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COURT EFFICIENCY AND PROCUREMENT PERFORMANCE

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Court Efficiency and Procurement Performance*

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Abstract

Disputes over penalties for breach of contract are often solved in court. We provide a simple model showing how inefficient courts may cause buyers to refrain from enforcing penalties for late delivery to avoid litigation, inducing sellers to delay. Using a large dataset on Italian public procurement, we then study empirically the effects of court inefficiency on public work delays. We find that, where courts are inefficient: i) public works are delivered with longer delays; ii) delays increase for more valuable contracts; iii) contracts are more often awarded to larger suppliers; iv) a higher share of the payment is postponed after delivery.

JEL-Code: H41; H57; K41.
Keywords: court efficiency; enforcement cost; delay; litigation; public procurement; time incentives.

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1 Introduction

Explicit contracting is the crucial governance instrument for public procurement transactions. Accountability concerns severely limit civil servants' discretion and, with it, the scope for relational contracting (Kelman, 1990 and 2002). Similarly, reputational considerations based on non-verifiable performance are rarely allowed in public procurement.[1]

On the other hand, contract enforcement costs can be very significant where the law court system is inefficient (Djankov et al., 2003). Contracting parties may then choose ex-post not to exercise their contractual rights to save on enforcement costs. In public procurement, high enforcement costs could thus mean that buyers are unable to effectively control suppliers' opportunism.

In this paper we empirically verify whether suppliers' opportunistic behaviour in public procurement is more likely when courts are less efficient. We specifically focus on suppliers' opportunism in terms of delivery delays. As Lewis and Bajari stressed (2011), delivery time is often an important quality dimension, and delays can impose significant negative externalities on end-users. First, to clarify the logic behind our main hypothesis, we build a simple model - developed in the spirit of the nuisance claim literature (Shavell and Rosenberg, 1985). We characterize the conditions under which - in equilibrium - suppliers strategically delay delivery when courts are inefficient, predicting that the public buyer will not exercise penalties to avoid litigation and - especially - end-users costs.[2]

We then use a large dataset on public works collected by the Italian Public Procurement Authority (AVCP) for the years 2000-2006 to empirically investigate this relationship. We merge this dataset with information collected by the Italian Statistics Institute (ISTAT) on the duration of civil trials by province for each year.

Our results show that the delay in execution of public works is positively and significantly associated with the duration of civil trials. This association is particularly strong for larger and more complex projects. This is consistent with our main hypothesis because complexity - and the asym-

[1] This has been particularly true in Europe where reputational considerations have always been seen by legislators as a tool to discriminate against foreign suppliers, e.g. EC Directives 17 and 18, 2004. However, a recent report by the General Accountability Office highlights widespread concerns for the use of reputational indicators in public procurement also in the USA (GAO, 2011, http://www.gao.gov/products/GAO).

[2] This occurs when the supplier's cost of filing a claim against penalties is small relative to the cost the public buyer incurs in defeating such claim. The difference between these costs increases when courts are slow. This is because the public buyer bears additional social/political costs when users' access to the completed works is delayed by the legal dispute.

metric information advantage belonging to it - is known to favor the plaintiff in legal disputes.[3] Furthermore, we find that where trials take longer, contracts are often awarded to larger suppliers. An intuitive potential explanation for this result - in line with previous evidence (see Laeven and Woodruff, 2007) - is that larger suppliers have internal legal departments that contain litigation costs. We also find that the size of payment to be paid after delivery is larger where trial duration is longer. This is suggestive of an attempt to reduce the incentive to delay by increasing its financial cost for the supplier.

Finally, as robustness checks, we consider different explanations for our findings on delivery delays, including corruption and public buyers' fiscal restraints.

