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Expert Witnesses and Arbitration Outcomes: Insights from Public Procurement Contract Disputes

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Abstract

We explore the use of expert witnesses 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. Arbitration mechanisms tend to give arbitrators discretion in how to proceed. Consequently, principal-agent problems can arise. Using an IV approach, we show that the use of an expert witness 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.

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

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

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 a 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 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. We argue that this opens up the possibility of principal-agent problems. While the participants selected to use arbitration to (presumably) quicken the process, the arbitrators may not necessarily put a premium on speed and, instead, put more weight on accuracy (or could benefit financially from a more drawn out dispute that increases the arbitrator's fees).

We argue that one important decision that affects the speed at which arbitration resolves disputes is the choice to use an expert witness. For public procurement contracts, individuals can be employed to estimate

²There 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.

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

⁴In 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.

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 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 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] 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 expert witnesses. 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.⁵ 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

⁵Webb and Wagar [2018] evaluate an expedited arbitration mechanism used in Canadian labor-management disputes and show that it quickens the dispute’s resolution.

is unaffected, but the duration of the dispute is extended.

2 Public Procurement Contracts & Arbitration 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. In line with the European Directives, the NPCC establishes rules for procurement by contracting authorities (hereafter CAs).

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 party may submit a tender in response to a call for competition) or restricted. In case of public contracts below the European monetary thresholds, CAs may skip ordinary procedures and use instead direct award or negotiated procedures with a minimum number of bidders.

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.

The PCC set up the *Autorità per la vigilanza sui lavori pubblici* (hereafter ANAC), an independent administrative authority regulating procurement and implementing anticorruption policy. Importantly, it provides a number of services including those of the Chamber of Arbitration.

For public procurement contracts, the NPCC allows arbitration as an ordinary litigation remedy alternative to trial before a court. To do so the CA shall indicate in the call for tender the intention to adopt an *ex ante* arbitration clause. *Ex-post* arbitration agreements are forbidden. When a dispute arises each party nominates the arbitrator of its choice from among professionals with special expertise on the the topic of the contract. The third arbitrator (i.e., the Chairman of the arbitration panel) 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.

The NPCC 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.⁶

⁶Professionals 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.

3 Data

From the text of the contract disputes filed at the Chamber of Arbitration, we 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. The number of days between these two makes up our *Duration* variable. Second, the votes of the three arbitrators is recorded. We create an indicator variable equal to one if they reach a unanimous decision; *Unanimous*. Third, we record the outcome (in Euros) of the dispute; *Award*. We normalize this by the initial amount claimed. Thus, one can interpret the award outcome as the proportion of the total dispute that is chosen. It is important to do this to disentangle the relative “victory” of one party from the stakes involved, which will be included as a control variable *Value*.

A number of control variables are also derived. 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 ($= \text{Net Worth} / \text{Total Assets}$) 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*.⁷ Also, it represents the size of the municipality, which proxies strong legal skills and the ability to draft comprehensive contracts. Further, we control for the local environment where the municipality operates. We 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*.

Given our interest in exploring the role of expert witnesses, three additional variables are considered. We create *Expert Witness*, which is equal to one if an outside expert witness was used in the arbitration proceedings. Further, we create *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.

4 Identification Strategy

Our objective is to identify the causal impact of the use of an outside, expert witness 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.

⁷Population data comes from the Italian National Institute of Statistics.

To deal with the endogeneity problem, we use an instrumental variables approach. Specifically, we will use two instruments for the use of an expert witness: (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 expert witness 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.

Even the background of the members of the panel could be associated with the likelihood of using an expert witness 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.⁸ This strong homogeneity creates the need to use an expert witness 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.

