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COURT EFFICIENCY AND PROCUREMENT PERFORMANCE

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June 2013

"MARCO FANNO" WORKING PAPER N.164

Court Efficiency and Procurement Performance*

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June 27, 2013

Abstract

Disputes on the penalties enforceable for breach of contract are often solved in court. Using a large dataset on Italian public procurement contracts, we study the effects of the inefficiency of the local law courts on the delay with which contractors deliver public works. First we sketch a simple model to see how inefficient law courts - i.e. those characterized by longer average duration of trials - may induce public buyers to refrain from enforcing penalties for late delivery in order to avoid costly disputes in court. Then our empirical findings show that, where the local law courts are inefficient: i) public works are delivered with longer delays, and this applies particularly to higher-value contracts - i.e. complex projects; ii) contracts are more often awarded to larger firms; and iii) on average, a higher share of final payment in contracts is adopted. These results are not driven by omitted environmental variables, since we show that delays in the completion of contracted works are still affected by the efficiency of the local law courts after including province-related fixed effects in the model and considering other possible explanations for our findings.

JEL-Code: H57; L33; K41.
Keywords: "efficiency" of the law courts, enforcement of contract obligations, public procurement contracts, time incentives.

*We are indebted to participants at the Workshop on Procurement and Corruption, Toulouse, April 2011; the PPP Chaire Conference, Paris, May 2011; the Italian Society of Law and Economics, Turin, December 2011; the Workshop on "Public Procurement: Current Research Trends", Moscow, October 2012; the Seminar at the Universit de Paris 1 Panthon-Sorbonne, CES, November 2012; the ISNIE conference in Florence, June 2013; the 2013 Conference of French Economic Association, Aix en Provence; and to Alberto Bennardo, Antonio Estache, Matteo Colombo, Claudine Desrieux, Michael Klien, Elisabetta Iossa, Marian Moszoro, Antonio Nicolo', Elena Podkolzina, Silvia Rizzuto, Stephane Saussier, Carine Staropoli, Steve Tadelis, for their comments. We gratefully acknowledge the financial support of the Italian Ministry of Education, University and Research (grant PRIN2008PYFHY/02) and the University of Padova (grant N. CPDA084881/08).

1 Introduction

Explicit contracting is the crucial governance instrument for public procurement transactions because accountability concerns severely limit civil servants' discretion and, with it, the scope for relational contracting (Kelman, 1990 and 2002). Similarly, reputational considerations based on assessing non-verifiable performance are typically not allowed in the evaluation of public procurement tenders.[1]

Contract enforcement costs can be significant where the law court system is inefficient, i.e. if judicial proceedings can be expected to last a long time (Djankov et al., 2003).[2] Contracting parties may therefore choose ex-post not to exercise their contractual rights if the benefits are lower than the costs of doing so. In public procurement contracts, high enforcement costs thus mean that buyers are unable to deter suppliers from adopting an opportunistic behavior.

In this paper, we empirically verify whether firms' opportunistic behavior in public procurement transactions is more likely when the local court is less efficient, and we theoretically investigate how this is the result of an equilibrium strategy in the Italian institutional setting. We specifically focus on contractors' opportunism in terms of delivery delays. As Lewis and Bajari stressed (2011), delivery time is often an important dimension of contract quality and its breach can generate significant negative externalities on end users. According to Italian public procurement regulations, a penalty for late delivery should be included in all awarded public contracts. This penalty is calculated for every day of delay as a percentage of the contract value and capped in its total amount. If contractors (suppliers) are late in delivering the contracted works, the contracting authorities (buyers) can exercise this penalty directly. Supplier might then sue buyers in the local civil courts to recover all or part of the penalty by demonstrating that they were not, or only partially, responsible for the delay.

In a simple theoretical setting we characterize the conditions under which it is an equilibrium strategy for the contractor firm (F) to delay the work's delivery and file a claim against the penalties

[1] This is particularly true in Europe where reputational considerations are (erroneously) seen by legislators as a source of entry deterrence and discrimination against foreign suppliers (EC Directives 17 and 18, 2004). The consequently crucial role of explicit contracts in public procurement thus makes the efficiency of the law courts for enforcement purposes particularly relevant.

[2] The literature on law court systems also investigates efficiency in terms of the judge's honesty and fairness in his decisions, corruption, and access to justice. Our study focus mainly (both empirically and theoretically) on their efficiency in terms of the time it takes for disputes to be settled by the court.

imposed by the contracting authority (CA), and for the latter do not defeat the contractor claim in court and not enforce the penalty. According to our model, this occurs when the cost F faces to file a claim in court is not too large, and the cost the CA incurs to defeat the claim in court is sufficiently high. The difference between the two parties' costs is enhanced when the courts take a long time to reach a sentence because then the CA will face additional social costs due to the end users' access to the completed works being further delayed until the legal dispute is over. Note that a F's opportunistic behavior, as described in our simple model and highlighted by our empirical results, resembles that of the plaintiff in a "nuisance suit", as investigated by Rosenberg and Shavell (1985): paraphrasing those authors' words for the purposes of our setting, the possibility of a "nuisance suit" arises whenever the plaintiff (the F, in our case) "is able to obtain a positive settlement from the defendant" (the CA). These authors also underline that defeating a claim usually means engaging in actions to gather evidence to support the defendant's contention that are frequently more costly than filing the claim.

Data and empirical results. We use data on public works collected by the Italian Authority for Vigilance over Contracts for Public Works, Services and Supplies (AVCP) for the years 2000 to 2006. This dataset includes information on all contracts for public works valued at 150,000 euros or more awarded in Italy; it is characterized by a great variability in terms of category, size, complexity and geographical location of the works concerned, giving us the opportunity to test our model's predictions and other hypotheses without having to limit our attention to very particular markets. The dataset contains information on several aspects of each procurement contract, such as awarding mechanism, starting value, execution time and costs. Concentrating on late delivery of the contracted works, we find a marked variability between provinces, categories and size of works, with delays averaging around 157 days and reaching peaks of more than 1500 days.

We merge this dataset with information collected by the ISTAT (Italian Statistics Institute) on the duration of civil trials by province for each year and with and other provincial time-varying characteristics. Duration of trials has a large variability among provinces and over time: it ranges from about 200 to over 2000 days, with a mean value of about 900 days, during the period considered.

We estimate a model specification that includes controls for the category and complexity of the works, contract awarding mechanisms, province (or CA) and year fixed effects. Our results show that the execution of public works is positively and significantly associated with the duration of

civil trials, particularly in the case of larger and more complex projects.

We test whether law court inefficiency coincides systematically with the selection of certain types of F. For a sub-sample of contracts, we can name the winner: by using the F's business entity as a proxy of the F's size, our estimates indicate that where trials take longer, contracts are more likely to be awarded to larger F's, and this suggests that larger Fs might incur lower costs as a result of lengthy legal proceedings. This finding is in line with previous evidence; for instance, Laeven and Woodruff (2007) show that the legal system has a lower impact on partnerships and corporations than on proprietorships, since in the latter the risk is concentrated in a single owner.

We also investigate whether public administrations use final payments as a means for containing contractor firms' delivery delays (the larger the final payment, the smaller the gain from delaying for the firm). We find that the duration of trials is generally associated positively and significantly with proportionally larger final payments: it appears that where the law courts are inefficient, CAs use final payments as sticks to ensure that the contracted delivery times are met.

Finally, as a further robustness check, we consider different explanations for our findings on delivery delays relating to corruption and to the role of the CA's fiscal restraints. We show that our main result remains much the same and is apparently unaffected by these factors.

Related literature. Our paper relates to three main strands of economic literature. First, there have recently been works on time incentives in public procurement contracts. In particular, Lewis and Bajari (2011) theoretically and empirically investigate an innovative awarding procurement design adopted by the California Department of Transportation that provides for explicit time incentives. They even estimate the benefit in terms of social welfare of including project completion time in the auction mechanism. D'Alpaos et al. (2013) show that, when penalties for late delivery are included in the contract, the F's choice concerning the execution time can be modeled as a real option (i.e. a Put Option). This choice is affected by the volatility of investment costs and the enforcement of penalty clauses (i.e. considering both judicial discretion and court inefficiency); the higher the former, and the lower the latter, the greater the penalty needed to oblige Fs to give up the potential savings they obtain by delaying the delivery of the works. We contribute to this literature by providing an empirical test on the interactions between the contract delivery penalties and their enforcement by the local law courts.

Second, there is strand of empirical literature on the costs related to the legal enforcement of

contractual obligations. Djankov et al. (2003) show how much these costs are linked to court efficiency in various legal systems. Using the length of a trial in civil courts as a measure (among others) of judicial efficiency in 109 countries, they investigate how a law court's efficiency depends on different levels of procedural "formalism". Their empirical findings demonstrate that the level of such formalism is higher in civil than in common law countries, and is typically associated with trials being expected to last longer, less fair sentences and more corruption. The authors emphasize that an inefficient judicial enforcement of contractual clauses often gives rise to agents adopting an opportunistic behavior and out-of-court litigation solutions. Jappelli et al. (2005) investigate the effect of judicial enforcement on credit markets: testing their model on a panel data from Italian provinces, they find that the duration of civil trials and the stock of pending civil trials per inhabitant correlate negatively with loans granted to local firms, and positively with credit constraint measures. Chemin (2012) empirically studies the effect of judicial reforms implemented in India in 2002 on small firms' performance, finding that expediting the disposal of civil suits enables fewer breaches of contract, encourages investments, and facilitates firm's access to finance. We contribute to this literature with empirical evidence of the cost - in terms of performance in public procurement contracts - of legally enforcing contractual obligations where local law courts are inefficient.