Related literature. Our paper relates at least 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 procurement awarding 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) find that when penalties for late delivery are included in the contract, the supplier'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 by the enforcement of penalty clauses (i.e. enforcement related both to judicial discretion and court inefficiency): the higher the former and the lower the latter, the greater the penalty needed to oblige the supplier 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 a strand of empirical literature on contract enforcement costs. 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

[3] Typically, complexity in procurement contracts implies stronger information asymmetry in favor of the supplier (Bajari and Tadelis, 2001), who - as discussed in Section 2.2, below - plays as plaintiff in our setting.

sentences and more corruption. The authors emphasize that an inefficient judicial enforcement of contractual clauses often gives rise to opportunistic behavior and settlements. A number of papers evaluate the implication of these findings for economic outcomes. Jappelli et al. (2005) investigate the effect of judicial enforcement on credit markets: testing their model on 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.[4] We contribute to this literature with empirical evidence of the cost - in terms of performance in public procurement contracts - of legally enforcing contractual obligations in the local area where law courts are inefficient.

Third, a body of empirical and theoretical literature focuses on the 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. More recent theoretical papers have also 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.

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 (i.e., within) variability in the average duration

[4]See also Litschig and Zamboni (2008), who estimate the effect of state judiciary presence on rent extraction (administrative irregularities) by Brazilian local governments; and Ponticelli (2013) who empirically assesses the extent to which the effects of a financial reform in Brazil depend on the quality of court enforcement.

of civil trials. Then, in Section 4, we present our estimation strategy and discuss our results (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). In Section 6, we present some robustness checks. Section 7 concludes.

2 Equilibrium delay in delivering Italian public procurement

To empirically investigate the supplier firm's - F, henceforth - opportunistic behavior in Italian public procurement, 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 contracting authority's - CA, henceforth - 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[5] and the Public Procurement Code,[6] which acknowledges the EU Directives 2004/17/EC and 2004/18/EC. 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 new clauses on price definitions (and revisions).

The contractual terms that suppliers 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

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

[6]The Code - D.Lgs No. 163/2006 - essentially provides a single framework for contracts for public works, supplies and services.

the case of delays.[7] According to 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.[8]

Italian public procurement law grants public buyers a considerable degree of discretion in the actual exercise of their right to enforce penalties for late deliveries. Suppliers 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. The buyer assesses the supplier's claims and decides whether to wholly - or partially - accept, or reject them. If the public buyer rejects them, the supplier 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 supplier and the public buyer to dispute in court may differ substantially. The public buyer'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 public buyer'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 public buyers to avoid entering into a dispute with suppliers where the law courts are inefficient, and to use the degree of discretion it is allowed to find a solution.

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

Players. We investigate a setting where a public buyer, i.e. a contracting authority CA, entrusts the execution of a contract to a supplier firm, 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 $V^{\mathrm{P}}(d)$ which should be payed by F for each day of late delivery, d, of the contracted works.

[7] 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). Note that these laws do not permit to blacklist suppliers that delivered late in the past. The contractual penalties are the only punishment for late delivery.

[8] The legislator considers this 10% as the supplier's (average) profit: thus, the rationale for this time incentive rule is that the contracting authority can make a claim on the supplier's whole profit, but not exceed it. Should the accumulated delay imply damages exceeding that threshold, the contracting authority 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.

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 $-V(d)$. In case of supplier's delivery delay, 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 in Appendix A).

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 the 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 s to be paid when the claim is decided in court decreases with the contract value Π, i.e. $s'(\Pi) < 0$.

Equilibrium delay. As highlighted in Shavell and Rosenberg (1985), in a legal dispute defeating a claim usually means engaging in actions to gather evidence to support the defendant's contention that are frequently more costly than the plaintiff's costs of making the claim.[9] 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, the CA is

[9]This is reinforced for complex procurement contracts, where larger information in conveyed to the supplier (Bajari and Tadelis, 2001). Such information can be used by the supplier itself to reinforce the signal in filing the claim in court: as stressed by Cooter and Rubenfeld (1985, p.1072), "a stronger signal increases the probability that the judge or the jury will favor the fact as represented by its sender".

indifferent 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-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 $\hat{d} = V^{\text{P-1}}(\frac{k_F+R_F}{1-s})$ 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:

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

implying that $\frac{k_F+R_F}{(1-s)} < \frac{R_{CA}}{s}$ 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. the F's expected payoff resulting from delaying the works and filing a claim, then provided 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: see Appendix A.

