Regulation and Procurement

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Procurement design, ingredients…

P-A relationship

Buyer has to choose:

- what exactly should be procured
- a contract with obligations and payments
- a firms' qualification screening (ex-ante/post qualification)
- an award mechanism to allocate the contract
- how to implement productive changes (i.e. adaptations) in the most cost-effective way.

Big changes in Procurement…

…in the last 20 years.

In the **private sector**, no more a secondary function, recognized as crucial factor of success/failure

- Toyota/GM story made it a core strategic function in many large corporations

In the **public sector,**

- Kelman's regulatory revolution in the US, increased flexibility a lot in the 90s…
- The EU has been revising its directives that try to level the playfield for foreign suppliers within the EU
- Now, also seen as a *strategic tool* to stimulate innovation, social inclusion, environment protection, SMEs particpation…

Increasingly complex public procurement objectives

- Private Procurement: Value for Money (VfM, max Q/P)
- Public Procurement: VfM + Efficiency + Integrity + Trade + SMEs
- EU: + MKTs Integration
- Now: + Social Inclusion, Environment, Innovation…
- Multiple objectives makes it difficult to monitor and incentivize performance (Dewatripont et al. 1999)
- **Rules** are Tools, often, not always, useful to achieve these objectives

Outline of the talk

Rules on

- Suppliers' qualification screening:
  - ex-ante/ex-post firms' qualification

  - "Firms' Qualifications and Subcontracting in Public Procurement: an Empirical Investigation" (Moretti, Valbonesi)

  - Firms' qualification screening and awarding in procurement (De Fraja and Valbonesi)

- Awarding procedure:
  - Negotiations
  - Auction formats

    - "Allotment in First-Price Auctions: an experimental investigation" (Corazzini, Galavotti , Sausgruber, Valbonesi)

    - "Level-k thinking in average bid procurement auctions" (Galavotti, Moretti, Valbonesi)

- Contract execution:
  - Explicit/Implicit Incentive

    - "Sticks and carrots in procurement: an experimental exploration" (Bigoni, Spagnolo, Valbonesi)
  - Enforcement of rules

    - "Court Efficiency and Procurement Performance" (Coviello, Moretti, Spagnolo , Valbonesi)

Supplier Qualification Screening

- typically aims to verify that the supplier is indeed able to comply with all the contract specifications with a reasonable degree of certainty.
- determines firms' entry into public procurement mkt
- according to the adopted rules, can directly affect suppliers' make-or-subcontract choice in performing a contract.

FIRMS' QUALIFICATIONS AND SUBCONTRACTING IN PUBLIC PROCUREMENT: an Empirical Investigation

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THE PAPER

Is there a difference in terms of offered prices in auctions for public works between firms which can freely choose to subcontract and firms which are obliged by regulation to subcontract?

What we do:

- Take advantage of Italian regulation on i) firms' qualification requirements to auctions' participation and ii) subcontracting, to **distinguish between firms' subcontracting position**:
  - firms that can **freely choose to horizontally subcontract**
  - firms that are **required to vertically subcontract**.
- Collect a **new dataset of auctions** for public works in the Italian region of Valle d'Aosta between 2000-2009.
- Show empirically that **firms that can freely choose to horizontally subcontract offer higher rebates**.

ITALIAN PUBLIC PROCUREMENT AUCTIONS: Qualifications

Bidders must be certified by a third party private company ('SOA'), and must satisfy:

- **general requirements** (i.e., financial and criminal standing, "anti-mafia"),
- **technical requirements** (i.e., skills to execute works - 46 categories of works).

An awarded ppc includes different categories of works:

- EXAMPLE: Consider a contract for the building of a road in a new residential area: the fulfilment of this contract contains three tasks: main category - road works (tA), secondary categories - water works (tB) and sewage works (tC).

Three basic principles of this qualification system:

- A bidder **must** be qualified for the **main category - tA**.
- A bidder **might not** be qualified for the **secondary categories**.
- Each part of the project **must be executed by qualified firms.**

VERTICAL AND HORIZONTAL SUBCONTRACTING

If a bidder is **qualified for all the categories** (in the example: tA, tB, tC), it has the **option** to subcontract.

- If he does, he must engage with subcontractors with similar qualifications (**horizontal subcontracting**).

If a bidder is **not qualified for one (or more) secondary categories** (tB,tC), he knows - ex-ante - he must subcontract.

- In so doing, he **must** engage with subcontractors with complementary qualifications (**vertical subcontracting**).
- Alternatively:
  - Make a consortia with other firms and pool together the qualifications.
  - Lease the missing qualifications (ie. very costly and unlikely event).