Third, a body of empirical and theoretical literature focuses on the rising use of relational contracts to escape the adverse effects of weak contracting institutions. Johnson et al. (2002) analyze the role of court efficiency in maintaining trust and reducing transaction costs in private procurement transactions in developing countries. Their findings show that, although the main instruments for governing buyer-supply exchanges are long-term relationships, transaction costs are significantly lower when courts are effective. Recent theoretical papers have analyzed parties' ex-post decisions whether or not to enforce previously-signed explicit contractual clauses by weighting the costs and benefits of doing so (Chakravarty and MacLeod, 2009; Doornik, 2010; Iossa and Spagnolo, 2011). We contribute to this literature by investigating the possibility that explicit contractual clauses (i.e. penalties for late delivery) are not enforced by public buyers because of the high costs of seeing these clauses disputed in front of inefficient law courts. On the other hand, our empirical results also show that, in provinces where the law courts are slow to act, public buyers wield the "stick" of higher proportions of the payments on completion of the works.

Structure of the paper. In Section 2, we briefly present the relevant institutional details of penalties for late delivery according to the Italian regulations on public procurement (2.1), and a simple model showing how agents may interact in such a setting (2.2). In Section 3, we describe our dataset, showing the cross-sectional variability (across Italian provinces) of delays in the execution of works, and the cross-sectional and time-related variability in the average duration of civil trials. Then, in Section 4, we outline our estimation strategy and the main results of our estimations (4.1). In Section 5, we consider the heterogeneous effects of projects of different size, providing additional evidence on different outcome variables (5.1); we also control for alternative explanations for our results (5.2). Our conclusions are contained in Section 6.

2 Equilibrium delay in delivering Italian public procurement

To investigate Fs' opportunistic behavior in Italian public procurement for the purposes of our empirical analysis, in this Section we briefly illustrate how time incentives and other terms are regulated (Section 2.1). Then we present a simple model describing the equilibrium delay in completing the contracted works from the F's point of view, and the CA's choice whether or not to enforce the agreed penalty for late delivery (Section 2.2).

2.1 Institutional setting of penalty for late delivery

Up until August 2006, contracts for public works in Italy were governed by Law No. 109/94[3] and the Public Procurement Code,[4] which acknowledges the EU Directives 2004/17/EC and 2004/18/EC.[5] Law No. 109/94 saw the light in the early 1990s, immediately after the crushing wave of scandals that literally wiped out a large part of the Italian political class found guilty of systematically using bribery in public procurement to finance their parties (and/or private expenses). This historical context helps us to understand why this law is so strict in reducing the use of auctions with scoring rules, limiting opportunities to award contracts by means of private negotiations, and imposing

[3]Framework Law on Public Works Contracts - a.k.a. "Legge Merloni".

[4]D.Lgs No. 163/2006 - Code for public contracts relating to works, services and supplies.

[5]The Code essentially provides a single framework for contracts for public works, supplies and services, and the rules governing the former are not very different from earlier requirements, since the Regulation (Presidential Decree No. 554/1999) has hardly been touched.

new clauses on price definitions (and revisions).

The contractual terms that Fs have to comply with in the delivery of public works are specified in the call for tenders. In particular, Italian law: i) prescribes time incentive clauses, in the form of damages to be liquidated for late delivery, in all contracts; ii) regulates the lower and upper limit of such penalties, and also caps their total amount; iii) describes the procedures to adopt in the case of delays.[6] Based on these rules, penalties for late delivery are calculated on a daily basis and must be set within the range of 0.03 to 0.1 per cent of the contract value for each day of delay, while their total amount may not exceed 10 percent of said value.[7]

Italian public procurement law grants CAs a considerable degree of discretion in the actual exercise of their right to enforce penalties for late deliveries. Fs can always appeal for all or part of the penalty not to be implemented if they are able to show either that they are not, or not entirely, responsible for the delay (i.e. planning errors, adverse weather conditions, contingencies, etc.), or that the fee is "manifestly disproportionate" to the harm done to the CA's interests. The CA assesses the F's claims and decides whether to wholly - or partially - accept, or reject them. If the CA rejects them, the F can go to court, but this solution is often very time-consuming for both parties due to the typically long time taken to complete civil trials in Italy. Note that the costs incurred by the F and the CA to dispute a case in court may differ substantially. The CA's costs are not limited to the resources needed to defeat the claim: litigation in court means that the works remain inaccessible to end users and the related social welfare loss can affect the CA's reputation and political interests. The longer the court proceedings, the greater the loss of utility for the citizens, and this can become a strong incentive for CAs to avoid entering into a dispute with Fs where the law courts are inefficient, and to use the degree of discretion it is allowed to find a solution.

[6] See the General Terms for Procurement of Public Works Contracts, Ministerial Decree No. 145/2000, art. 22, and Presidential Decree No. 554/1999, art. 117 (Regulation implementing the framework law on public works No.109/94).

[7] The legislator considers this 10% as the F's (average) profit: thus, the ratio for this time incentive rule is that the CA can make a claim on the firm's whole profit, but not exceed it. Should the accumulated delay imply damages exceeding that threshold, the CA has to terminate the contract and start another awarding procedure for the completion of the work (and may also go to court to claim for the payment of further damages). In this case, the completion of the works will be further delayed due to work at the construction site being stopped while the new awarding procedure is implemented.

2.2 A simple model of the equilibrium delay in public procurement delivery

Players. We investigate a setting where a *CA* entrusts the execution of a contract to a *F*. These parties sign a contract that specifies the works involved, the timing of their execution, the price to be paid for said works, Π, and a penalty $V^{\mathrm{P}}(d)$ payable by F for each day of late delivery, d, of the contracted works.

We assume that F is capacity constrained and derives a positive value from postponing the contract's execution: $V(d)$ is the F's benefit from the days d of delay in delivery of the works. Delaying the contract's execution generates damages for the *CA* that, for the sake of simplicity, we assume to be $-V(d)$, and the *CA* has the right to enforce a corresponding penalty, $V^{P}(d)$.

We shall also make the following assumptions of regularity of the functions $V(d)$ and $V^{\mathrm{P}}(d)$: $V(0) = 0$, $V^{\mathrm{P}}(0)$=0; $V(d)$ and $V^{\mathrm{P}}(d)$ are continuous functions; $V(d)$ is strictly concave; $V^{\mathrm{P}}(d)$=Nd is linear, for N>0.

Strategies. We assume that *CA* and F are risk neutral, and that their actions are illustrated in terms of the game tree (see Figure 1).

If F delays, *CA* might choose whether or not to enforce the penalty for late delivery. When *CA* enforces the penalty, F might file a claim to recover a part of the penalty enforced, $(1 - s)V^{\mathrm{P}}(d)$, where $1 \geq s > 0$. Filing a claim carries a small administrative cost for F, $k_F \geq 0$, that we assume to be given and known to both the parties involved.

When F delays and files a claim, *CA* can either defeat the claim in court or withdraw. If *CA* withdraws, it will be damaged by F's delay and will not pocket the penalty. If *CA* defeats F in court, it will incur a cost, $R_{CA} \geq 0$, that we assume to be given and known to both parties, and it can expect to be awarded a part of the penalty imposed $sV^{\mathrm{P}}(d)$, where $1 \geq s > 0$. If *CA* goes to court, F will face the legal costs of litigation $R_F \geq 0$.

Payoffs. If F does not delay in the delivery of the works, F and *CA* will have the following payoffs, respectively:

$$(\Pi, b(\Pi))$$

where Π is the contract's value paid to F, and b is the utility gained by CA from the contract's execution; b is an increasing function of the contracts value Π, and also includes some measure of social welfare for the citizens using the public works in question.

If F delays and CA does not react, their respective payoffs will be:

$$(\Pi + V(d), b(\Pi) - V(d))$$

If F delays and CA enforces the penalty, their respective payoffs become:

$$(\Pi + V(d) - V^P(d), b(\Pi) - V(d) + V^P(d))$$

If F delays, CA enforces the penalty, F files a claim and CA withdraws, they will respectively achieve:

$$(\Pi + V(d) - (k_F), b(\Pi) - V(d))$$

If F delays, CA enforces the penalty, F files a claim and CA defeats F's claim in court, the respective payoffs will be:

$$(\Pi + V(d) - sV^P(d) - (k_F + R_F), b(\Pi) - V(d) + sV^P(d) - R_{CA})$$

In this setting, we first investigate the simpler case where F's costs for filing a claim and defending it in court $(k_F + R_F)$ and the CA's cost to respond, (R_{CA}), are both fixed, positive and common knowledge, where $R_{CA} > R_F$. We also assume that s - the fraction of the penalty to be paid if F files the claim and CA defeats it in court - is exogenously given.

We then discuss our results as stated in *Proposition 1*, thus studying i) the case for legal cost increasing in (γ), the average time of solving a dispute in court, i.e. $R_{CA}(\gamma)$ and $R_F(\gamma)$, where $R_{CA}(\gamma) > R_F(\gamma)$; and ii) the case where the fraction of penalty paid when decided in court decreases with the contract value Π, i.e. $s(\Pi)$.

Equilibrium delay. When it comes to the costs incurred by the parties for a legal dispute, as highlighted in Shavell and Rosenberg (1985), defeating a claim usually means engaging in actions to gather evidence to support the defendant's contention that are frequently more costly than the costs of making the claim. In addition, in the Italian public procurement setting, litigation in court further delays the citizens' use of the contracted works until the trial is over, and this

coincides with a social welfare loss and a consequent additional cost to CA of disputing enforceable penalties in court. In both situations $R_{CA} > R_F$, and for a large value of R_{CA}, it could be too costly for CA to take F to court. The expectation of a very large value of R_{CA} may induce CA not to enforce the penalty. In particular, it is all the same to CA whether it enforces the penalty or not, providing that F delays the delivery of the works and files a claim, whenever

$$(b(\Pi) - V(d) = b(\Pi) - V(d) + sV^P(d) - R_{CA})$$
$$\iff R_{CA} = sV^P(d)$$

So CA will only go to court if $R_{CA} \leq sV^{\mathrm{P}}(d)$.

