X_{irt}\beta + \rho_{ir} + \tau_{it} + \epsilon_{irt}. \quad (2)$$

Unfortunately, the instrument *Open Tendering* suffers from missing observations. Information on how the contract was originally formed is missing for 47 cases. As a matter of precaution, we attribute them to the non-open tendering procedure group. However, two robustness checks are here proposed. First, we move these observations to the group of open tendering procedure, giving a value of one to them. Second, we rerun the analysis without these missing values. Our main findings hold in both cases.

5 Results

First, we establish our main finding that the use of an outside expert slows down the arbitration process. Table 2 presents the results with $Y = Duration$.

The naive OLS regression, (1), reports a positive and highly statistically-significant relationship between the use of an outside expert and the duration of the arbitration proceeding. Using the descriptive statistics presented in Table 1, this represents an increase in the duration by about $\frac{5}{6}$ths of a standard deviation. This finding is robust to using the process used to form the contract as an instrument. Missing values in Open Tendering instrument are imputed to open procedure (2), non-open procedure (3), or omitted (4).

From the first stage, as expected, the open tendering process is positively related to the use of an expert, while the number of technical expert panelists reduces the likelihood of its use. These effects are statistically significant. Along with the large F-statistic, this suggests we have strong instruments. Consistent with Figures 2 an open, competitive process and the presence of technical expert panelists are highly associated with the use of tribunal-appointed experts. As a robustness check, in Table 8, 9 and 10 we employ one instrument at a time, re-running Equation 2 using only *Technical Panel* or *Open Tendering*. Although the main results still hold, we observe that the effective F-test on weak instruments cannot be rejected at 95% confidence level. This is an indication that the two instruments are not strong enough when used separately, supporting the results of Table 2.

Turning to the arbitrator's decision, it is reasonable to ask whether the use of an expert tends to favor one side over another. Table 3 duplicates the results presented in the top panel of Table 2, but uses *Award* as the dependent variable.

There is no consistent relationship between the use of an expert and the award made by the arbitrators. In fact, the sign switches when expertise is instrumented for with the number of technical experts in the panel and the tendering process used to form the contract, column (2). This result still holds in the robustness

check, columns (3) and (4). Ultimately, we take this as inconclusive evidence of an effect on the award.

Further, we consider the results with the uncertainty amongst the arbitrators as the dependent variable of interest. Table 4 presents the results.

Across the specifications, the use of an expert is unrelated with agreement amongst the three arbitrators. Taken together, the use of an expert, which is employed at the discretion of the arbitrators selected to resolve the dispute, slows down the speed at which a decision is reached but does not have a measurable effect on the outcome of the arbitration or agreement existing between the arbitrators.

As discussed previously, a portion of our disputes cannot be readily coded as being restricted in the tendering process. Thus, our instrument used in the three tables puts the open tendered contracts with the unclassifiable contracts together as our instrument, with the unclassified added to the restricted into a "not-open" category, our results are unaffected. The instrument is highly statistically significant and maintains a large F-stat in the first stage, while the duration is still extended with a change in the award or unanimity of the vote. Finally, missing values are omitted as a further robustness check. First stage statistics and main findings still hold. Thus, our result is not sensitive to the measurement of our instrument.

6 Conclusion

Economic exchange requires dispute resolution mechanisms. The design of a dispute resolution mechanism ultimately trades off accuracy in decisions with the costs. As market participants can be expected to differ in the relative importance of these two considerations, a uniform publicly-provided court system is unlikely to be preferable in all contracting environments. Hence, arbitration serves as an alternative dispute resolution for those who value cost mitigation relatively more. Arbitration mechanisms, though, leave important discretionary decisions to the arbitrators. This opens up the possibility of a principal-agent problem as they may find greater benefits to high-cost, prolonged disputes that search for the most accurate decision. We explore this concern in a data set of public procurement contract disputes in Italy. Italy, in particular, suffers from a slow public court system and, hence, arbitration is potentially valuable. An important discretionary decision within arbitration is whether outside experts are hired to testify in these cases. Using an instrumental-variables approach we identify the causal impact of the use of experts. We show that the speed at which a dispute is resolved, an important measurement of arbitration costs, slows down considerably when the arbitrators' choose to bring in experts. Further, we show that the use of tribunal-appointed experts has no measurable impact on the arbitral award decided nor does it have a consistent impact on the uncertainty of the proceedings, as proxied by a unanimous vote by the panel of arbitrators. Thus, the use of experts in these cases creates costs without a measurable benefit.