RESEARCH QUESTION

Is the firm's subcontracting position (Optional horizontal vs. Mandatory vertical) associated with different rebates?
(i.e., does the firm discount - ex ante - its subcontracting position on the bid?)

- Descriptive statistics show that, on average, bidders with the option of horizontal subcontracting offer higher rebates (+1 pp) than vertically subcontracting firms.

Our procurement setting offers an interesting test on how the supplier organizes the production, i.e. with or without outsourcing, and facing vertical or horizontal subcontracting.

DATASET

SOURCE 1: We collect transcripts of **269 auctions** issued by the Regional Government of Valle d'Aosta, that contain information on:

- firm's (bidder) ID.
- rebate (bidder's % discount on auction's reserve price).

SOURCE 2: From AVCP (National Autority for Public Contracts), we recall:

- For each **auction**, information on auction/project **characteristics**:
  - type of auction: average price or average price+lottery;
  - reserve price;
  - categories of works.

SOURCE 3: For each **bidder**, information on owned **qualification** (i.e. categories of works for which the bidder is qualified).

DESCRIPTIVE STATISTICS: AUCTIONS/PROJECTS CHARACTERISTICS

Bid-level data					
Variable	Obs.	Mean	St.Dev.	Min	Max
Rebate (%)	13,317	17.215	4.829	0.001	43
Reserve price (Euros)	269	1,103,786	865,298	155,526	5,267,860
No. of participants	269	55.450	31.845	3	155
Expected duration (days)	269	328.640	172.645	79	1,440
Average bid format	269	0.892	0.311	0	1
Average bid format + lottery	269	0.108	0.311	0	1
Road works	269	0.372	0.484	0	1
River and hydraulic works	269	0.297	0.458	0	1
Buildings	269	0.078	0.269	0	1

DESCRIPTIVE STATISTICS: BIDDERS CHARACTERISTICS

	% of the sample
Local bidders	32.90
Bidders' size:	
small	11.69
medium	53.08
large and co-operatives	21.90
Consortia	13.33
Subcontracting status (% of sample):	
Mandatory_Vertical	12.83
Optional_Horizontal (excluding consortia)	73.84
Subcontracting status (% of bidders):	
always Mandatory_Vertical	1.39
either Optional_Horizontal or Mandatory_Vertical	75.00
always Optional_Horizontal (excluding consortia)	10.28

MODEL SPECIFICATION

We want to identify whether the bidder discount -ex ante- its position on the bid. We assume that all firms know their production plans at the bidding stage, thus discounting the cost of subcontracting in their rebate.

$$Rebate_{ij} = \alpha + \beta_1 Optional\_Horizontal_{ij} + \beta_2 Q_j + \beta_3 X_i + \epsilon_{ij}. \quad (1)$$

- ***Rebate*** is the % discount on the reserve price offered by bidder i in auction j
- ***Optional_Horizontal*** is a dummy that takes value 1 if the bidder i has all the required qualifications for contract j and **can freely choose to horizontally subcontract**; it takes value 0 otherwise (call it $Mandatory\_Vertical$).

- Q is a set of contract/project j characteristics: Reserve price, Expected duration of works, Awarding mechanism, Categories of works, Year of awarding.
- X is a set of firm's i characteristics proxied by firm's size and location, or firm fixed effects (or firm-year fixed effects).

ESTIMATION RESULTS: REGRESSIONS

Dependent variable:	Bidding Rebate		
Mean outcome:	17.21	17.15	17.23
	OLS	OLS	OLS
Optional_Horizontal	0.212**	0.323***	0.363***
	(0.097)	(0.100)	(0.110)
(log of) Reserve price	0.154**	0.205***	0.220***
	(0.069)	(0.078)	(0.079)
(log of) Expected duration	-0.294***	-0.294***	-0.375***
	(0.095)	(0.110)	(0.116)
(log of) No. participants	1.206***	1.298***	1.261***
	(0.142)	(0.153)	(0.164)
Category of work dummy	YES	YES	YES
Type of auction dummy	YES	YES	YES
Firm's size dummy/Cons.	YES	NO	NO
Firm fixed-effects	NO	YES	NO
Firm-year fixed-effects	NO	NO	YES
Year dummy	YES	YES	YES
Observations	13,317	9,988	9,600
Adj. R-squared	0.519	0.543	0.575

ESTIMATION RESULTS: COMMENTS

The positive and statistically significant coefficient of $Optional\_Horizontal$ indicates that **bidders which can freely choose to subcontract**:

- If they **do not subcontract**, they do not have **to face any seeking cost** (i.e., costs of finding a qualified subcontractor).