Similarly, if F has opted for a delay d, and CA has enforced the allowable penalty, F will then file a claim if and only if

$$\Pi + V(d) - V^P(d) = \Pi + V(d) - sV^P(d) - (k_F + R_F)$$
$$\iff (k_F + R_F) = (1 - s)V^P(d)$$

This implies that F will file a claim when $(k_F + R_F) \leq (1\text{-}s)V^{\mathrm{P}}(d)$.

Therefore, if the following two conditions are simultaneously met:

$$(k_F + R_F) < (1 - s)V^P(d) \tag{1}$$
$$R_{CA} > sV^P(d)$$

F will delay the works and file a claim, and CA will not enforce the penalty.

Let $\hat{d} = V^{\text{P-1}}(\frac{R_F}{1-s})$ and $\tilde{d} = V^{\text{P-1}}(\frac{R_{CA}}{s})$. Note for the two conditions in (1) to be satisfied simultaneously, the following must apply:

$$\hat{d} = V^{\text{P-1}}(k_F + \frac{R_F}{1-s}) < \tilde{d} = V^{\text{P-1}}(\frac{R_{CA}}{s})$$

implying that $k_F + \frac{R_F}{(1-s)} < \frac{R_{CA}}{s}$ since $V^{\text{P-1}}$ is an increasing function.

Lemma 1 *For* $d \in [\hat{d}, \tilde{d}]$, CA *does not enforce the penalty, and if* CA *does enforce the penalty, then* F *goes to court.*

Let be d^* the number of days of delay that maximizes the function $V(d)$, $(d^* = argmaxV(d))$. Now let us consider F's choice of d at the initial stage.

Let us define ($d^{'}$ as the delay that maximizes $\Pi + V(d) - sV^{P}(d) - (k_F + R_F)$, i.e. F's expected payoff resulting from delaying the works and filing a claim, then providing that CA enforces the penalty and defeats the claim in court, the following *Proposition* states the optimal delay chosen by F.

Proposition 1: *There is a positive number m such that, if* d^* *comes within the interval* $d \in [\hat{d}, \tilde{d}+m]$ *the following strategies are adopted as the only subgame perfect equilibrium of our game:* F *chooses* $d = d^*$ *in the initial stage if* d^* *belongs to* $[\hat{d}, \tilde{d}]$ *or* $d = \tilde{d}$ *if* d^* *belongs to* $[\hat{d}, \tilde{d} + m]$, CA *does not enforce the penalty in the second stage, and* F *goes to court only if* CA *enforces the penalty. Moreover,* m *solves the following equation*: $V(\tilde{d} + m) - V(\tilde{d}) = sV^{P}(\tilde{d} + m) + (k_F + R_F)$.

Proof: For $d^* \in [\hat{d}, \tilde{d}]$, F maximizes its profits by choosing d^*, given that CA does not enforce the penalty, and CA maximizes its utility by choosing not to enforce the penalty given that F chooses d^*. Thus, for $d^* \in [\hat{d}, \tilde{d}]$, the F's optimal choice at the first stage is $d = d^*$, implying that there is a Nash perfect equilibrium in which F chooses $d = d^*$ and files a claim if CA enforces the penalty or whereas CA does not enforce the penalty. For $d^* = \tilde{d} + \epsilon$, where $(\epsilon) \leq (m)$ there is a perfect equilibrium when F chooses $d = \tilde{d}$ and files the claim if CA enforces the penalty or whereas CA does not enforce the penalty. Given the definition of m, for any $m^{'} \in (0, m)$, $V(\tilde{d}) + \Pi > \Pi + V(\tilde{d} + m^{'}) - sV^{P}(\tilde{d} + m^{'}) - (k_F + R_F)$, since V increases in d. As a consequence, for any $m^{'} \in (0, m)$, F prefers to set $d = \tilde{d}$ instead of $d = \tilde{d} + m^{'}$, so as to obtain the larger payoff. *End of the Proof.*

Proposition 1 indicates that whenever the marginal benefit derivable from delaying delivery is large enough for F, i.e. $(\hat{d}) \leq d^*$, F will choose to delay and to file a claim if CA enforces the penalty. Moreover, if the legal costs incurred by the CA to defeat the F's claim in court are high enough, $\tilde{d}$ is larger by a sufficient margin (or at least no smaller than d^*), so CA will not go through with the legal proceedings for delays worth d^*, or slightly less. This explains why with the above features exists in the interval $[\hat{d}, \tilde{d}]$. This equilibrium extends to the interval $[\hat{d}, \tilde{d} + m]$ where m is such that $V(\tilde{d}) + \Pi = \Pi + V(\tilde{d} + m^{'}) - sV^{P}(\tilde{d} + m^{'}) - (k_F + R_F)$: by choosing $(\tilde{d})$, F will benefit from all the

advantages of delaying the execution of the works $V(\tilde{d})$, without having to pay even a fraction of the penalty $sV^P(d)$, or the costs of litigation in court, R_F. The results stated in the above *Proposition 1* deserve discussion, bearing in mind how parties' legal costs are affected by the average duration of a trial, γ, conducted by the local law courts, i.e. $R_{CA}(\gamma)$ and $R_F(\gamma)$. On the other hand, as mentioned by Bajari and Tadelis (2001) and broadly assumed in the procurement literature, the higher the value of the contract, Π, the greater the complexity of its execution, and the latter gives F an informative advantage that can be used to dispute penalties for delays in court. In other words, the fraction s that F has to pay when a penalty is disputed will decrease with Π, i.e. $s(\Pi)$, with $s'(\Pi) < 0$. Taking these considerations into account, the previous (2) can be rewritten as

$$\hat{d} = V^{\text{P-1}}(k_F + \frac{R_F(\gamma)}{1 - s(\Pi)}) < \tilde{d} = V^{\text{P-1}}(\frac{R_{CA}(\gamma)}{s(\Pi)}) \tag{2}$$

In terms of comparative statics, that interest us for our empirical analysis, a simple examination of (3) shows that:

i) the range for values of d where F delays the delivery and files the claim and CA does not enforce the penalty - i.e. the interval $[\hat{d}, \tilde{d}]$ - becomes larger, the higher Π;

ii) the interval for equilibrium in the delays moves to the right (i.e. towards higher values of $\hat{d}$ and $\tilde{d}$ - as the parties' legal cost $R_F(\gamma)$ and $R_{CA}(\gamma)$, increase with increasing values of γ;

iii) since $R_{CA}(\gamma)$ increases with (γ) at a faster rate than $R_F(\gamma)$ because CA also suffers from the social welfare loss due to further delays (until the trial is over) before the citizens can start to exploit the public works, the values of d for which CA will not go to court and will not enforce the penalty becomes larger, the higher the value of γ.

3 Database

We analyze a single database collected by the Italian Authority for Vigilance over Contracts for Public Works, Services and Supplies (AVCP), which gives us access to all the public works with starting values of 150,000 euros or more put up for auction in Italy between 2000 and 2006. Our data include information on several aspects of each procurement contract, such as the auction's awarding mechanism, the reserve price and the winning rebate, the expected and actual duration

of the works, the main category of works involved, and the location and type of *CA* awarding the contract. For a subsample of auctions, we also look at the business identity of the winning *F* and the proportion of the final payment (on completion) *vis-a-vis* the total amount that the *CA* pays the *F*.

Our sample consists of contracts awarded in 15 regions.[8] As shown in Table 1, most of the contracts were awarded by means of auctions open to all comers (about 75%), and about 70% of the CAs involved were municipal and provincial authorities). The contracts refer to projects for different types of works, but the majority concern the construction of buildings (about 33%) or roads and bridges (about 30%).

As for the different participation procedures, Italian legislation on public procurement indicates three main types: open procedures, restricted procedures and negotiations.[9] In our sample, about 75.8% of the contracts were awarded through open procedures, about 9.7% through negotiations, and the remaining 14.5% through restricted (or simplified restricted) procedures.

We define *delays in completion of the works* as the difference between the expected delivery (due) date and the actual completion of the contracted works: the former is usually calculated by the *CA*'s engineers and stated in the contract, while the latter is recorded once the works have been actually delivered. In our dataset, the delays in completion averaged around 153 days, with a maximum of 1,578 days. Some works are completed on time, or even in advance (this was true of about 7% and 9% of the sample, respectively), but about 85% of the works were delivered late.[10] Figure 2 shows provincial variations in the average days of delay in the completion of public works. A higher concentration of delays is apparent in Central and Southern Italy, but the picture varies considerably among the Northern Italian provinces too.

Our measure of the *duration of trials* is drawn from the Italian Statistics Institute (ISTAT), and was calculated for each law court as the average time taken to arrive at a sentence (weighted over

[8] We consider 15 of the 20 Italian regions because the other 5 (Val D'Aosta, Trentino Alto-Adige, Friuli Venezia-Giulia, Sicily and Sardinia) enjoy a greater degree of legislative autonomy and have rather different rules for public procurement contracts.

[9] According to Italian law, the choice of a particular awarding procedure depends on the reserve price of the auction and certain other technical aspects: the standard approach is the open procedure, based on first price or average bid auctions. As Decarolis said (2013), the mechanisms "are identical in everything except for the exact way the winner is determined".