While it is difficult to assess accuracy, the expectation is that the use of these experts improves the correctness of the decisions. The implication of our finding is that if institutional designers are interested in providing an alternative mechanism to publicly-provided courts that economizes on the deadweight loss

created by conflict, they may want to consider the incentives of the arbitrators and whether they align with the goals of the disputants.

We feel that this observation complements well previous analysis on the incentive effects created by arbitration mechanism design decisions, but there are a few limitations worth acknowledging. For one, we only observe disputes that make their way to the arbitration tribunal. We do not know how many disputes were resolved privately through renegotiations of the contracts. It is possible that the use of experts affects pre-arbitration bargaining. Further, contract authorities choose whether to include a clause in the original contract that requires a dispute, if it were to arise, to be taken to arbitration. Ultimately, our results are conditioned on the dispute occurring in a contract that requires arbitration that is not privately resolved. Nevertheless, we feel it is unlikely that these selection effects will negate our findings.

Further, in light of our findings it is not clear what the policy response should be. The potential solution, as with any principal-agent problem, will hinge on either being able to monitor the agent's decisions directly, or to create incentives for the agent that line up with the principal's objectives. Fee structures that encourage meetings and a lengthier process, as flat per-meeting fees would create, can be expected to suffer from the principal-agent problem identified here.

Tables

Table 1: Summary Statistics

	mean	st. dev.	min.	max.
Outcome Variables				
Duration (log transformed)	6.1121	0.6287	3.9512	7.7557
Award	0.3281	0.3099	0	1
Unanimous	0.8364	0.3707	0	1
Explanatory Variable & Instrument				
Expert	0.6261	0.4849	0	1
Technical Panel	0.2149	0.5571	0	3
Open Tendering	0.6915	0.4629	0	1
Control Variables				
Value (log transformed)	0.8729	1.9286	-4.2336	7.8570
Queries	11.8691	9.9009	0	84
Revenues (log transformed)	14.6996	4.1182	0	20.9950
Equity	15.3273	40.0745	-491.0095	84.36
Population (log transformed)	12.6342	3.4706	5.9687	17.9098
Corruption Index	0.2393	0.1909	0.0147	0.8697
Public Works	0.1915	0.3944	0	1

All public procurement contract disputes resolved at the Ministry of Corruption's tribunal between 2007 and 2020 are included; $N = 214$.

Table 2: Duration

	(1) OLS (naive)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert	0.498***	0.398**	0.462**	0.448***
	(0.0632)	(0.203)	(0.196)	(0.166)
Value	0.0265	0.0305	0.0280	0.0394*
	(0.0229)	(0.0224)	(0.0231)	(0.0209)
Queries	0.00556***	0.00587***	0.00567***	0.00424**
	(0.00199)	(0.00202)	(0.00197)	(0.00176)
Revenue	-0.00549	-0.00550	-0.00550	-0.00959
	(0.00687)	(0.00623)	(0.00617)	(0.00752)
Equity	0.000267	0.000441	0.000331	0.000585
	(0.000482)	(0.000455)	(0.000487)	(0.000609)
Population	-0.0254**	-0.0258**	-0.0256**	-0.0193*
	(0.0120)	(0.0111)	(0.0109)	(0.0114)
Corruption Index	-0.725***	-0.703***	-0.717***	-0.746***
	(0.143)	(0.130)	(0.137)	(0.196)
Public Works	0.167**	0.156**	0.163**	-0.0434
	(0.0801)	(0.0731)	(0.0732)	(0.110)
Constant	7.510***	7.619***	7.550***	6.388***
	(0.186)	(0.289)	(0.273)	(0.238)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.656	0.652	0.655	0.654
Obs.	214	214	214	167
First Stage Results				
Technical Panel		-0.240***	-0.219***	-0.284***
		(0.048)	(0.050)	(0.047)
Open Tendering		0.225**	0.287**	0.302**
		(0.086)	(0.116)	(0.120)
Rob. test of endogeneity		0.213	0.032	0.170
Eff. F statistic test		12.459*	11.335*	16.980**