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 an equilibrium 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 $R_F(\gamma)$. Last round, 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 (2) 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 political costs and 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.

Finally, if the F's cost of filing a claim, (k_F), is sunk and fixed - as it is in the Italian public procurement framework - the F's incentive to delay and file a claim will result larger for high value contract.

3 Database

We merge a data set about the procurement auctions administered by each Italian public administration between 2000 and 2006 with a database containing the duration of judicial trials in Italy. The former database is provided by the Authority for Vigilance over Contracts for Public Works, Services and Supplies (AVCP), which collects data on all procurement auctions for public works with a starting value greater or equal to 150,000 euros. The latter database is collected by the Italian National Statistics Institute (ISTAT).

Our procurement data include information on several dimensions of each procurement contract, such as the auction's awarding mechanism, the reserve price (i.e. the auction's starting value set by an engineer employed in the CA) and the winning rebate (i.e. the percentage discount from the reserve price offered by the auction's winning firm), 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 observe the business identity of the winning F and the proportion of the final payment (on completion) *vis-à-vis* the total amount that the CA pays the F.

Our sample consists of contracts awarded in 15 regions.[10] As shown in Table 1, most of the contracts were awarded by means of auctions open to all comers (about 75.8%), 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 32.3%) or roads and bridges (about 30.4%).

As for the different participation procedures, Italian legislation on public procurement indicates three main types: open procedures, restricted procedures and negotiations.[11] 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 for about 6.72% and 8.74% of the sample, respectively), but about 84.54% of the works were delivered late.[12] 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 calculated for each law court as the average time taken to arrive at a sentence (weighted over the number of pending cases), and the resulting figure was averaged by province if a province had more than one law court.[13] We focus on first instance civil

[10] 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.

[11] 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 (2013) puts it: the mechanisms "are identical in everything except for the exact way the winner is determined".

[12] 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).

[13] This measure has been adopted in other studies on Italy; see, for instance, Jappelli et al. (2005) on the relationship

trials (i.e. "procedimento civile di cognizione ordinaria di primo grado") by province and by year from 2000 to 2006. We refer to local civil courts because this is where disputes on the execution of a public procurement contract should be solved in Italy.[14]

The average duration of a first instance 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 (i.e., within variation) 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.

Figures 2 and 3 suggest 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 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 want to test whether the duration of trials affects the delays in the completion of public works. Our empirical strategies relies on the within province variation in the duration of trials and uses fixed effect regressions. We consider project-level data, controlling for the characteristics of the project and the CA, and estimating different versions of the following 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 the value of the average duration of trials in in the province p taken at the beginning of works (year t) for each project. X is a set of variables for: i) the characteristics of the project, e.g. the reserve price and the main category of 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

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.

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

participation in the auction); iii) the type of CA. Q contains province population (time-varying), and T represents year dummy variables. In alternative specifications, we experiment including contracting authorities CA fixed effects.

4.1 Main results

Table 2 reports estimates 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 fixed effects, in columns 5 to 8 for CA fixed effects. The latter model (i.e. after including CA 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 results suggest 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 suppliers' perception of the law court's inefficiency as much as when the duration is in the lower ranges. 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.[15]

In our model, we also control for auctions reserve price (i.e. taken in 100,000 euros, 2000 equivalents) to proxy of the complexity and/or size of the works involved (see Bajari et al. 2009). An engineer employed by the CA sets the reserve price, following a price-list of the standardized cost for each type of work. We introduce the reserve price either as a single term (columns 1, 2, 5 and 6), or as a single and as 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.