[10] Similar empirical evidence on the delay in delivery of Italian public procurement contracts has been also found by Decarolis and Palumbo (2011); Coviello and Gagliarducci (2010); Coviello and Mariniello (2008); Guccio et al. (2007); Decarolis (2013); D'Alpaos et al. (2013), Bucciol et al. (2013).

the number of pending cases), and the resulting figure was averaged by province if a province had more than one law court.[11]

We focus on civil trials (i.e. "procedimento civile di cognizione") by province and by year from 2000 to 2006, referring to local civil courts because this is where disputes on the execution of a public procurement contract should be solved in Italy.[12]

The average duration of a civil trial in Italy in the years 2000 to 2006 was 911 days, with a minimum of 205 days and a maximum of 2,221 (for our sample, the mean was 889, the minimum 205, and the maximum 2,221 days, with a standard deviation of about 294 days). The figures show variation across the provinces (see Figure 3) and over time (see Figure 4). These cross-sectional and over-time variations lie at the heart of our strategy to identify the relationship between the duration of trials and the delay in the completion of public works in the framework of a fixed-effect model.

Our graphical evidence (Figures 2 and 3) suggests a positive correlation between the average duration of trials and the average delay in the completion of public works by province during the period considered (2000-2006). This correlation is confirmed in the scatter plot in Figure 5, which shows a positive correlation when we consider the average data by province and year.

4 Empirical analysis

We use fixed effect regressions to estimate the relationship between the average duration of trials and the delays in the completion of public works. We consider project-level data, controlling for the characteristics of the project and the CA, and estimating different versions of this baseline specification:

$$Delay_{ipt} = \alpha + \beta_1 J_{pt} + \beta_2 X_i + \beta_3 Q_{pt} + \beta_4 T_t + \beta_5 P_p + \epsilon_{ipt}. \tag{3}$$

where J is our measure of the average duration of trials in the province p at time t. X is a set of variables for: i) the characteristics of the project, e.g. the reserve price and the main category of

[11] This measure has been adopted in other studies on Italy; see, for instance, Jappelli et al. (2005) on the relationship between the duration of trials and banking market performance in the Italian provinces. In D'Alpaos et al. (2013) duration of trials has been related to performance in Italian public procurement contracts; however, their work differs from ours in the research question, in the richness of the dataset and model specifications.

[12] On the other hand, disputes concerning the awarding phase of public procurement contracts have to be handled by the local administrative tribunals.

works (which are proxy for the project's size or complexity, and the type of work involved); ii) the characteristics of the auction (e.g. the type of participation in the auction); iii) the type of *CA*. To contain the problem of omitted variables, we also include other variables Q relating to province and time (e.g. the province's population), province-related fixed effects P to better exploit the within-province variations in the duration of trials, and year dummy variables T to adjust for temporal shocks that might have affected the time-related trends of the firm's outcome and/or the contracts chosen by the *CA*. As an alternative to dummy variables for the type of *CA* and the province, we include *CA*-related fixed effects to better account for the *CA*'s characteristics and location.

4.1 Main results

Table 2 shows the results of our estimation of the relationship between the delay in the delivery of contracted works and the average duration of trials in the law courts in the province where the *CA* operates. In columns 1 to 4 we control for province-related fixed effects, in columns 5 to 8 for *CA*-related fixed effects. The latter model (i.e. after including *CA*-related fixed effects) seems to fit the data better, suggesting that variability in the works completion time correlates strongly with local factors not apparent to the econometrician. These might include the personal attitudes of *CA* managers (or other *CA* staff) to the more or less strict enforcement of a contract, all else being equal.

In columns 1, 3, 5 and 7 in Table 2, we present linear models for the duration of trials which turn out to be not statistically significant. In columns 2, 4, 6 and 8, we add the quadratic term. Our evidence suggests that the effect of the duration of the trials on delay in the delivery of works is positive and decreasing, and statistically significant. This non-linear effect indicates that, for extremely lengthy trials, the extra time they take does not change the firms' perception of the law court's inefficiency as much as when the duration is in the lower ranges.[13] One standard deviation increase of the duration of the trials (computed at average duration of trials) induces an increase respect to the mean value of delays in the completion of works of about 3% in the province fixed-effect models and 4.8% in the *CA* fixed-effect models.

[13] In the Appendix, Table A.1, we check the robustness of these results by focusing on the sample of contracts for the Piedmont and Lombardy regions, which usually coincides with a better-quality data collection. In this subsample, however, there is a more limited variability in the duration of trials.

In our model, among the controls for the characteristics of the contract and of the *CA*, we introduce the auction's reserve price (i.e. the auction's starting value calculated by the *CA*'s engineers) and, like Bajari et al. (2009), we consider this as a proxy of the complexity and/or size of the works involved. We introduce the reserve price either as a single term (columns 1, 2, 5 and 6), or as a single and as the squared term (columns 3, 4, 7 and 8) to take possible non-linear effects into account. Our results for the estimation of the reserve price (based on the single term) show that it is positive and statistically significant correlated with the delay in the completion of the works. An increase of one standard deviation in the reserve price (about 1.1 million euros) is associated with an increase of about 20% in the average delay in completing the works (or about 1.8% if we consider a 100,000 euro increase in the reserve price). When we introduce the squared term of the reserve price as well, our results show that the effect on the delays is still positive and statistically significant, but its marginal effect is lower when the reserve price is higher.[14]

5 Extensions

In this section, we investigate the mechanisms behind the effects of an inefficient law court on performance in public works contracts.

First we check whether there is any heterogeneous effect of the duration of trials for different levels of complexity of a project. If the *F* takes advantage of both those features, we would expect to see larger delays for more complex projects completed in provinces where the average duration of trials is longer. We thus add the interaction between the reserve price for the contract and the duration of trials to our model specification. Table 3 shows that the effect of the duration of trials is greater, the greater the complexity of the works involved in a project.

In the following paragraphs, we check whether the duration of trials correlates with other outcomes, such as the type of *F* winning the contract and the proportion of the *CA*'s final payment (Section 5.1); and whether the relationship between inefficient enforcement by local courts and late delivery

[14]The positive but declining relationship between the complexity of a project and the delays in the delivery of the works can be explained by the *F*'s evaluation of the benefit it derives from delaying the works: for a more complex project, a *F* has more resources to transfer from said project and devote to other contracts, so its benefits increase with the size of the resources it has to mobilize. The *F* does not necessarily obtain constantly greater benefits from larger and larger projects, because transferring very large resources can be very costly (and because the *F* may not have other similarly complex projects underway where such large resource might be usefully exploited).

of contracted works has other explanations, such as corruption or the *CA*'s financial constraints (Section 5.2).

5.1 Other outcomes

In this section, we test first whether law court inefficiency systematically selects different types of winning *F*, then whether *CA*s use their final payments as a way to contain a *F*'s tendency to delay the completion of the works.

As in the previous test, we focus on proxies of a *F*'s size. Longer trials coincide with an increase in a *F*'s litigation costs (i.e., if a *F* delays and the *CA* enforces the penalty, and the *F* takes the *CA* to the court). These litigation costs will be higher for smaller *F*s than for larger enterprises because the latter typically have their own legal offices that make the burden of legal costs easier to sustain. We thus expect to see that, in provinces where trials last longer, large *F*s are more likely to bid for contracts than small *F*s, and consequently have higher chances of securing the contracts. In particular, we consider two types of business entity: one-man businesses as a proxy for micro-sized *F*s, and joint-stock companies (JSC) as a proxy for large *F*s.[15] We only consider these two business entities because the correlation with the firm's size is less clear for other types of firm, and because JSC and one-man businesses had much the same probability of winning a contract in the period observed: according to our dataset (as shown in Table 1), they won about 11.3% and 10.7% of the contracts, respectively.[16] The results of our estimations in Table 4 show that JSC have a higher likelihood of winning a contract in provinces where trials in law courts last longer. A rough calculation of this effects indicates that an increase of one standard deviation in the duration of the trials (vis-a-vis the average duration of a trial) corresponds to a roughly +1% change in the probability of a contract being won by a JSC as opposed to a -0.2% difference for the one-man businesses.

As a further test associated with our main results, we look at the amount of the final payment as a proportion of the total amount paid to the *F* by the *CA* for the execution of the works. In

[15] Using the AIDA Bureau Van Dijk dataset, which contains information on the balance sheets and characteristics of Italian corporations (and therefore does not cover the whole sample of *F*s winning contracts for public works), we see that the JSC that won contracts for public works between 2008 and 2011 had a median workforce of 74 employees (mean 440).

[16] As for the other types of business entity, we see that limited partnerships (SAS) win about 6% of the contracts, general partnerships (SNC) about 9%, limited-liability companies (SRL) about 49%, and the remaining of contracts are won by temporary consortia and cooperative firms.

the subsample of auctions for which we have this information, we see that this proportion averages around 6% of the total value of the contract, with a standard deviation of about 11%. According to the Italian regulations on procurement, the final balance is only payable to the F after the contract has been completed and all necessary tests have been conducted to confirm the proper execution of the works.[17] In our setting, CAs can use this final payment to deter Fs from delaying the execution of works, using larger final payments as a "stick" where any external enforcement by the local court is a weak threat. Table 5 shows the estimated positive (and statistically significant) correlation between the duration of trials and the proportion of the final payment for each contract, and therefore that CAs tend to make up for a weak external enforcement (due to long and costly civil trials) by means of an instrument of their own (proportionally larger final payments) to deter Fs from delaying.[18]

5.2 Alternative explanations for the late delivery of contracted works

In this section, we test whether the effects of an inefficient legal system are related to other factors that might contribute to explaining our empirical findings.