Dependent variable is the duration of the dispute. The variables Duration, Value, Revenue, and Population are all log transformed. The 2SLS estimations in (2), (3), and (4) use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure, (1) and (2), non-open procedure, (3), or omitted, (4). Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The bottom panel presents the results from the first-stage estimation. All estimations use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. The effective F-statistic test is the weak-instrument test by Montiel Olea and Pflueger [2013] under the null of weak instruments for a weak-instrument threshold of $\tau = 10\%$.

Table 3: Award

	(1) OLS (naive)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert	0.0508	0.0108	0.0812	0.0510
	(0.0765)	(0.150)	(0.115)	(0.118)
Value	-0.0316*	-0.0301	-0.0328	-0.0428**
	(0.0180)	(0.0228)	(0.0203)	(0.0200)
Queries	-0.00319*	-0.00307**	-0.00329**	-0.00269***
	(0.00177)	(0.00144)	(0.00159)	(0.000996)
Revenue	0.00428	0.00428	0.00428	0.0165***
	(0.00719)	(0.00650)	(0.00640)	(0.00558)
Equity	0.000887***	0.000957**	0.000834**	0.000907***
	(0.000219)	(0.000407)	(0.000335)	(0.000257)
Population	0.0123	0.0122	0.0124	0.0119
	(0.0127)	(0.0110)	(0.0115)	(0.0106)
Corruption Index	0.241	0.250	0.234	0.163
	(0.176)	(0.188)	(0.173)	(0.271)
Public Works	0.0575	0.0531	0.0608	0.0204
	(0.0625)	(0.0652)	(0.0598)	(0.0980)
Constant	0.191	0.234	0.158	-0.323
	(0.304)	(0.207)	(0.245)	(0.267)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.238	0.235	0.237	0.276
Obs.	214	214	214	167
First Stage				
Technical Panel		YES	YES	YES
Open Tendering		YES	YES	YES

Dependent variable is the size of the arbitral award, normalized by the total value of the dispute. The variables Value, Revenue, and Population are all log transformed. The 2SLS estimations in (2), (3), and (4) use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure, (1) and (2), non-open procedure, (3), or omitted, (4). Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