- If they **subcontract**, they:
  - are **less likely to face seeking costs**, as they have to outsource to "known and similar" firms; Lewis, Sappington. 1991, AER
  - have **more bargaining power** with potential subcontractors, as they have symmetric information about the cost and, eventually, they can execute the works by themselves (outside option). Grossman, Helpman. 2002, QJE.

CONCLUSION

In our public procurement setting, bidders for a contract can have different subcontracting positions:

- They can freely choose to horizontally subcontract (*Optional Horizontal*);
- They must vertically subcontract (*Mandatory Vertical*).

We found that *Optional Horizontal* firms offer higher rebates than the others:

- They seem to benefit the flexibility in organizing their production to execute the contract.
- This finding empirically confirms the theoretical result by Spiegel (1993) on production efficiency by horizontal subcontracting
- and, it is in line with Lafontaine and Slade's (2008) argument about the negative effects of government's interventions on firms' integration (in their case is vertical restraints to integration, in our case is vertical mandatory vertical subcontracting).
- This result is robust to different checks.

Awarding procedure 1.

- Bajari and Tadelis (2001, RJE), Tadelis (2012):
  - More complex projects will result in less design completeness, are more likely to be renegotiated and are better procured with cost-plus contracts.
  - Simpler projects are more likely to have more complete specifications and are better procured using fixed-price contracts.

➔ trade-off between providing incentives to lower costs and avoiding costly and wasteful renegotiation that accompany adaptation.

Awarding procedure 2.

- Cost-plus contract➔ Negotiations

- Fixed-price contract ➔ Auctions:
  - First Price Auction
  - Second Price Auction
  - Average Bid Auction
  - Scoring rule

First Price auctions & allotment

- Allotment of awarded contracts:

it facilitates the participation of "small" bidders interested in few units only ➔ SMEs

- *2011 Green Paper on the modernization of EU public procurement policy*

- *New EU Directives*

Allotment in First-Price Auctions: An Experimental Investigation

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Motivation (1)

- An auctioneer wants to allocate a certain quantity of a divisible good. The auctioneer can either sell the entire quantity as a single package or, alternatively, she can split it into two (or more) sub-lots.
- Allotment? Traditional pros and cons…

Yes (a) it promotes competition by facilitating the participation of "small" bidders
(b) bidders may be interested in few units only;
(c) with risky items, it allows differentiation of (idiosyncratic) risks.

No (a) depending on substitutability/complementarity of units and asymmetries across bidders, the strategic response to allotment may lead to a loss of revenues/efficiency.

Is this the whole story? That is, beyond the factors abovementioned, does allotment per se (fixed number of symmetric bidders, no substitutability/complementarity) matter in auctions? We experimentally study the "pure" effects of allotment (i.e. splitting a divisible good into identical sub-lots) on bids and efficiency in "pay-your-bid(s)" auction formats.

- How to implement allotment?
  (a) multiple units in the same auction (shares of financial assets; tradable permits; electricity; raw materials);
  (b) separate parallel auctions, each involving one sub-lot (eBay and other online platforms).

Experimental Design (1)

Overview

- 18 subjects in each session; in every period, subjects are randomly partitioned into 9 pairs. Pairs are formed within re-matching groups of 6 subjects;
- For each treatment, 3 sessions, 9 independent observations at the re-matching group level;
- 15 periods;
- Initial budget (to cover losses) of 300 points;
- Ztree; subjects are undergraduate students; University of Innsbruck;
- 12.00 euro for 45 minutes;
- Questionnaire (socio-demographic, risk aversion, joy of winning).

Experimental Design (2)

Treatments:

- Benchmark (1A1U):
  - ✓ single-unit, first-price, independent private value auction with two bidders;
  - ✓ private values ~ U[0;200];
  - ✓ each subject places one bid;
  - ✓ Payoff: for the winner, private value - winning bid; for the loser, 0.

- Discriminatory auction (1A2U):
  - ✓ two (identical) units in one auction;
  - ✓ each subject simultaneously places two bids in the auction;
  - ✓ the two highest bids win one unit each;
  - ✓ private value (of one unit) ~ U[0;100];
  - ✓ Payoff: for each acquired unit, private value of the unit - corresponding winning bid; 0 otherwise.