A possible concern stems from the fact that the duration of trials probably correlates with an overall poor quality of the local socio-institutional environment. In particular, the positive relationship between the duration of trials and the late delivery of public works might be affected by other factors, such as corruption, that may in turn be territorially correlated with courts having an overload of cases and with the time it takes to arrive at a sentence. In the previous model, we have added province-related or CA-related fixed effects that should be able to capture the different degrees of corruption in different parts of the country. To add further evidence, however, we also introduce a corruption indicator. We use the corruption indicator proposed by Golden and Picci (2005), which is at province level for Italy and measures the extent of corruption in public works. This indicator is constructed from the difference between the estimated monetary amount of public infrastructure built in a given province and the monetary amount actually spent to complete these infrastructure. The authors show that a higher difference between the two coincides with larger

[17] The final payment should generally be no more than 10% of the total outlay.

[18] Note that a proportionally larger final payment may also contribute to fewer small Fs bidding for and winning contracts in provinces where trials take longer (because those Fs typically have a tighter budget).

amounts of money being wasted in corruption. Since this indicator does not vary over time,[19] we introduce it in our model through an interaction with the variable measuring the average duration of trials. The results (Table 6) show that the effect of the duration of trials on the late delivery of public works changes very little when the corruption indicator is included in the model.

Another possible explanation for the late delivery of public works relates to some sort of exchange between the parties: due to budget constraints, the *CA* might approve a *F*'s delays in the completion of works (i.e. the *CA* waives enforcing a penalty in exchange for delayed payments), and this benefits the *F*. Grembi et al. (2012) recently analyzed the effect of an unexpected relaxation of the municipal authorities budget constraints on the outcome of their policies and found that this coincided with higher deficits (mainly due to lower revenues). We follow in the footsteps of Grembi et al. (2012) and explore whether the relaxation of the local stability growth pact for municipalities with a population of less than 5,000 in 2001 had any direct effect on delays in the delivery of public works for the municipal authorities (i.e. the CAs). In particular, we check whether changes in the municipal authorities' budget constraints (i.e. changes to the local stability pact) affect the main relationship we estimated between the inefficiency of the law courts and firms' late completion of public works. To test this possibility, we focus on a subsample of contracts awarded by municipal authorities (Table 7). The *CA*'s budget constraints are proxied in two different ways: a) in columns 1 and 2, through the interaction between a dummy variable for the municipalities with a population of less than 5,000, and a dummy variable representing the period (from 2001 onwards, after the stability and growth pact was relaxed); and b) in columns 3 and 4 we use a third-order polynomial of the population and make it interact with the post-2000 dummy variable. Our estimations suggest that these proxies for the *CA*'s budget constraints have no direct effect on the late completion of public works, while the effect of the duration of trials remains statistically significant, positive and declining.

[19] Golden and Picci (2005) do not offer a time-related variable, but it would seem reasonable to adopt such an indicator in our analysis because we focus on a timeline of six years and corruption - like social capital - is typically a slow-moving factor.

6 Conclusion

Contracts are a good deterrent against opportunistic behavior only insofar as they are credibly and effectively enforced through the application of their rules and the threat of an efficiently functioning legal action. In this paper, we empirically investigate how the enforcement of contractual obligations by local courts affects suppliers' performance in public procurement contracts in Italy. We proxy the "inefficiency" of enforcement by the local law courts with a measure of the average duration of a trial. Using information on the late delivery of contracted works obtained from a large public procurement database, we investigate such breaches of contract referring them to the competent local court. According to Italian regulations on public procurement, a penalty for late delivery should be included in each contract and any disputes about its enforcement should be solved by the local law courts.

Our empirical findings show that public works are delivered with longer delays in provinces where the local courts are less efficient. This is particularly true of higher-value contracts (i.e. more complex projects), and it suggests that the information advantage of Fs managing larger-scale works makes them behave more opportunistically. Our empirical findings are consistent with a roughly-sketched theoretical model in which an equilibrium delay results from simply assuming that the costs involved in disputing penalties in court are greater, by a sufficient margin, for the CA than for the F.

We also find that where local courts are inefficient, public procurement contracts are more often awarded to larger Fs than to smaller ones: this could be because the different-sized Fs will have a different structure, the larger companies having their own legal offices and consequently incurring lower costs when they face litigations in court than the smaller Fs, which have to avail themselves of the professional services of outside legal consultants.

Our empirical findings also show that, on average, CAs opt for a proportionally higher final payment in their contracts if their local courts are inefficient. Having ascertained that contractual enforcement by the local courts is ineffectual, this seems to suggest that the CAs use proportionally larger final payments as a "stick" to reduce the benefit the supplier can gain from delaying the delivery of the works.

Finally, we check two other possible explanations for our findings by controlling for: i) the role of

corruption, which correlates with an inefficient legal system; and ii) the role of the *CA*'s budget constraints, which may affect delays in payments made by *CA*s and firms' performance as a result. These checks confirm the main results of our estimations.

References

Bajari, P., and S. Tadelis (2001). Incentives versus Transaction Costs: A Theory of Procurement Contracts. *RAND Journal of Economics*, 32(3), 387-407.

Bajari, P., S. Tadelis and R. McMillan (2009). Auctions versus Negotiations in Procurement: An Empirical Analysis. *Journal of Law, Economics and Organization*, 25(2), 372-399.

Bucciol, A., O. Chillemi and G. Palazzi (2013). Cost Overrun and Auction Format in Small Size Public Works. *European Journal of Political Economy*, 30, 35-42.

Chakravarty, S. and W.B. MacLeod (2009). Contracting in the Shadow of the Law'. *The RAND Journal of Economics*, 40, 533-557.

Chemin, M. (2012). Does Court Speed Shape Economic Activity? Evidence from a Court Reform in India. *Journal of Law, Economics and Organization*, 28(3), 460-485.

Coviello, D. and S. Gagliarducci (2010). Building Political Collusion: Evidence from Procurement Auctions. IZA working paper No. 4939.

Coviello, D. and M. Mariniello (2008). Does Publicity Affect Competition? Evidence from Discontinuities in Public Procurement Auctions. CSEF working papers No. 189.

D'Alpaos, C., M. Moretto, P. Valbonesi and S. Vergalli (2013). Time Overruns as Opportunistic Behaviour in Public Procurement. *Journal of Economics*, in press.

Decarolis, F. (2013). Awarding Price, Contract Performance and Bids Screening: Evidence from Procurement Auctions. *American Economic Journal: Applied Economics*, in press.

Decarolis, F. and G. Palumbo (2011). La Rinegoziazione dei Contratti di Lavori Pubblici: un'Analisi Teorica ed Empirica. In F. Balassone and P. Casasio (eds.), Le infrastrutture in Italia: dotazione, programmazione, realizzazione, Bank of Italy.

Djankov, S., R. La Porta, F. Lopez-De-Silanes and A. Shleifer (2003). Courts. *The Quarterly Journal of Economics*, 118(2): 453-517.

Doornik, K. (2010). Incentive Contracts with Enforcement Cost. *Journal of Law, Economics and Organization*, 26(1):115-143.

Golden, M.A. and L. Picci (2005). Proposal for a New Measure of Corruption, Illustrated with Italian Data. *Economics and Politics*, 17, 37-75.

Grembi, V., T. Nannicini, and U. Toiano (2012). Policy Responses to Fiscal Restraints: A Difference-in-Discontinuities Design. IZA working paper No. 6952.

Guccio, C., G. Pignataro and I. Rizzo (2007). Efficienza delle procedure di appalto dei lavori pubblici: un'analisi empirica del caso italiano. Paper presented at the 'XIX conferenza SIEP', 13 - 14 September 2007, Pavia.

Iossa, E. and G. Spagnolo (2011). Contracts as Threats: on a Rationale for Rewarding A while Hoping for B. CEPR Discussion Papers No. 8195.

Laeven, L. and C. Woodruff (2007). The Quality of the Legal System, Firm Ownership, and Firm Size. *Review of Economics and Statistics*, 89(4), 601-614.

Lewis, G. and P. Bajari (2011). Procurement Contracting with Time Incentives: Theory and Evidence. *The Quarterly Journal of Economics*, 126(3), 1173-1211.

Kelman, S. (1990). Procurement and Public Management: The Fear of Discretion and the Quality of Government Performance. Washington, DC: AEI Press

Kelman, S. (2002). Remaking Federal Procurement. *Public Contracts Law Journal*, 31, 581-622.

Jappelli, T., M. Pagano and M. Bianco, (2005). Courts and Banks: Effects of Judicial Enforcement on Credit Markets. *Journal of Money, Credit and Banking*, 37(2), 223-44.

Johnson, S., J. McMillan, and C. Woodruff (2002). Courts and Relational Contracts. *Journal of Law, Economics and Organization*, 18, 221-277.

Rosenberg, D., and S. Shavell (1985). A model in Which Suits Are Brought for Their Nuisance Value. *International Review of Law and Economics*, 5, 313.