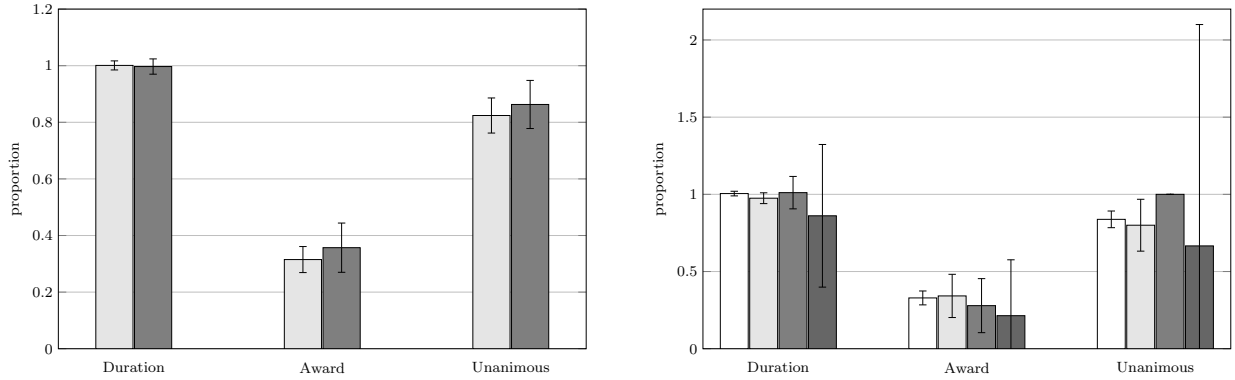
Table 4: Uncertainty

	(1) OLS (naive)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert	-0.0672	-0.0410	0.0348	-0.0438
	(0.0626)	(0.200)	(0.196)	(0.162)
Value	-0.00417	-0.00521	-0.00819	0.0173
	(0.0179)	(0.0176)	(0.0174)	(0.0225)
Queries	0.00313	0.00304*	0.00281*	0.00136
	(0.00192)	(0.00173)	(0.00164)	(0.00159)
Revenue	-0.00273	-0.00272	-0.00272	0.000927
	(0.00688)	(0.00610)	(0.00598)	(0.0118)
Equity	-0.000754	-0.000799	-0.000931	-0.000873
	(0.000881)	(0.000752)	(0.000781)	(0.000641)
Population	0.00762	0.00770	0.00793	0.00513
	(0.00896)	(0.00817)	(0.00790)	(0.0102)
Corruption Index	-0.184	-0.190	-0.206	0.0296
	(0.176)	(0.148)	(0.143)	(0.183)
Public Works	-0.0305	-0.0277	-0.0194	0.0445
	(0.0894)	(0.0766)	(0.0787)	(0.0984)
Constant	0.717***	0.689**	0.607**	0.118
	(0.230)	(0.327)	(0.308)	(0.230)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.159	0.158	0.147	0.226
Obs.	214	214	214	167
First Stage				
Technical Panel		YES	YES	YES
Open Tendering		YES	YES	YES

Dependent variable is equal to one if the arbitrators made a unanimous decision. The variables Value, Revenue, and Population are all log transformed. The 2SLS estimations in (2), (3), and (4) use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure, (1) and (2), non-open procedure, (3), or omitted, (4). Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