Experimental Design (3)

- Multi-auction (2A1U):
  - ✓ two parallel auctions based on the same rules, each involving one unit;
  - ✓ the units in the two auctions have the same value;
  - ✓ each subject simultaneously places two bids, one in each auction;
  - ✓ within each auction, the highest bid wins the unit;
  - ✓ private value (of one unit) ~ U[0;100];
  - ✓ Payoff: for each acquired unit, private value of the unit - corresponding winning bid; 0 otherwise.

The distribution (in terms of boundaries and mean) of the private values is the same across treatments.

Theoretical Predictions

- Under Risk Neutrality:
    1. 0-spread;
    2. Bid equivalence;
    3. (Expected) efficiency equivalence.

Kagel and Levin (1995): "it is probably safe to say that risk aversion is one element, but far from the only element, generating bidding above the RNNE."

- Under Risk Aversion & Joy of Winning (Grimm and Engelmann, 2005):
    1. Overbidding in all treatments. In particular, both the bids in 1A2U and 2A1U are greater than what implied by RN;
    2. Bid spreading in 1A2U and 2A1U;
    3. Under JoW, bids are higher in 1A1U than in the other two treatments;
    4. (Expected) efficiency is higher in 1A1U. Under JoW, the auctioneer's revenue is higher in 1A1U than in 1A2U and 2A1U.

RESULTS

- Our main findings:
  a. allotment reduces the extent of overbidding;
  b. stronger effects when subjects compete for multiple units in the same auction;
  c. bid spreading in the allotment formats;
  d. allotment implies a loss of (allocative) efficiency. Allotment does not affect bidders' surplus BUT reduces auctioneer's revenue.
  e. Both the hypotheses of "joy of winning" and "risk aversion" successfully account for the experimental results.

- In the auctioneer's perspective: in addition to reduce transaction costs (organization costs, notary costs, etc), single-unit auctions increase the revenue by enhancing bidders' aggressiveness.
- If allotment is necessary, then the auctioneer should prefer multiple parallel auctions (each involving a single sub-lot) to a single discriminatory auction (involving all the sub-lots).