Figure 1: The Game Tree

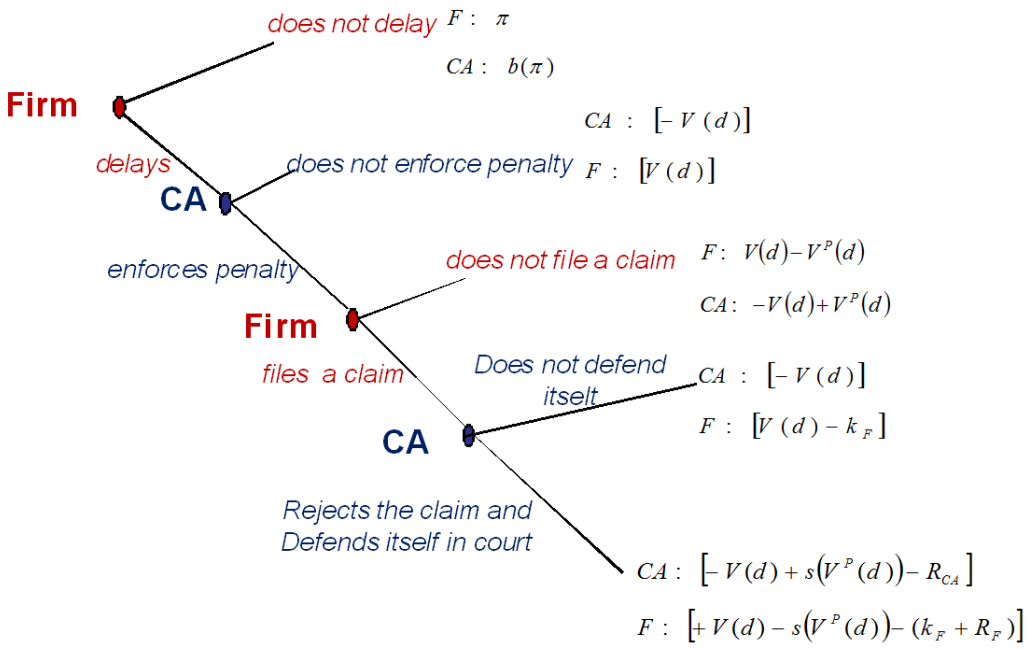

Table 1: Summary statistics

VARIABLE	(1) OBS	(2) MEAN	(3) SD	(4) MIN	(5) P25	(6) P50	(7) P75	(8) MAX
Dependent variable								
Delay in completion (days)	40521	153.339	168.209	-194	30	108	225	1578
Winner is:								
joint-stock company	20070	0.107	0.309	0	0	0	0	1
one-man business	20070	0.114	0.317	0	0	0	0	1
Final payment (share)	28175	0.060	0.114	0	0.005	0.006	0.060	1
Contract characteristics								
Reserve price	40521	5.824	11.154	1.303	1.998	3.008	5.492	299.805
Awarding procedure:								
open	40521	0.758	0.428	0	1	1	1	1
restricted	40521	0.081	0.273	0	0	0	0	1
simplified restricted	40521	0.064	0.245	0	0	0	0	1
negotiation	40521	0.097	0.296	0	0	0	0	1
Category of works:								
buildings	40521	0.323	0.467	0	0	0	1	1
roads and bridges	40521	0.304	0.460	0	0	0	1	1
cultural heritage	40521	0.065	0.247	0	0	0	0	1
hydraulic	40521	0.065	0.247	0	0	0	0	1
Type of CA:								
municipal authorities	40521	0.548	0.498	0	0	1	1	1
provincial authorities	40521	0.151	0.358	0	0	0	0	1
ministries	40521	0.042	0.200	0	0	0	0	1
Province-related controls								
Duration of trials (days)	40521	889.389	293.701	205	664	839.5	1063	2221
Population of prov.	40521	11.356	11.598	0.890	3.577	6.430	11.498	40.131

Notes. The table shows the dependent variables, the control (independent) variables, at auction/project level and province level, used in the model specifications through the paper. The reference period is 2000-2006. Public works data refer to contracts with an estimated value above 150,000 euros. *Delay in completion of works* (days) represents the days of delay in the delivery of the works. *Joint-stock company (JSC)* is a dummy variable that takes a value of 1 if the winner of the project is a joint-stock company, or a value of 0 otherwise. *One-man business* is a dummy variable that takes a value of 1 if the winner of the project is a one-man business, or a value of 0 otherwise. *Final payment (share of total payment)* indicates the balance paid on completion of the works (by the *CA* to the *F*) as a proportion of the total payment. *Reserve price* is the auction's starting value (in 100,000s of euros, CPI deflated) set by the *CA*. *Awarding procedure* is a set of dummy variables indicating the types of awarding mechanism: *Open* is a dummy variable that takes the value of 1 if participation in the auction is open to any *F* certified for the execution of the works, or a value of 0 otherwise; *Restricted* and *Simplified restricted* are two dummy variables that indicate two slightly different types of awarding mechanism; they both take a value of 1 if participation in the auction is restricted to *F*s certified for the execution of the works and invited by the *CA* (after *F*s have shown interest in bidding for the works), or a value of 0 otherwise; *Negotiation* is a dummy variable indicating a type of awarding mechanism, that takes a value of 1 if the *CA* invites a limited number of certified *F*s, or a value of 0 otherwise. *Category of works* includes a set of dummy variables indicating the main categories of works involved in the project. The table shows only the most commonly-observed categories: *Buildings* is a dummy variable taking a value of 1 if the main category of works relates to the construction of buildings, or a value of 0 otherwise; *Roads and bridges* is a dummy variable taking a value of 1 if the main category of works relates to road works or bridge building; *Cultural heritage* is a dummy variable taking a value of 1 if the main category of works relates to cultural heritage conservation works; *Hydraulic* is a dummy variable taking a value of 1 if the main category of works relates to the construction, conservation or improvement of hydraulic systems. *Type of CA* includes a set of dummy variables for the type of *CA* awarding the contract. The table only shows the most often encountered types of *CA*: *Municipal authorities* is a dummy variable for the type of *CA* that takes a value 1 if the *CA* is a municipal authority, or a value of 0 otherwise; *Provincial authorities* is a dummy variable indicating a type of *CA* that takes a value of 1 if the *CA* is a provincial government; *Ministries* is a dummy variable for the type of *CA* that takes a value of 1 if the *CA* is a ministry. *Duration of trials (days)* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Population of prov.* is a province-level variable (varying over time) that indicates the resident population (x 100,000) in a given province. Sources: auction/project-level variables are from the AVCP (Italian Authority for the Vigilance on Contracts for Public Works, Services and Supplies) dataset; province-level variables are from ISTAT (Italian Statistics Institute) data.

Figure 2: Average delays in completion of works (days) by provinces

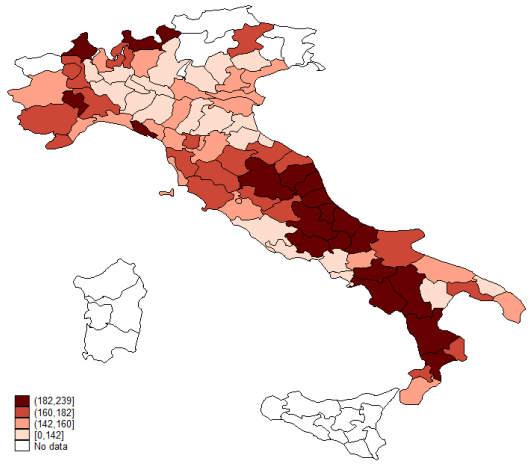

Figure 3: Average duration of trials (days) by provinces

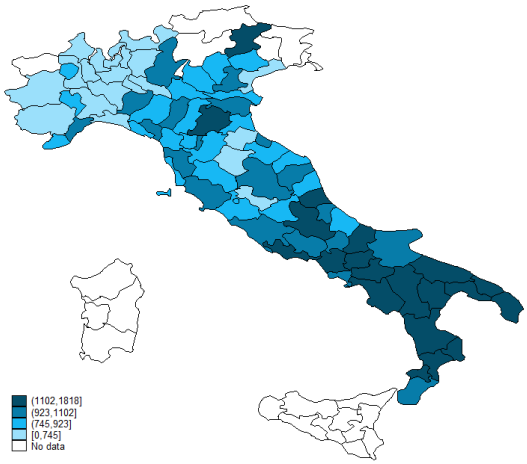

Figure 4: Average duration of trials (days) by year and macro-regions

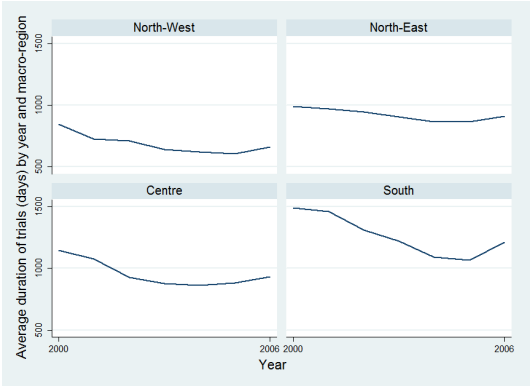

Figure 5: Average delays in completion of works and average duration of trials (by province-year)

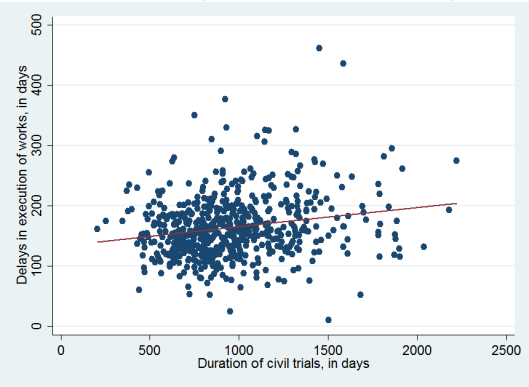

Table 2: Delays in the completion of works and duration of trials

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEPENDENT VARIABLES	Delays in completion of works (days)							
Duration of trials	0.00182	0.06142*	0.00161	0.06166**	0.00939	0.08274***	0.00863	0.08655***
	(0.007)	(0.033)	(0.007)	(0.030)	(0.007)	(0.030)	(0.007)	(0.030)
Duration of trials^2		-0.00003*		-0.00003**		-0.00003**		-0.00003***
		(0.000)		(0.000)		(0.000)		(0.000)
Reserve price	2.83227***	2.83373***	6.35360***	6.35523***	2.95800***	2.96120***	6.73345***	6.73922***
	(0.299)	(0.299)	(0.410)	(0.410)	(0.269)	(0.269)	(0.318)	(0.318)
Reserve price^2			-0.02779***	-0.02779***			-0.03080***	-0.03082***
			(0.002)	(0.002)			(0.002)	(0.002)
Type of CA FE	X	X	X	X				
Category of works FE	X	X	X	X	X	X	X	X
Awarding mechanism FE	X	X	X	X	X	X	X	X
Province FE	X	X	X	X				
CA FE					X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Province-year control	X	X	X	X	X	X	X	X
Observations	40,521	40,521	40,521	40,521	40,521	40,521	40,521	40,521
R-squared	0.103	0.103	0.124	0.124	0.369	0.369	0.385	0.386
Mean outcome	153.3	153.3	153.3	153.3	153.3	153.3	153.3	153.3
Mean Dur.	889.4	889.4	889.4	889.4	889.4	889.4	889.4	889.4
SD Dur.	293.7	293.7	293.7	293.7	293.7	293.7	293.7	293.7
t-test[b(Dur.)+b(Dur.)^2=0]		3.44*		4.09**		7.40***		8.26***
Linear effect +SD	0.534		0.473		2.759		2.535	
Effect +SD at mean Dur.		4.621		4.591		7.354		7.417
Effect +SD at 25th perc. Dur		8.021		8.017		11.65		11.98
Effect +SD at 75th perc. Dur.		2.001		1.952		4.046		3.903