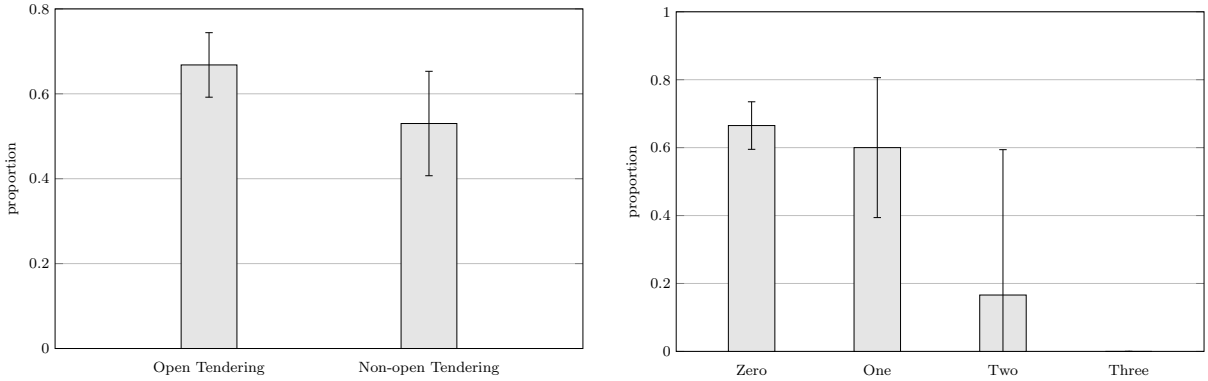
Figures

Figure 1: Outcomes and Use of Open Tendering & Technical Experts



The left panel depicts the prevalence of the use of an open tendering process. The right panel depicts the use of technical experts as arbitration panelists. In the left panel, the light gray columns represent mean of the sample of disputes with an open tendering process. The dark gray columns present the mean of the sample of disputes without an open tendering process. Duration is normalized by the (full sample) mean to allow for all three outcome variables to be presented on the same figure. In the right panel, from left to right, the columns represent the mean of the sample of disputes with zero, one, two, or three technical expert arbitrators on the panel, respectively. The 95% confidence intervals are depicted. For the left panel, a two-tailed, difference-in-mean t-test between those with and those without an open, competitive tendering procedure has $t = -0.2115$, $t = 0.911$, $t = 0.715$ for the three variables, respectively. Each has $p > 0.1$. A two-sample Wilcoxon rank-sum (Mann-Whitney) test is also performed for the three variables: $z = -0.085$, $z = 0.217$ and $z = 0.716$, respectively. Again each has $p > 0.1$. Finally, a two-sample Kolmogorov-Smirnov test for equality of distribution functions for the three variables. Again each has $p > 0.1$. For the right panel, a multivariate test on means has $F = 2.51$, $F = 0.20$ and $F = 0.68$ for the three variables, respectively. Each has $p > 0.06$.

Figure 2: Open Tendering and Use of Experts



In the left panel, the first column is the proportion of disputes that use an expert in the arbitration proceedings arising from contracts formed with an open tending procedure ($N = 148$). The second column is the proportion of disputes that use an expert in the arbitration proceedings arising from contracts formed without an open tendering procedure ($N = 66$). In the right panel, each column represents the proportion of disputes that use an expert in the arbitration proceedings arising from panels formed with zero ($N = 180$), one ($N = 25$), two ($N = 6$), or three ($N = 3$) technical panelists, respectively. The 95% confidence intervals are depicted. For the right panel, a two-tailed, difference-in-mean t-test has $t = 1.943$ with $p = 0.053$. For the right panel, a multivariate test on means has $F = 3.86$ with $p = 0.010$.

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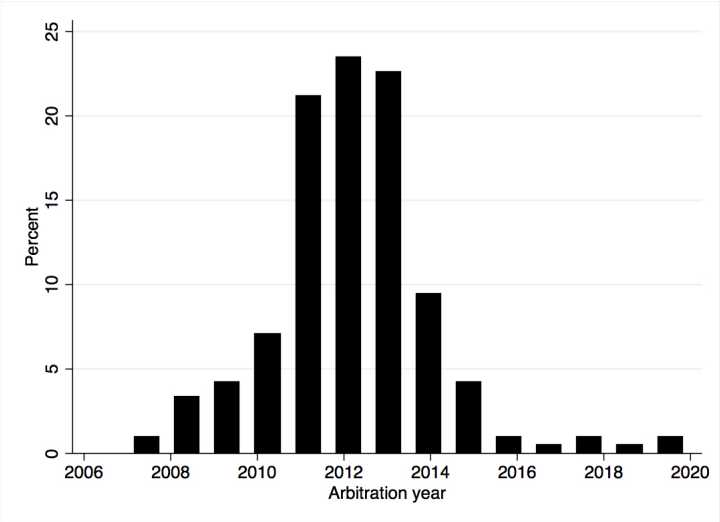
Appendix

Figure 3 presents the histogram of the distribution of arbitration disputes over time in our data set. Figure 4 provides the average award outcome over time. The data set is collapsed to present the mean value for each year. Figure 5 provides the fitted values for each year.

Figure 3: Number of Arbitration Cases by Year



The bulk of the observations come from the years 2011-13. As shown in Figure 4 the arbital award is quite consistent over this relevant time period. Further, the fitted values for the arbital award is also rather flat over the entire time period, but especially so for the 2011-13 time period.

Table 5 compares the mean values for the outcome variables and the control variables for the sample of observations with an open tendering process and not using an open tendering process. The final column provides the results of a difference-in-means t-test.