[15] *Percentage increase over the mean value* $= [(\beta_{Duration} * SD_{Duration} + 2 * \beta_{Duration^2} * SD_{Duration} * MEAN_{Duration})/MEAN_{Delay}] * 100 =$ [7.417 / 153.3]*100= 4.84.

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.[16]

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. According to our model, if F takes advantage of such 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 what follows, we check whether the duration of trials correlates with other outcomes, such as the type of winning company, F, adjudicating the contract, and the proportion of the CA's final payment (Section 5.1). We also test whether the relationship between inefficient enforcement by local courts and late delivery of contracted works is compatible with 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 supplier firms, F, then whether public buyers, CAs, use their final payments as a way to

[16] 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 supplier's evaluation of the benefit it derives from delaying the works: for a more complex project, a supplier 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 supplier firm does not necessarily obtain constantly greater benefits from larger and larger projects, because transferring very large resources can be very costly (and because the supplier may not have other similarly complex projects underway where such large resource might be usefully exploited).

contain a F's tendency to delay the completion of the works.

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 Fs 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 Fs are more likely to bid for contracts than small Fs, and consequently have higher chances of winning the contracts. We focus on proxies of a F's size. In particular, we consider two types of business entity: one-man businesses as a proxy for micro-sized Fs, and joint-stock companies (JSC) as a proxy for large Fs.[17] We only refer to these two business entities because the correlation with the supplier's size is less clear for other types of supplier, 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.[18] 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-à-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 the subsample of auctions for which we observe 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.[19] In our setting, CAs can use this final payment to deter Fs from delaying the execution

[17] 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 Fs 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).

[18] 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.

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

of works, adopting 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 *CA*s 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 *F*s from delaying.[20]

5.2 Alternative explanations for the late delivery of contracted works

The analysis up to this point has shown fairly robust evidence that delays in judicial trials are associated with procurement performance and selection of winners. In this section, we explore whether the duration of trials is 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 or *CA* 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 amounts of money being wasted in corruption. Since this indicator does not vary over time,[21] we introduce it in our model through an interaction with the variable measuring the average duration of trials. The

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

[21] Golden and Picci (2005) do not offer a time varying 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.

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*. In a recent paper, Grembi et al. (2012) 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 suppliers' 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 positive relationship between the duration of trials remains statistically significant.

6 Robustness checks

In this section we report three different robustness checks on our main estimated relationship between the duration of trials and the delays in the delivery of the public work.

Firstly, we check whether our estimates are influenced by poor data quality and *CA*'s potential misreporting of information. We thus focus on the sample of contracts awarded in Piedmont and Lombardy regions, which usually coincides with a better-quality data collection. In this subsample,

there is a more limited cross-province and over-time variability of the duration of trials, however, as shown in Table 8, our main estimation are confirmed.[22]

Then, we focus on the choice of the reference year of the duration of trials to consider as relevant for the supplier's choice of delaying the delivery of the works. So far, we have used the duration of trials taken at the beginning of the works, i.e. in the year of awarding, which means that the supplier firm decides whether to delay or not, and the days of the eventual delay, taking into account the province's observed duration of trials at the beginning of the work. One might argue that F i) does not necessarily decide to delay at the beginning of the execution of the works, but it might take the decision at any time during the life of the contract or just before the date of expected delivery, when the province's average duration of trials could differ from the average duration observed at the beginning of the works (especially for longer contracts); ii) does not necessarily have a sharp perception of the actual duration of trials at any time in a province. From our data, we cannot observe when the supplier begins to slow the execution of the works (i.e. it begins to delay), since we do not have information on project's intermediate timetable and the relative assessment of the intermediate goals. We thus show two robustness checks to jointly take into account the two concerns described above: for any project we use the average duration of trials in the province from time T_0 to T_{-2}, where T_0 refers to i) the median year between the date of awarding and the date of expected delivery, or ii) the year of the expected delivery.