Results (1): Over-bidding

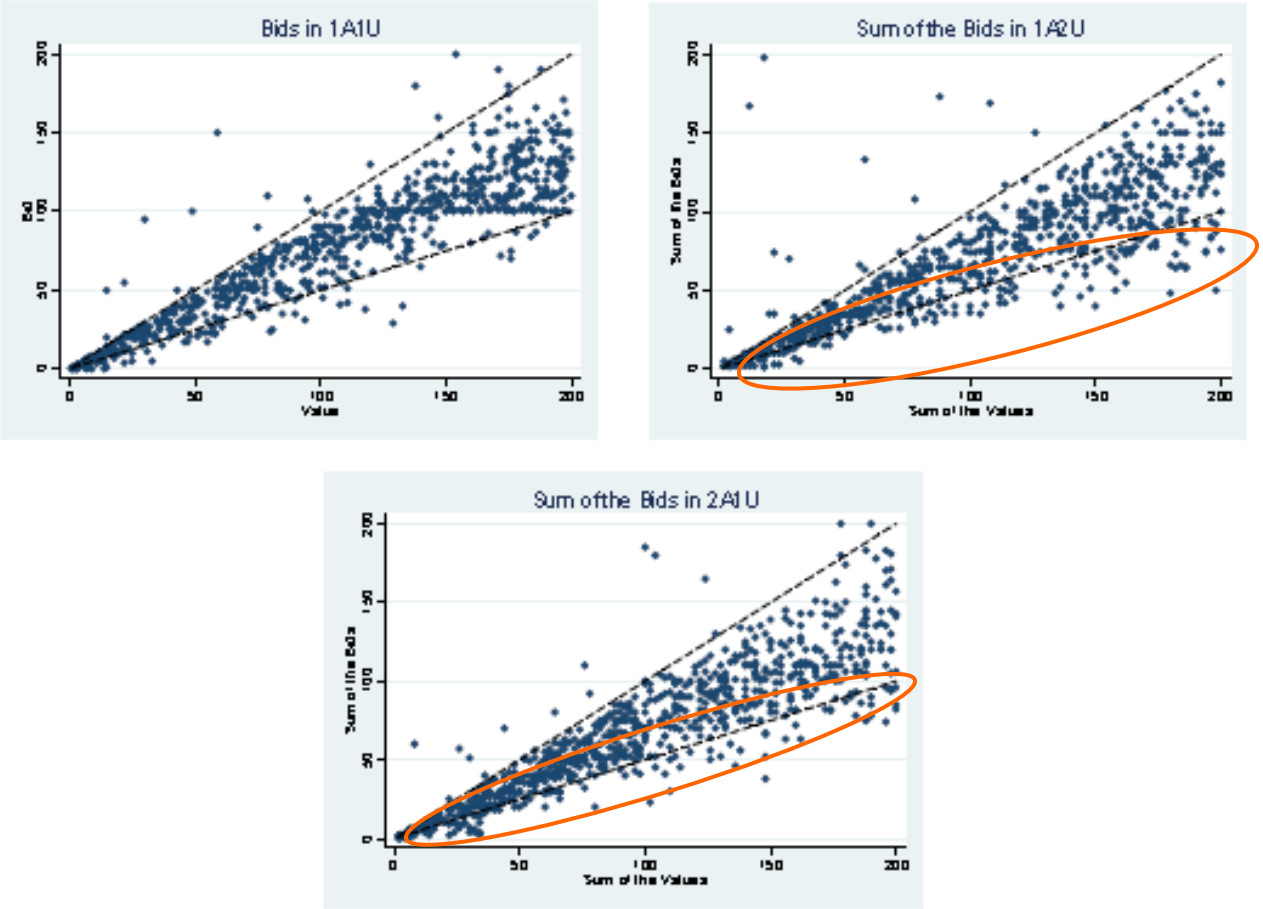

Fig. 1. (Sum of the) bids in 1A1U, 1A2U and 2A1U

Results (5): Bid spreading and bidding behavior in 1A2U and 2A1U

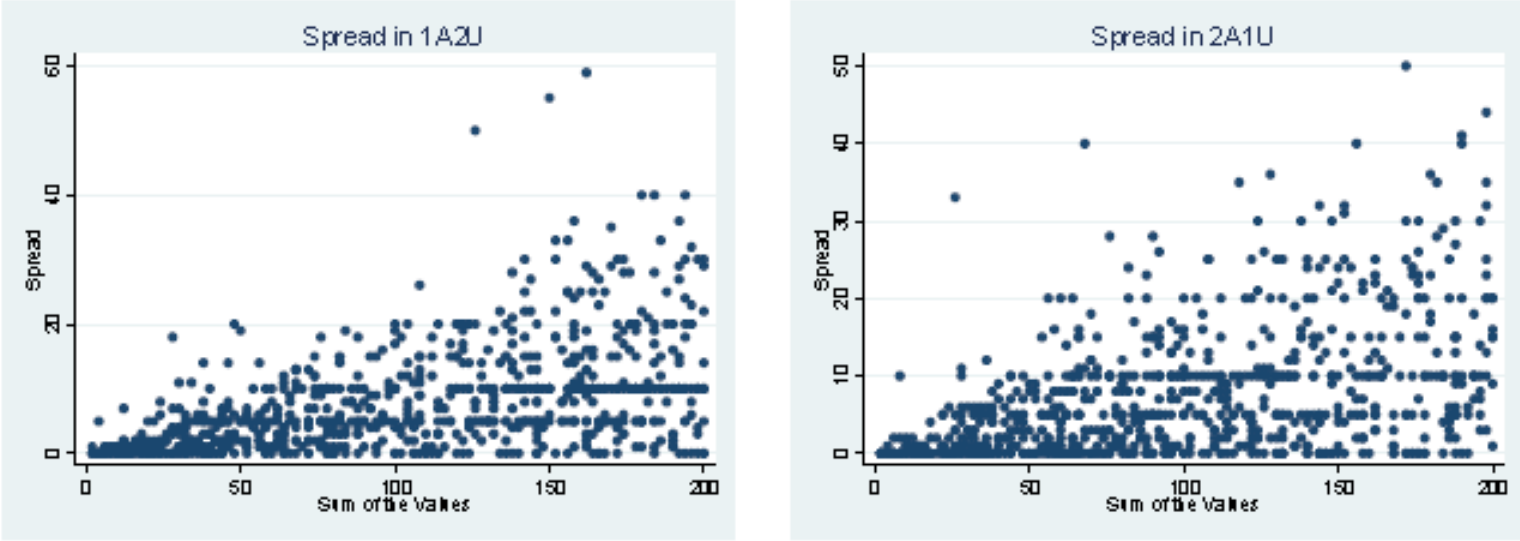

Fig. 2. Bid spreading in $1A2U$ and $2A1U$

Contract execution 1.

- Incentives
  - Explicit (Bonus and Penalties)
  - Implicit (Relational Contracts)

Sticks and Carrots in Procurement

an Experimental Exploration

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Motivation

- Procurement represents a large share on GDP:
  - Public procurement alone weights for about 20% in US and 16% in EU (Handbook of Procurement, 2006)
- Usually fixed-price contracts stipulating:
  A) Price
  B) Minimum quality standards
  C) a set of penalties (i.e. deductions up to a fraction of the contract value, "liquidated damages")
- contracts setting A) and B) and analogous arrangements framed as bonuses (i.e. lower base payment and additional payments rewarding sellers' good performance) are far less common.