There are not any important discrepancies, except for *Queries* and *Publicworks*, between the mean value of the control variables for those procurement contracts which used the open tendering process and those that did not.

Table 6 compares the mean values for the outcome variables and the control variables partitioning the sample by the number of arbitrators on the panel who are technical experts. The final column provides the results of a multivariate F-test.

Table 7 compares the mean values for the outcome variables and the control variables for the sample of observations with an expert witness being used and those without an expert witness. The final column provides the results of a difference-in-means t-test.

The following (and final) three tables re-estimate the three primary tables in the body of the text, but only use the open tending process indicator variable as an instrument.

Figure 4: Outcome Average by Year

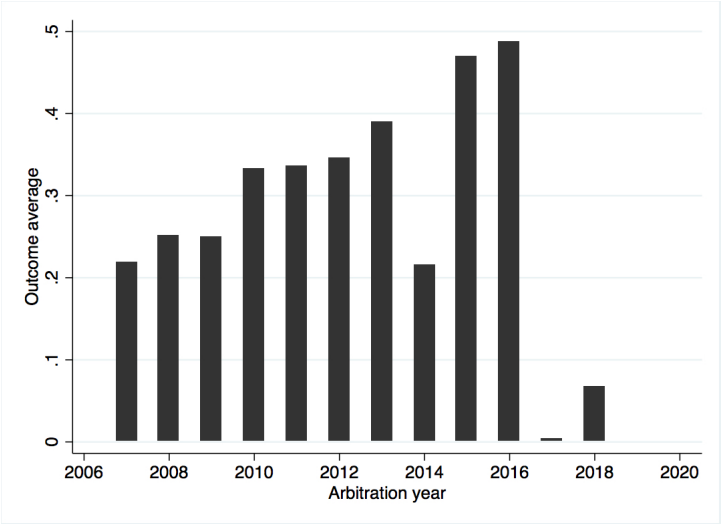


Figure 5: Predicted Values by Year

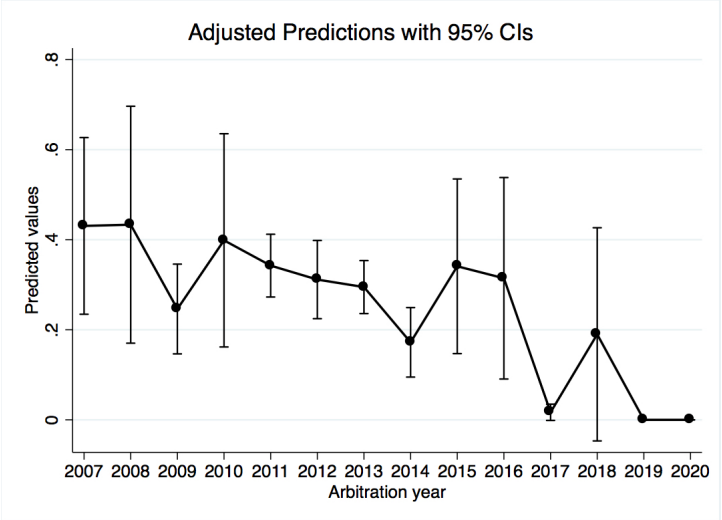


Table 5: Variable Means by Open Tendering Procedure

	open tendering procedure		t-test
	= 0	= 1	
ln(Duration)	6.0985	6.1182	-0.2115
Award	0.3570	0.3152	0.9112
Unanimity	0.8636	0.8243	0.7156
ln(Value)	1.1949	0.7293	1.6372
Queries	9.6969	12.8378	-2.1616 **
ln(Revenues)	14.0253	15.0003	-1.6055
Equity	18.0403	14.1175	0.6605
ln(Population)	12.7438	12.5853	0.3079
Corruption index	0.2589	0.2306	1.0013
Public Works	0.5	0.0540	8.9419 ***