Our estimation results show that duration of trials has a positive and decreasing effects on the delays of delivery of the works even when we take as reference year of the duration of trials the median date of the life of the project (Table 9) and at the date of expected delivery (Table 10) and we measure it as a moving average of the last three years. [23]

7 Conclusion

Contracts are a good deterrent against opportunistic behavior only insofar as they are credibly and effectively enforced. In this paper, we empirically investigate how the quality of enforcement

[22] In Table 8 we also report estimation results for delays in the delivery of works focusing on the sample of contracts for which we observe a value for each of 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). Our main estimation results are confirmed.

[23] Since we consider two lagged years and we do not have information about the duration of trials prior 2000, projects that were expected to end before 2002 are not included in the sample.

of contractual obligations by local courts affects suppliers' performance in public procurement contracts in Italy. Following Djankov et al. (2003) and Jappelli et al. (2005) - among others - 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 relating them to the competent local court.

Our empirical analysis shows that public works are delivered with longer delays in provinces where the local courts are less efficient. This is particularly true for higher-value contracts (i.e. more complex projects), suggesting that stronger information advantage typical of suppliers managing larger-scale works makes them behave more opportunistically. These findings are consistent with a simple theoretical model in which an equilibrium delay results from the costs involved in disputing penalties in court are greater, by a sufficient margin, for the public buyer than for the supplier. Such an assumption is coherent with all those context where - once litigation in court starts - the works remain inaccessible to end-users until the dispute's solution: the belonging social welfare loss can affect the public buyer's reputation and political interests, *de facto* increasing its cost in disputing penalties.

We also find that where local courts are inefficient, public procurement contracts are more often awarded to larger firms: this could be because the different-sized suppliers 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 suppliers, which have to avail themselves of the professional services of outside legal consultants.

Finally, our empirical results highlight that, on average, public buyers opt for a proportionally higher final payment in their contracts if their local courts are inefficient. This seems to suggest that buyers use proportionally larger final payments as a "stick" to reduce the benefit the supplier can gain from delaying the delivery of the works.

Taken together, our results suggest that court efficiency is a crucial determinant of procurement performance. Moreover, these results contribute to the current debate on the importance of contract enforcement institutions in developed and developing countries. They show that these institutions are crucial not only for financial contracting and the performance of the private sector, but also for the quality of basic public goods.

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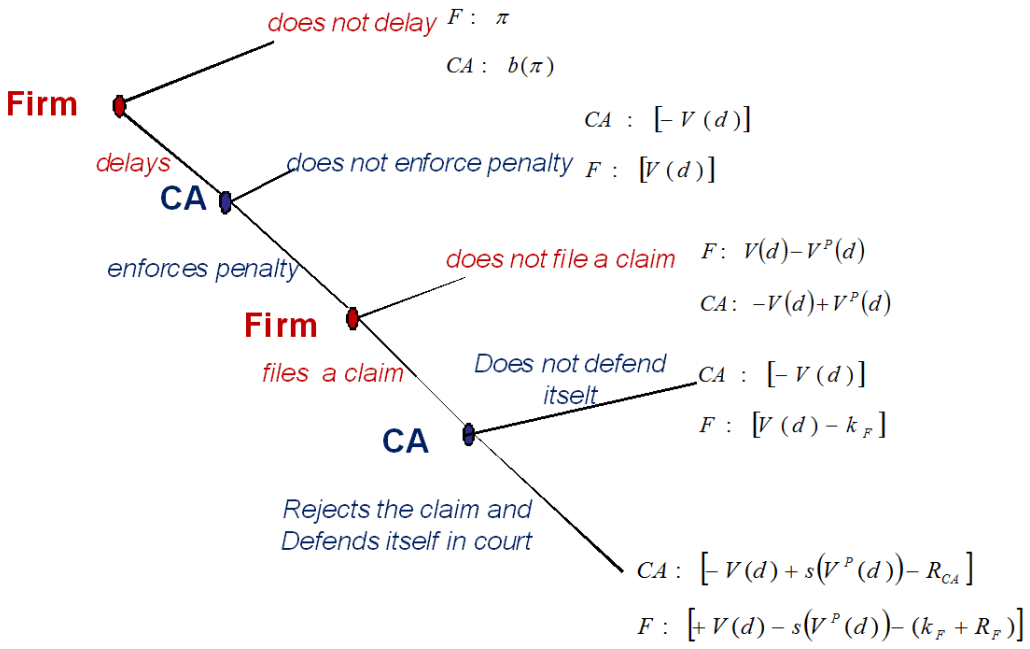
APPENDIX A: Figure and Proof of the Proposition