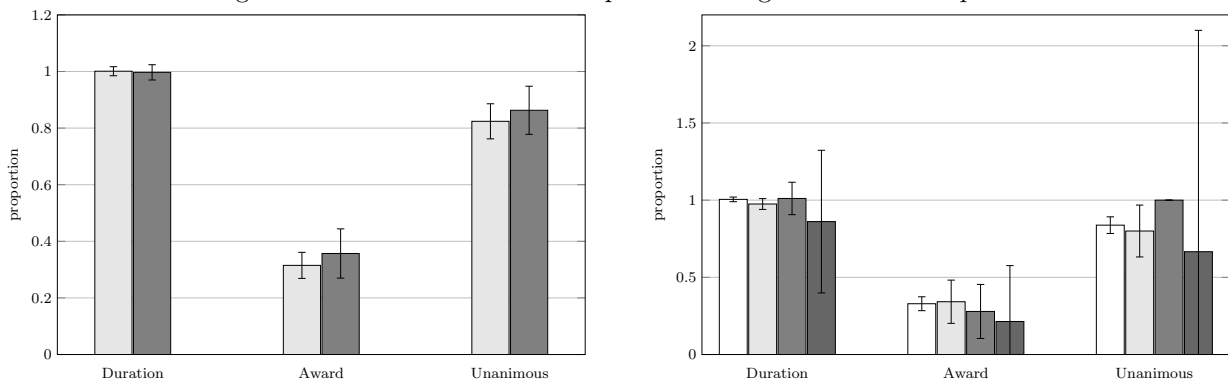
We feel that both the process used to select the service provider and the panel's background are unlikely to be directly associated with the outcome of the arbitration. There is no reason to believe that the manner in which the contract and the panel were formed will affect how long it takes for arbitrators 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 tendering 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.

⁸Nearly 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.

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 $p > 0.06$.

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.

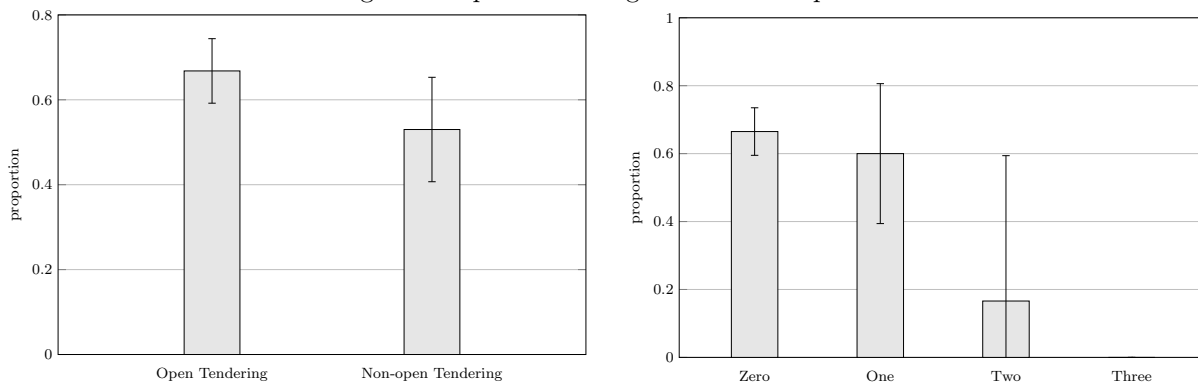
Use of an open-tendering process is associated with a statistically significant reduction in the proportion of observations which involve expert witnesses. In addition, there is a monotonically decreasing relationship between the number of technical experts on the arbitration panel and the proportion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

$$Y_{irt} = \alpha_1 ExpertWitness_{irt} + X_{irt}\alpha + \rho_{ir} + \tau_{it} + \epsilon_{irt}. \quad (1)$$

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. We 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

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

Figure 2: Open Tendering and Use of Experts



In the left panel, the first column is the proportion of disputes that use an expert witness in the arbitration proceedings arising from contracts formed with an open tendering procedure ($N = 148$). The second column is the proportion of disputes that use an expert witness in the arbitration proceedings arising from contracts formed with without an open tendering procedure ($N = 66$). In the right panel, each column represents the proportion of disputes that use an expert witness 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 $p = 0.010$.

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 expert witness slows down the arbitration process. Table 1 presents the results with $Y = Duration$.

The naive OLS regression, (1), reports a positive and highly statistically-significant relationship between the use of an expert witness and the duration of the arbitration proceeding. This represents an increase in the duration by more than $\frac{5}{6}$ 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 an expert witnesses, 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 Figure 2 an open, competitive process and the presence of technical expert panelists are highly associated with the use of expert witnesses. As a robustness check, we employ one instrument at a time, re-running Equation 2 using only *Technical Panel* or *Open Tendering*. Although the main results