Table 6: Variable Means by the Number of Technical Panelists

	technical Panel				F-test
	= 0	= 1	= 2	= 3	
ln(Duration)	6.1443	5.9653	6.1829	5.2644	2.51 *
Award	0.3296	0.3429	0.2793	0.2140	0.20
Unanimity	0.8388	0.8000	1.0000	0.6667	0.68
ln(Value)	1.0049	0.2685	0.3997	-1.0646	2.27 *
Queries	12.2333	10.04	10	9	0.52
ln(Revenues)	14.7012	14.6413	14.9501	14.5876	0.01
Equity	17.2698	2.3023	13.8316	10.3133	1.04
ln(Population)	12.9220	11.5844	10.0651	9.2537	3.33 **
Corruption index	0.2379	0.2321	0.1959	0.4721	1.62
Public works	0.2222	0.040	0.0000	0.0000	2.34 *

Table 7: Mean Groups by Expert Witness

	external expertise		t-test
	= 0	= 1	
ln(Duration)	5.6607	6.3816	-9.7402 ***
Award	0.3023	0.3435	-0.9387
Unanimity	0.8875	0.8059	1.5617
ln(Value)	0.4371	1.1331	-2.5883 ***
Queries	8.8375	13.6791	-3.5542 ***
ln(Revenues)	14.7891	14.6461	0.2451
Equity	8.6252	19.3286	-1.9020 *
ln(Population)	12.6063	12.6509	-0.0908
Corruption index	0.2360	0.2413	-0.1976
Public works	0.275	0.1417	2.4171 **

Table 8: Duration - Robustness checks

	(1) IV (2SLS)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert Witness	0.267	0.715*	0.866***	0.788**
	(0.252)	(0.418)	(0.312)	(0.344)
Value	0.0356*	0.0180	0.0121	0.0300
	(0.0214)	(0.0315)	(0.0278)	(0.0281)
Queries	0.00628***	0.00488**	0.00440	0.00306
	(0.00223)	(0.00231)	(0.00286)	(0.00243)
Revenue	-0.00552	-0.00547	-0.00545	-0.0152
	(0.00650)	(0.00644)	(0.00693)	(0.00966)
Equity	0.000668	-0.000109	-0.000372	0.000147
	(0.000614)	(0.000655)	(0.000626)	(0.000659)
Population	-0.0262**	-0.0248**	-0.0243**	-0.0208*
	(0.0116)	(0.0106)	(0.0104)	(0.0123)
Corruption Index	-0.675***	-0.772***	-0.805***	-0.799***
	(0.135)	(0.170)	(0.184)	(0.270)
Public Works	0.142*	0.191**	0.208**	0.00773
	(0.0760)	(0.0903)	(0.0862)	(0.134)
Constant	7.760***	7.276***	7.112***	6.394***
	(0.353)	(0.468)	(0.374)	(0.262)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.634	0.636	0.599	0.624
Obs.	214	214	214	167
First Stage Results				
Technical Panel	-0.218***			
	(0.048)			
Open Tendering		0.180**	0.283**	0.277**
		(0.073)	(0.108)	(0.112)
Rob. test of endogeneity	0.599	0.276	1.482	0.578
Eff. F statistic test	20.673*	6.074	6.946	6.251

Dependent variable is the number of days between the filing of the dispute and its resolution (log transformed). The variables Value, Revenue, and Population are all log transformed. All disputes between 2007 and 2020 included; $N = 214$. Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p <0.05, *p¡0.1$. The bottom panel presents the results from the first-stage estimation. All estimations use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure (2), non-open procedure (3), or omitted (4). The effective F-statistic test is the weak-instrument test by Montiel Olea and Pflueger [2013] under the null of weak instruments for a weak-instrument threshold of $\tau = 10\%$.