Figure 1: The Game Tree



Proof of Proposition 1: 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.

APPENDIX B: Tables and Figures

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
Provincial 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. *Delay in completion of works (days)* represents the delay in delivering 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, 2000 equivalents) 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, or a value of 0 otherwise; *Cultural heritage* is a dummy variable taking a value of 1 if the main category of works relates to cultural heritage conservation works, or a value of 0 otherwise; *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, or a value of 0 otherwise. *Type of CA* includes a set of dummy variables for the type of *CA* awarding the contract. The table only shows the most frequent encountered types of *CA*: *Municipal authorities* is a dummy variable that takes a value 1 if the *CA* is a municipal authority, or a value of 0 otherwise; *Provincial authorities* is a dummy variable that takes a value of 1 if the *CA* is a provincial government, or a value of 0 otherwise; *Ministries* is a dummy variable that takes a value of 1 if the *CA* is a ministry, or a value of 0 otherwise. *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

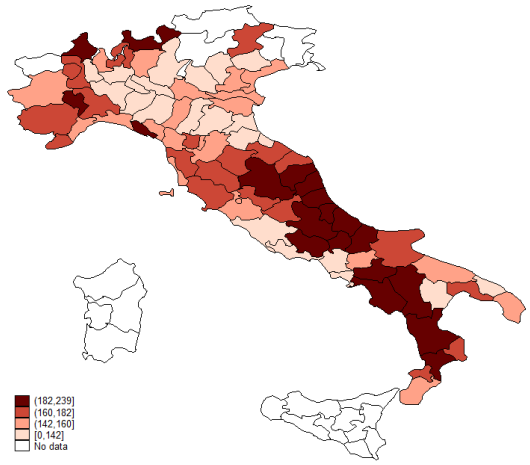


Figure 3: Average duration of trials (days) by provinces

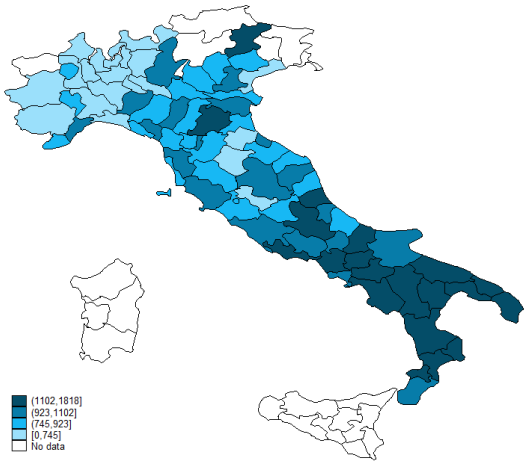


Figure 4: Average duration of trials (days) by year and macro-regions

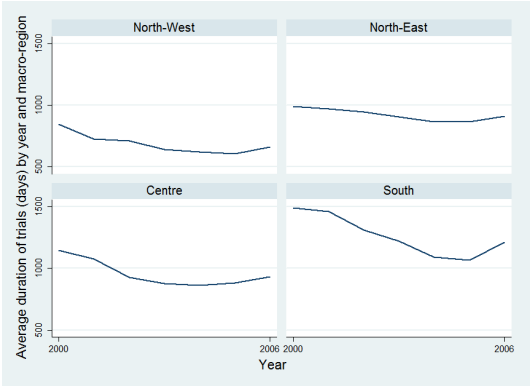


Figure 5: Average delays in completion of works and average duration of trials (by province-year)