This is puzzling as in many countries there are regulations that cap the level of enforceable penalty but not that of performance bonus

$\Rightarrow$ *real benefit in framing payoff-equivalent incentive as bonuses rather as penalties!*

What we did

An experiment – focus on procurement relations characterized by:

- multiple tasks (verifiable/non verifiable)
- dynamic dimension (relational contract)
- competition

(minimizing the impact of social preferences)

Main research questions

- payoff-equivalent **penalties and bonuses** are in fact fungible?
  - If not, how do they differ? could this explain the prevalence of penalties in real world procurement?
- more specifically, how do bonuses and penalties **differ** in terms of:
  - interaction with **relational** incentives.
    $\rightarrow$ are monetary and relational incentives substitute or complements in inducing effort?
  - **"displacement effect"** on effort, from the non-contractible to the ~~non~~-contractible task?
  - allocation of **surplus** between buyers and sellers

The Game - 1

Buyer-Seller relation. One traded good, with **2 dimensions:**

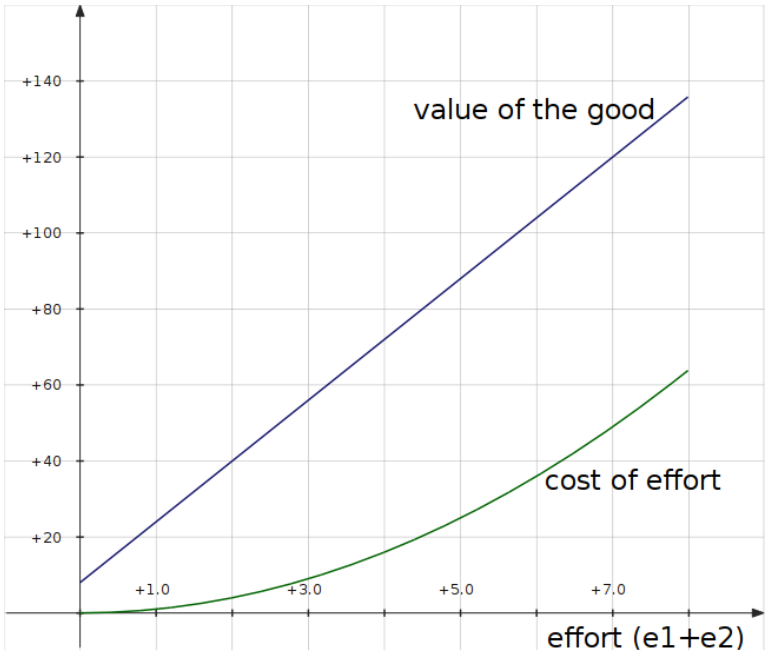
- one **verifiable** (delivery time) $\Rightarrow$ effort $e_1 = 0, 1, \ldots, 4$
- one **non-verifiable** (quality) $\Rightarrow$ effort $e_2 = 0, 1, \ldots, 4$

Value of the good for B:
$8 + 16(e_1 + e_2)$

Cost for providing the good for S:
$(e_1 + e_2)^2$

Efficient Outcome:
$e_1 = e_2 = 4$, Surplus=72

N.E. of one shot game
(without explicit incentives):
$e_1 = e_2 = 0$, Surplus=8



▸ profit functions

The Game - 2

Finitely but **indefinitely** repeated game: # periods $\in [15, 30]$; continuation probability=67%

Trading phase *(max. 3 mins.)*

Buyers make contractual offers (public/private)

- fixed compensation $w \in [0, 130]$
- desired level of effort (not binding): $e_1^d, e_2^d \in [0, 4]$
- addressee (if private offer). Note: reputation matters.

Sellers can accept only one offer in a period.

buyers=#sellers -2

Contract execution

Sellers set $e_1, e_2 \in [0, 4]$

$\Downarrow$

profits determined

Treatments

▸ experimental procedure

treatment	Monetary Incentive available	Standard Theoretical Prediction
T – *trust*	payment fully unconditional on outcome	$w = 4$, $e_1 = e_2 = 0$ Surplus=8 $\pi_b = \pi_s = 4$
B – *bonus*	**bonus** = 20 conditional on $e_1 \geq e_1^*$	$w = 0$, $e_1 = 4$, $e_2 = 0$ Surplus=56 $\pi_b = 52$, $\pi_s = 4$
P – *penalty*	**penalty** = -20 conditional on $e_1 < e_1^*$	$w = 20$, $e_1 = 4$, $e_2 = 0$ Surplus=56 $\pi_b = 52$, $\pi_s = 4$
I – *incentives*	**bonus and penalty**	monetary incentives always used. Indifference between bonus and penalty.