Table 9: Award - Robustness checks

	(1) IV (2SLS)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert Witness	0.134	-0.286	-0.0276	-0.124
	(0.151)	(0.331)	(0.213)	(0.235)
Value	-0.0349*	-0.0184	-0.0286	-0.0380*
	(0.0209)	(0.0304)	(0.0203)	(0.0207)
Queries	-0.00345*	-0.00214	-0.00295*	-0.00208
	(0.00180)	(0.00170)	(0.00156)	(0.00140)
Revenue	0.00429	0.00424	0.00427	0.0194***
	(0.00635)	(0.00752)	(0.00659)	(0.00637)
Equity	0.000744*	0.00147**	0.00102**	0.00113***
	(0.000389)	(0.000700)	(0.000407)	(0.000346)
Population	0.0126	0.0113	0.0121	0.0126
	(0.0120)	(0.00909)	(0.0107)	(0.00984)
Corruption Index	0.223	0.314	0.258	0.190
	(0.172)	(0.236)	(0.176)	(0.299)
Public Works	0.0665	0.0207	0.0489	-0.00596
	(0.0598)	(0.0868)	(0.0627)	(0.103)
Constant	0.102	0.556*	0.276	-0.326
	(0.266)	(0.292)	(0.325)	(0.258)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.226	0.042	0.228	0.228
Obs.	214	214	214	167
First Stage				
Technical Panel	YES	NO	NO	NO
Open Tendering	NO	YES	YES	YES

Dependent variable is the size of the arbitral award, normalized by the total value of the dispute. The variables Value, Revenue, and Population are all log transformed. All disputes between 2007 and 2020 included; $N = 214$. Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05, *$p¡0.1. The 2SLS estimations in (1), (2), (3) and (4) use Value, Queries, Revenue, Population (each log transformed), Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure (2), non-open procedure (3), or omitted (4).

Table 10: Unanimity - Robustness checks

	(1) IV (2SLS)	(2) IV (2SLS)	(3) IV (2SLS)	(4) IV (2SLS)
Expert Witness	0.130	-0.456	-0.164	-0.202
	(0.257)	(0.317)	(0.237)	(0.264)
Value	-0.0120	0.0111	-0.000366	0.0216
	(0.0176)	(0.0234)	(0.0197)	(0.0259)
Queries	0.00251	0.00435	0.00343*	0.00191
	(0.00175)	(0.00302)	(0.00200)	(0.00189)
Revenue	-0.00270	-0.00277	-0.00274	0.00356
	(0.00593)	(0.00782)	(0.00645)	(0.0133)
Equity	-0.00110	-7.83e-05	-0.000585	-0.000669
	(0.000847)	(0.000819)	(0.000860)	(0.000694)
Population	0.00823	0.00641	0.00732	0.00583
	(0.00789)	(0.00997)	(0.00825)	(0.0112)
Corruption Index	-0.227	-0.100	-0.164	0.0543
	(0.149)	(0.207)	(0.161)	(0.181)
Public Works	-0.00900	-0.0729	-0.0411	0.0207
	(0.0830)	(0.0798)	(0.0805)	(0.0937)
Constant	0.503	1.138***	0.822**	0.115
	(0.362)	(0.423)	(0.324)	(0.230)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	-	0.112	-	0.148
Obs.	214	214	214	167
First Stage				
Technical Panel	YES	NO	NO	NO
Open Tendering	NO	YES	YES	YES

Dependent variable is equal to one if the arbitrators made a unanimous decision. The variables Value, Revenue, and Population are all log transformed. All disputes between 2007 and 2020 included; $N = 214$. Clustered standard errors presented in parentheses; *** $p < 0.01$, ** $p <$0.05, $*$pj0.1. The 2SLS estimations in (1), (2), (3) and (4) use Value, Revenue, Population (each log transformed), Queries, Capitalization Index, Corruption Index, Public Works, year indicators and region fixed effects as other instruments. Missing values in Open Tendering instrument are imputed to open procedure (2), non-open procedure (3), or omitted (4).

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ISBN 9788868514365