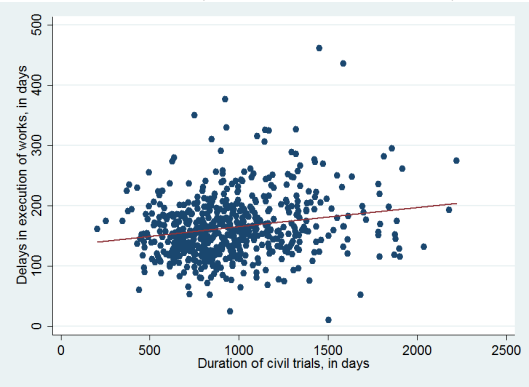


Table 2: Delays in the completion of works and duration of trials

	(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 delay in delivering 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, 2000 equivalents) set by *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 single term and 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 single term and 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 single term and 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 delay in delivering 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, 2000 equivalents) set by *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.		0.0103		-0.00249
Effect +SD at 25th perc. Dur.		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, 2000 equivalents) set by *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 2005); *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 single term and 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 single term and 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 single term and 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 *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, 2000 equivalents) set by *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 single term and 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 single term and 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 single term and 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)*, i.e. the delay in delivering 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, 2000 equivalents) set by *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	0.02982***	0.04285	0.02495***	0.00409
	(0.009)	(0.041)	(0.009)	(0.041)
Duration of trials^2		-0.00001		0.00001
		(0.000)		(0.000)
Municipal Pop. < 5,000	28.82456**	29.18623**		
	(11.452)	(11.507)		
(Municipal Pop. < 5,000)*(Post 2000)	16.90733	16.74381		
	(12.146)	(12.066)		
Post 2000	-14.92850***	-14.78118***	-10.72628*	-10.77074*
	(4.593)	(4.657)	(6.024)	(6.061)
Municipal Pop.			-0.00027***	-0.00027***
			(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.)			-0.00004	-0.00005
			(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	3.67213***	3.67378***	3.84076***	3.84029***
	(0.590)	(0.590)	(0.571)	(0.571)
Category of work FE	X	X	X	X
Awarding mechanism FE	X	X	X	X
Province FE	X	X	X	X
Province-year control	X	X	X	X
Observations	22,199	22,199	22,199	22,199
R-squared	0.077	0.077	0.080	0.080
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	8.699		7.279	
Effect +SD at mean Dur.		9.216		6.423
Effect +SD at 25th perc. Dur.		10.06		5.075
Effect +SD at 75th perc. Dur.		8.563		7.462

Notes. Coefficients are presented with standard errors (clustered at province 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)*, i.e. the delay in delivering 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, 2000 equivalents) set by *CA*. When denoted with an "X", regressions additionally include: *Province FE*, a set of dummy variables for the province where the contract is awarded; *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 single term and 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 single term and 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 single term and as a quadratic term).

Table 8: Robustness: Delays in the completion of works and duration of trials

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.			1.437				8.768	
Effect +SD at 25th perc. Res.			-0.824				4.490	
Effect +SD at 75th perc. Res.			1.282				8.483	
Effect +SD at mean Res. (and mean Dur.)				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