RESULTS

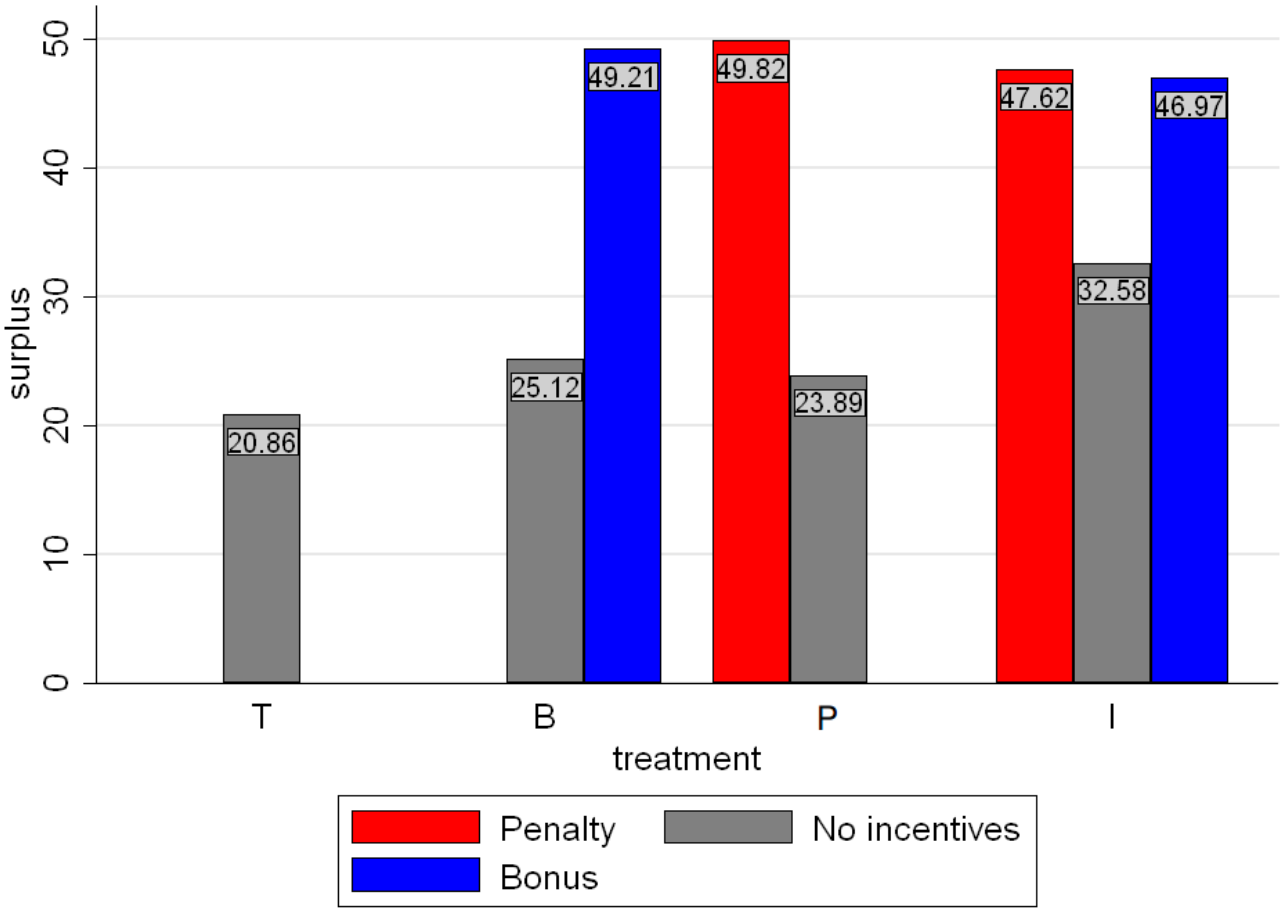
An experiment on the effects of implicit and differently framed monetary **incentives** in a dynamic **multiple-principal/multiple-agent** setting.

- framed as a firm-to-firm relation
- contractible and non-contractible tasks
- endogenous matching
- buyers are the short side of the market.