Notes. Coefficients are presented with standard errors in parentheses (clustered at province level in columns 1 to 4, or at *CA* level in columns 5 to 8). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in columns 1 to 8 is *Delay in completion of works (days)*, i.e. the days of delay in the delivery of the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *Type of CA FE*, a set of dummy variables for the type of *CA* awarding the contract; *Category of works FE*, a set of dummy variables for the main category of works; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province FE* is a set of dummy variables for the province where the works are awarded; *CA FE* is a set of dummy variables for each *CA*; *Year FE* is a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year* control means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are provided: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. The *t-test* was used to assess whether the sum of the coefficients Duration of trials and Duration of trials^2 is statistically different from zero. Some effects computed on the dependent variable are included: *Linear effect +SD* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term); *Effect +SD at Mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the mean value of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 25th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 25th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 75th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 75th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term).

Table 3: Delays in completion of works, duration of trials and complexity of the works

	(1)	(2)	(3)	(4)
DEPENDENT VARIABLES	Delays in completion of works (days)			
Duration of trials	-0.00882	0.05486	-0.00493	0.06887**
	(0.009)	(0.035)	(0.009)	(0.032)
Duration of trials^2		-0.00003**		-0.00003**
		(0.000)		(0.000)
(Duration of trials)*Reserve price	0.00174**	0.00175**	0.00235**	0.00236***
	(0.001)	(0.001)	(0.001)	(0.001)
Reserve price	1.30855*	1.30111*	0.99256	0.99460
	(0.716)	(0.709)	(0.749)	(0.740)
Type of CA FE	X	X		
Category of works FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
Province FE	X	X		
CA FE			X	X
Year FE	X	X	X	X
Province-year control	X	X	X	X
Observations	40,521	40,521	40,521	40,521
R-squared	0.104	0.104	0.370	0.371
Mean outcome	153.3	153.3	153.3	153.3
Mean Dur.	889.4	889.4	889.4	889.4
SD Dur.	293.7	293.7	293.7	293.7
Effect +SD at mean Res.	0.378		2.580	
Effect +SD at 25th perc. Res.	-1.572		-0.0662	
Effect +SD at 75th perc. Res.	0.209		2.350	
Effect +SD at mean Res. (and mean Dur.)		4.748		7.204
Effect +SD at 25th perc. Res. (and mean Dur.)		2.786		4.557
Effect +SD at 75th perc. Res. (and mean Dur.)		4.577		6.974

Notes. Coefficients are presented with standard errors in parentheses (clustered at province level in columns 1 and 2, or at *CA* level in columns 3 to 4). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in columns 1 to 4 is *Delay in completion of works (days)*, i.e. the days of delay in the delivery of the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *Type of CA FE*, a set of dummy variables for the type of *CA* awarding the contract; *Category of works FE*, a set of dummy variables for the main category of works; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province FE* is a set of dummy variables for the province where the works are awarded; *CA FE* is a set of dummy variables for each *CA*; *Year FE* is a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year* control means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are provided: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. Some effects of the Duration of trials computed on the dependent variable are included: *Effect +SD at mean Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean level of the Reserve price (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at 25th perc. Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Reserve price variable's distribution (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at 75th perc. Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Reserve price variable's distribution (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at mean Res. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean value of the Reserve price variable and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price); *Effect +SD at 25th Res. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Reserve price variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price); *Effect +SD at 75th Res. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Reserve price variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price).

Table 4: Dimensions of the winning firms and duration of trials

	(1)	(2)	(3)	(4)
DEPENDENT VARIABLES	Winning firms is:			
	JSC (large firm)		One-man business (micro firm)	
Duration of trials	0.00001	0.00014**	0.00004*	-0.00016*
	(0.000)	(0.000)	(0.000)	(0.000)
Duration of trials^2		-0.00000**		0.00000**
		(0.000)		(0.000)
Reserve price	0.00457***	0.00457***	-0.00157***	-0.00157***
	(0.000)	(0.000)	(0.001)	(0.001)
Type of CA FE	X	X	X	X
Category of works FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
Province FE	X	X	X	X
Year FE	X	X	X	X
Province-year control	X	X	X	X
Observations	20,070	20,070	20,070	20,070
R-squared	0.074	0.074	0.085	0.085
Mean outcome	0.107	0.107	0.114	0.114
Mean Duration of trials	884.9	884.9	884.9	884.9
SD Duration of trials	286.7	286.7	286.7	286.7
t-test[b(Dur.)+b(Dur.)^2=0]		4.03**		3.37*
Linear effect +SD	0.00206		0.0103	
Effect +SD at mean Dur.t.		0.0103		-0.00249
Effect +SD at 25th perc. Dur.t.		0.0174		-0.0136
Effect +SD at 75th perc. Dur.		0.00454		0.00645

Notes. Coefficients are presented with standard errors in parentheses (clustered at province level). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in columns 1 and 2 is a dummy variable indicating that the winning *F* is a *JSC* (joint stock company), in columns 3 and 4 the dependent variable is a dummy variable indicating that the winning *F* is a *One-man business*. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *Type of CA FE*, a set of dummy variables for the type of *CA* awarding the contract; *Category of works FE*, a set of dummy variables for the main category of works; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province FE* is a set of dummy variables for the province where the works are awarded; *Year FE* is a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year* control means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are provided: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. The *t-test* was used to assess whether the sum of the coefficients Duration of trials and Duration of trials^2 is statistically different from zero. Some effects computed on the dependent variable are included: *Linear effect +SD* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term); *Effect +SD at Mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the mean value of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 25th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 25th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 75th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 75th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term).

Table 5: Share of final payment and duration of trials

	(1)	(2)	(3)	(4)
DEPENDENT VARIABLES	Final payment (share on total payment)			
Duration of trials	0.00001	0.00005*	-0.00000	0.00003
	(0.000)	(0.000)	(0.000)	(0.000)
Duration of trials^2		-0.00000*		-0.00000
		(0.000)		(0.000)
Reserve price	-0.00073***	-0.00073***	-0.00069***	-0.00069***
	(0.000)	(0.000)	(0.000)	(0.000)
Type of CA FE	X	X		
Category of works FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
Province FE	X	X		
CA FE			X	X
Year FE	X	X	X	X
Province-year control	X	X	X	X
Observations	28,175	28,175	28,175	28,175
R-squared	0.066	0.066	0.386	0.386
Mean outcome	0.0600	0.0600	0.0600	0.0600
Mean Dur.	866.4	866.4	866.4	866.4
SD Dur.	292.8	292.8	292.8	292.8
t-test[b(Dur.)+b(Dur.)^2=0]		3.88*		0.86
Linear effect +SD	0.00177		-0.000497	
Effect +SD at mean Dur.		0.00488		0.00119
Effect +SD at 25th perc. Dur.		0.00728		0.00267
Effect +SD at 75th perc. Dur.		0.00256		-0.000252

Notes. Coefficients are presented with standard errors in parentheses (clustered at province level in columns 1 and 2, or at *CA* level in columns 3 and 4). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in columns 1 to 4 is the *Share of final payment*, that is the final payment as a proportion of the total payment the *F* receives from the *CA* for completing the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *Type of CA FE*, a set of dummy variables for the type of *CA* awarding the contract; *Category of works FE*, a set of dummy variables for the main category of works; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province FE* is a set of dummy variables for the province where the works are awarded; *CA FE* is a set of dummy variables for each *CA*; *Year FE* is a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year* control means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are provided: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. The *t-test* was used to assess whether the sum of the coefficients Duration of trials and Duration of trials^2 is statistically different from zero. Some effects computed on the dependent variable are included: *Linear effect +SD* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term); *Effect +SD at Mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the mean value of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 25th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 25th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 75th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 75th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term).