Table 1: Duration

	(1)	(2)	(3)	(4)
	OLS	IV	IV	IV
	(naive)	(2SLS)	(2SLS)	(2SLS)
Expert Witness	0.505 *** (0.0630)	0.453 ** (0.216)	0.494 ** (0.243)	0.479 ** (0.192)
Value	0.0395 * (0.0205)	0.0420 ** (0.0201)	0.0400 * (0.0211)	0.0504 ** (0.0211)
Revenue	-0.00365 (0.00654)	-0.00360 (0.00605)	-0.00364 (0.00613)	-0.00865 (0.00928)
Equity	0.000325 (0.000514)	0.000418 (0.000544)	0.000344 (0.000566)	0.000592 (0.000521)
Population	-0.0261 ** (0.0123)	-0.0262 ** (0.0111)	-0.0261 ** (0.0109)	-0.0208 * (0.0117)
Corruption Index	-0.727 *** (0.148)	-0.716 *** (0.224)	-0.725 *** (0.229)	-0.751 ** (0.334)
Public Works	0.158 ** (0.0781)	0.152 ** (0.0759)	0.157 ** (0.0752)	-0.0402 (0.126)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.651	0.650	0.651	0.652
Obs.	214	214	214	167
First Stage Results				
Technical Panel		-0.241 *** (0.050)	-0.221 *** (0.053)	-0.285 *** (0.048)
Open Tendering		0.228 ** (0.083)	0.290 ** (0.128)	0.305 ** (0.140)
Rob. test of endogeneity		0.056	0.053	0.001
Eff. F statistic test		11.394 **	9.766 **	13.881 **
Sargan test		1.015	1.021	1.753

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; $N = 214$. Robust 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. The 2SLS estimations in (2), (3) and (4) use Value, 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, (1) and (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 $\tau = 10\%$.

still hold, we observe that the effective F-test on weak instruments cannot be rejected. This is an indication that the two instruments are not strong enough when used separately, supporting the results of Table 1.

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 2 duplicates the results presented in the top panel of Table 1, 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 3 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 witness, 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. Their design must trade 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 public court system is unlikely to be preferable in all contracting environments. Hence, arbitration serves as an alternative 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 expert witnesses are hired to testify in these cases.

Using an instrumental-variables approach we identify the causal impact of the use of expert witnesses.

Table 2: Award

	(1)	(2)	(3)	(4)
	OLS	IV	IV	IV
	(naive)	(2SLS)	(2SLS)	(2SLS)
Expert Witness	0.0469 (0.0801)	-0.0179 (0.142)	0.0624 (0.140)	0.0311 (0.116)
Value	-0.0391 ** (0.0155)	-0.0361 *** (0.0135)	-0.0398 *** (0.0135)	-0.0498 *** (0.0136)
Revenue	0.00322 (0.00728)	0.00328 (0.00576)	0.00321 (0.00568)	0.0159*** (0.00562)
Equity	0.000854 *** (0.000224)	0.000969 *** (0.000355)	0.000827 ** (0.000370)	0.000903 *** (0.000277)
Population	0.0127 (0.0125)	0.0125 (0.00847)	0.0127 (0.00853)	0.0128 (0.00954)
Corruption Index	0.242 (0.177)	0.256 (0.274)	0.239 (0.271)	0.166 (0.340)
Public Works	0.0627 (0.0630)	0.0553 (0.0672)	0.0645 (0.0655)	0.0183 (0.116)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.231	0.224	0.231	0.270
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), 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). Robust standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Uncertainty

	(1)	(2)	(3)	(4)
	OLS	IV	IV	IV
	(naive)	(2SLS)	(2SLS)	(2SLS)
Expert Witness	-0.0635 (0.0698)	-0.0139 (0.194)	0.0504 (0.189)	-0.0339 (0.153)
Value	0.00313 (0.0185)	0.000806 (0.0196)	-0.00221 (0.0198)	0.0208 (0.0212)
Revenues	-0.00169 (0.00624)	-0.00174 (0.00560)	-0.00180 (0.00556)	0.00123 (0.0113)
Equity	-0.000721 (0.000699)	-0.000809 (0.000706)	-0.000923 (0.000733)	-0.000871 (0.000679)
Population	0.00728 (0.0117)	0.00745 (0.0105)	0.00767 (0.0104)	0.00466 (0.0130)
Corruption Index	-0.186 (0.257)	-0.196 (0.227)	-0.210 (0.225)	0.0283 (0.203)
Public Works	-0.0357 (0.0781)	-0.0300 (0.0706)	-0.0226 (0.0722)	0.0455 (0.105)
Year Controls?	YES	YES	YES	YES
Region Fixed Effects?	YES	YES	YES	YES
R^2	0.155	0.152	0.139	0.225
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), 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). Robust standard errors presented in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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 expert witnesses. Further, we show that the use of 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 expert witnesses in these cases creates costs without a measurable benefit.

While it is difficult to assess accuracy, the expectation is that the use of these expert witnesses 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.

Our observation complements 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 contract renegotiations. It is possible that the expert's use 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.

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