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 observe 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)*, i.e. the delay in delivering 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, 2000 equivalents) set by *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 single term and 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 single term and 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 single term and 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. 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 9: Robustness: 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)							
(Average lags) Duration of trials	-0.01211	0.13666***	-0.01013	0.15501***	0.02439**	0.15604***	0.02572**	0.17175***
	(0.014)	(0.052)	(0.014)	(0.052)	(0.012)	(0.053)	(0.012)	(0.053)
(Average lags) Duration of trials^2		-0.00007***		-0.00008***		-0.00006***		-0.00007***
		(0.000)		(0.000)		(0.000)		(0.000)
Reserve price	2.81140***	2.81530***	6.25542***	6.26588***	2.84250***	2.84719***	6.37210***	6.38386***
	(0.307)	(0.306)	(0.424)	(0.423)	(0.295)	(0.296)	(0.362)	(0.362)
Reserve price, squared			-0.02796***	-0.02801***			-0.02954***	-0.02960***
			(0.003)	(0.003)			(0.003)	(0.003)
Type of CA FE	X	X	X	X				
Category of work 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	33,053	33,053	33,053	33,053	33,053	33,053	33,053	33,053
R-squared	0.104	0.104	0.124	0.124	0.382	0.382	0.397	0.397
Mean outcome	149.4	149.4	149.4	149.4	149.4	149.4	149.4	149.4
Mean Dur.	879.1	879.1	879.1	879.1	879.1	879.1	879.1	879.1
SD Dur.	269.2	269.2	269.2	269.2	269.2	269.2	269.2	269.2
Linear effect +SD	-3.260		-2.727		6.565		6.925	
Effect +SD at mean Dur.		4.747		6.162		12.34		13.33
Effect +SD at 25perc. Dur.		11.98		14.20		19.04		20.76
Effect +SD at 75perc. Dur.		-1.654		-0.943		6.411		6.754

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 delay in delivering of the works. *(Average lags) Duration of trials* is a province-level variable (varying over time) and it is constructed as a moving average from time T_0 to T_{-2} where T_0 is the median year between the date of awarding and the date of expected (contractual) delivery of works; it represents 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, 2000 equivalents) set by *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 2002 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 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 single term and 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 single term and 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 single term and as a quadratic term).

Table 10: Robustness: 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)							
(Average lags) Duration of trials	-0.01605	0.16609***	-0.01439	0.17828***	0.01492	0.18199***	0.01611	0.18882***
	(0.015)	(0.059)	(0.015)	(0.055)	(0.012)	(0.057)	(0.012)	(0.055)
(Average lags) Duration of trials^2		-0.00008***		-0.00009***		-0.00008***		-0.00008***
		(0.000)		(0.000)		(0.000)		(0.000)
Reserve price	3.02397***	3.02926***	6.84147***	6.85128***	3.13707***	3.14225***	7.11113***	7.11930***
	(0.304)	(0.304)	(0.449)	(0.448)	(0.306)	(0.306)	(0.369)	(0.369)
Reserve price, squared			-0.03071***	-0.03075***			-0.03264***	-0.03267***
			(0.003)	(0.003)			(0.003)	(0.003)
Type of CA FE	X	X	X	X				
Category of work 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	35,088	35,088	35,088	35,088	35,088	35,088	35,088	35,088
R-squared	0.104	0.105	0.128	0.128	0.377	0.378	0.395	0.396
Mean outcome	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1
Mean Dur.	874.4	874.4	874.4	874.4	874.4	874.4	874.4	874.4
SD Dur.	267.2	267.2	267.2	267.2	267.2	267.2	267.2	267.2
Linear effect +SD	-4.290		-3.845		3.986		4.306	
Effect +SD at mean Dur.		5.500		6.511		11.29		11.85
Effect +SD at 25 perc. Dur.		14.34		15.87		19.78		20.63
Effect +SD at 75perc. Dur.		-2.044		-1.469		4.041		4.363

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 delay in delivering of the works. *(Average lags) Duration of trials* is a province-level variable (varying over time) and it is constructed as a moving average from time T_0 to T_{-2} where T_0 is the year of expected (contractual) delivery of works; it represents 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, 2000 equivalents) set by *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 2002 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 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 single term and 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 single term and 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 single term and as a quadratic term).