Table 6: Delays in completion, duration of trials and corruption

	(1)	(2)	(3)	(4)
DEPENDENT VARIABLE	Delays in completion of works (days)			
Duration of trials	0.01353	0.06328*	0.00673	0.08337***
	(0.009)	(0.033)	(0.008)	(0.031)
Duration of trials^2		-0.00002*		-0.00003***
		(0.000)		(0.000)
Duration of trials * Corruption	-0.00893	-0.00571	0.00335	0.00371
	(0.006)	(0.006)	(0.003)	(0.003)
Reserve price	2.82917***	2.83011***	2.94424***	2.94754***
	(0.304)	(0.304)	(0.269)	(0.269)
Type of CA FE	X	X		
Category of works FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
Province FE	X	X		
CA FE			X	X
Year FE	X	X	X	X
Province-year control	X	X	X	X
Observations	40,071	40,071	40,071	40,071
R-squared	0.103	0.103	0.369	0.369
Mean outcome	153.5	153.5	153.5	153.5
Mean Dur.	887.1	887.1	887.1	887.1
SD Dur.	294.2	294.2	294.2	294.2
Effect +SD at mean Corr.	0.987		3.104	
Effect +SD at 25th perc. Corr.	2.270		2.622	
Effect +SD at 75th perc. Corr.	-0.0886		3.508	
Effect +SD at mean Corr. (and mean Dur.)		4.630		7.991
Effect +SD at 25th perc. Corr. (and mean Dur.)		5.450		7.458
Effect +SD at 75th perc. Corr. (and mean Dur.)		3.942		8.438

Notes. Coefficients are presented with standard errors in parentheses (clustered at province-level in columns 1 and 2 or *CA*-level in columns 3 and 4). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The dependent variable in columns 1 to 4 is the *Delay in completion of works (days)*, which represents the days of delay in the delivery of the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Corruption* is a province-level variable (not varying over time), that indicates the level of corruption in public works in a given province (it refers to 1997; data are from Golden and Picci, 2005). *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *Type of CA FE*, a set of dummy variables for the type of *CA* awarding the contract; *Category of works FE*, a set of dummy variables for the main category of works involved; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province FE* is a set of dummy variables for the province where the contract is awarded; *CA FE* is a set of dummy variables for each *CA*; *Year FE* is a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year control* means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are reported: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. Some computed effects of the Duration of trials on the dependent variable are included: *Effect +SD at mean Corr.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean level of the Corruption (this effect is only included when the Duration of trials enters the model as a single term and interact with the Corruption); *Effect +SD at 25th perc. Corr.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Corruption variable's distribution (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Corruption); *Effect +SD at 75th perc. Corr.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Corruption variable's distribution (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Corruption); *Effect +SD at mean Corr. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean value of the Corruption variable and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Corruption); *Effect +SD at 25th Corr. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Corruption variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Corruption); *Effect +SD at 75th Corr. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Corruption variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Corruption).

Table 7: Delays in completion, duration of trials and *CA*'s budget constraints

	(1)	(2)	(3)	(4)
DEPENDENT VARIABLE	Delays in completion of works (days)			
Duration of trials	0.00985	0.09884**	0.00855	0.10381***
	(0.011)	(0.039)	(0.011)	(0.040)
Duration of trials^2		-0.00004**		-0.00004**
		(0.000)		(0.000)
Municipal pop. < 5,000	-18.84679	-17.70089		
	(18.521)	(18.068)		
(Municipal Pop. < 5,000)*(Post2000)	-2.73392	-3.15416		
	(15.485)	(15.387)		
Post 2000	-21.64948***	-19.77181***	-27.50660***	-26.17898***
	(5.522)	(5.561)	(6.528)	(6.526)
Municipal Pop.			-0.00005	-0.00005
			(0.000)	(0.000)
Municipal Pop.^{2}			0.00000	0.00000
			(0.000)	(0.000)
Municipal Pop.^{3}			-0.00000	-0.00000
			(0.000)	(0.000)
Post2000*(Municipal Pop.)			0.00008	0.00008
			(0.000)	(0.000)
Post2000*(Municipal Pop.^{2})			-0.00000	-0.00000
			(0.000)	(0.000)
Post2000*(Municipal Pop.^{3})			0.00000	0.00000
			(0.000)	(0.000)
Reserve price	4.00363***	4.00942***	4.01254***	4.01893***
	(0.655)	(0.656)	(0.658)	(0.658)
Category of works FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
CA FE	X	X	X	X
Province-year control	X	X	X	X
Observations	22,199	22,199	22,199	22,199
R-squared	0.335	0.335	0.335	0.335
Mean outcome	159.1	159.1	159.1	159.1
Mean Dur.	880.1	880.1	880.1	880.1
SD Dur.	291.7	291.7	291.7	291.7
Linear effect +SD	2.875		2.494	
Effect +SD at mean Dur.		8.089		8.077
Effect +SD at 25th perc. Dur.		13.43		13.80
Effect +SD at 75th perc. Dur.		3.965		3.663

Notes. Coefficients are presented with standard errors (clustered at *CA* level) in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The sample is restricted to contracts awarded by municipal authorities. The dependent variable in columns 1 to 4 is the *Delay in completion of works (days)*, which represents the days of delay in the delivery of the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Municipal Pop.*<5,000 is a dummy variable that takes a value of 1 if the contract is awarded by a municipality with less than 5,000 inhabitants, or a value of 0 otherwise. *Municipal Pop.* represents the population of the municipality. *Post*2000 is a dummy variable that takes a value of 1 for years from 2001 to 2006, a value of 0 for the year 2000. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *CA FE*, a set of dummy variables for each *CA*; *Category of works FE*, a set of dummy variables for the main category of works involved in the contract; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation). *Province-year control* means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are included: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. Some effects of the Duration of trials computed on the dependent variable are included: *Linear effect +SD* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term); *Effect +SD at mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the mean value of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 25th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 25th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 75th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 75th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term).

Table A.1: Robustness checks

DEPENDENT VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Delays in execution of works (days)							
	Reduced sample				Only Piedmont and Lombardy			
Duration of trials	0.00624	0.12536**	-0.00684	0.10609**	0.03773**	0.03344	0.01065	-0.01060
	(0.013)	(0.051)	(0.016)	(0.052)	(0.016)	(0.062)	(0.018)	(0.085)
Duration of trials^2		-0.00005**		-0.00005**		0.00000		0.00001
		(0.000)		(0.000)		(0.000)		(0.000)
Reserve price	3.50121***	3.50521***	1.85259*	1.88292*	2.10474***	2.10456***	-0.67628	-0.68383
	(0.372)	(0.372)	(1.069)	(1.067)	(0.286)	(0.115)	(0.871)	(0.871)
(Duration of trials)*(Reserve price)			0.00195	0.00192			0.00468***	0.00469***
			(0.001)	(0.001)			(0.001)	(0.001)
Category of works FE	X	X	X	X	X	X	X	X
Awarding mechanism FE	X	X	X	X	X	X	X	X
CA FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
Province-year control	X	X	X	X	X	X	X	X
Observations	20,070	20,070	20,070	20,070	13,401	13,401	13,401	13,401
R-squared	0.412	0.412	0.413	0.413	0.318	0.318	0.320	0.320
Mean outcome	165.5	165.5	165.5	165.5	144.7	144.7	144.7	144.7
Mean Dur.	884.9	884.9	884.9	884.9	668.1	668.1	668.1	668.1
SD Dur.	286.7	286.7	286.7	286.7	222.2	222.2	222.2	222.2
Linear effect +SD	1.788				8.384			
Effect +SD at mean Dur.		8.402				8.105		
Effect +SD at 25th perc. Dur.		15.28				7.966		
Effect +SD at 75th perc. Dur.		2.549				8.148		
Effect +SD at mean Res. (and mean D.)				7.701				7.392
Effect +SD at 25th perc. Res. (and mean Dur.)				5.476				3.104
Effect +SD at 75th perc. Res. (and mean Dur.)				7.549				7.106
Effect +SD at mean Res.			1.437				8.768	
Effect +SD at 25th perc. Res.			-0.824				4.490	
Effect +SD at 75th perc. Res.			1.282				8.483	

Notes. Coefficients are reported with standard errors (clustered at *CA* level) in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. The table shows two simple robustness checks. We restrict our sample of contracts by applying two criteria: i) in columns 1 to 4, we focus on a common sample (i.e. on the same sample of contracts) where for each contract we find a value for the three alternative dependent variables (i.e. the delays in the completion of works, the share of final payment, and the size of the winning firms); ii) in columns 5 to 8, we only consider regions with a better-quality data collection, i.e. Piedmont and Lombardy. The dependent variable in columns 1 to 8 is the *Delay in completion of works (days)*, which represents the days of delay in the delivery of the works. *Duration of trials* is a province-level variable (varying over time), computed as the average number of days elapsing between the date of filing a suit and the date when a sentence is passed in a civil trial. *Reserve price* is the auction's starting value (in 100,000 euros, CPI deflated) set by the *CA*. When denoted with an "X", regressions additionally include: *CA FE*, a set of dummy variables for each *CA*; *Category of works FE*, a set of dummy variables for the main category of works involved in the contract; *Awarding mechanism FE*, a set of dummy variables for the type of awarding mechanism (open, restricted, negotiation); *Year FE*, a dummy variable corresponding to the year when the contract is awarded (between 2000 and 2006); *Province-year control* means that a variable with a province-year dimension has been added (i.e. population of the province). Some summary statistics for the sample are included: *Mean outcome* is the mean value of the dependent variable for the sample; *Mean Dur.* of trials is the mean value of the Duration of trials variable for the sample; *SD Dur.* is the standard deviation of the Duration of trials variable for the sample. Some effects of the Duration of trials computed on the dependent variable are included: *Linear effect +SD* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term); *Effect +SD at mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the mean value of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 25th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 25th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term); *Effect +SD at 75th perc. Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials from the 75th percentile of its distribution (this effect is only included when the Duration of trials enters the model as a quadratic term). *Effect +SD at mean Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean level of the Reserve price (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at 25th perc. Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Reserve price variable's distribution (this effect is only shown when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at 75th perc. Res.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Reserve price variable's distribution (this effect is only included when the Duration of trials enters the model as a single term and interacts with the Reserve price); *Effect +SD at mean Res. p. and mean Dur. t.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the mean value of the Reserve price variable and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price); *Effect +SD at 25th Res. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 25th percentile of the Reserve price variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price); *Effect +SD at 75th Res. and mean Dur.* represents the change in the dependent variable associated with an increase of one standard deviation in the Duration of trials computed at the 75th percentile of the Reserve price variable's distribution and at the mean value of the Duration of trials (this effect is only included when the Duration of trials enters the model as a single term and as a quadratic term, and interacts with the Reserve price).