Main results:

1. **relational** incentives are weak in our setting, even weaker with monetary incentives
2. **monetary** incentives help to increase **surplus**...
3. ...but have **side effects**:
   - displacement effect (contractible vs. non contractible task)
   - motivational crowding out
4. the **framing** of incentives has no effects on (1), (2), and (3), but it affects the distribution of surplus between buyers and sellers

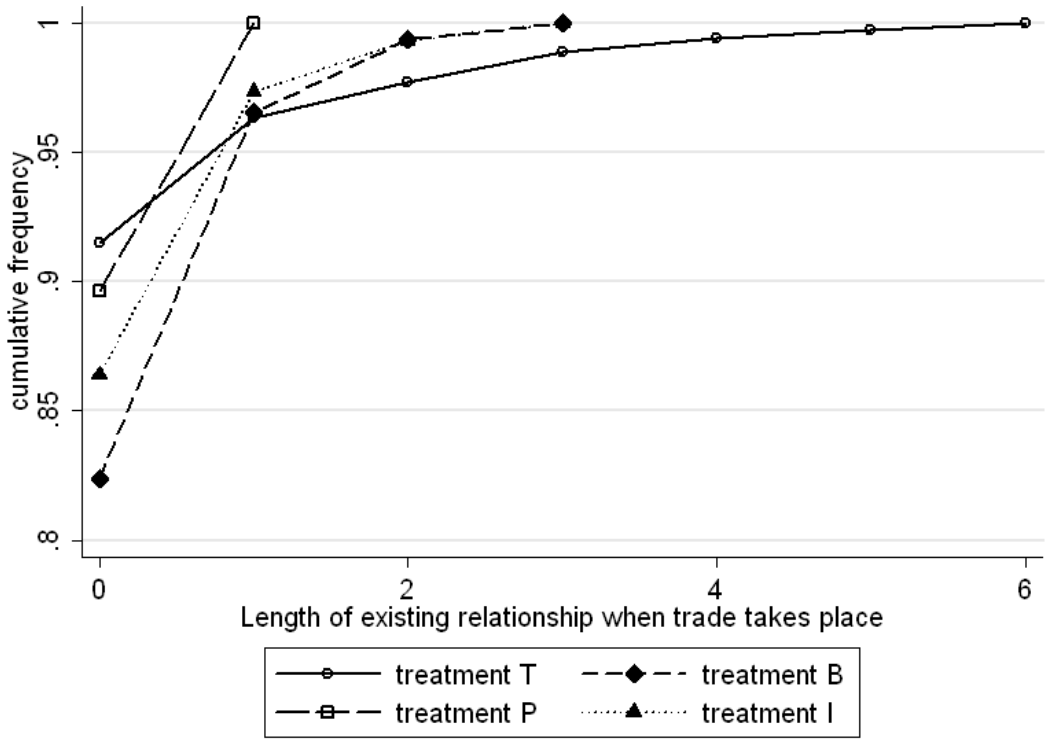
Surplus – *no framing effect*



Result (1)

Monetary incentives have a **positive net effect on surplus.**

Relational Contracts – *no framing effect*



Result (2)

Absent monetary incentives, **relational** *incentives are* **weak**. *When buyers have the opportunity to use monetary incentives, the relational dimension of the contract becomes even less important.*

Contract execution 2.

- Enforcement of explicit rules:

"Explicit contracting is the crucial governance instrument in public procurement" (Spagnolo, 2012) ➔ the judicial system plays a relevant role and its efficiency is an issue.

- In EU Accountability rules and market integration concerns (non discrimination principle, level playing field,...) strongly limit the scope for relational contracting or reputational forces (past performance measures).

COURTS EFFICIENCY AND PROCUREMENT PERFORMANCE

preliminary version

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AIM OF THE PAPER (and outline)

- investigate the relationship between
  - **weak enforcement by local courts of law** ("slow" courts' decisions) **&**
  - **default in public procurement contracts** (delays in contract's delivery).

- provide a simple theoretical setting on equilibrium delay in execution;
- take to (Italian) data the simple theoretical model;
- run several robustness checks and controls to assess for competing interpretation of our results.

PUBLIC PROCUREMENT AND EXPLICIT CONTRACTING

- **In EU** public procurement transactions:
  - Explicit contracting is the crucial governance instrument (Spagnolo, 2012);
  - Accountability rules and market integration concerns (non discrimination principle, level playing field,...) strongly limit the scope for relational contracting or reputational forces (past performance measures).

$\rightarrow$ the judicial system plays a relevant role and its efficiency is an issue.

- **In Italy**, penalties (deductions) for delayed delivery should be included in the initial contract and:
  - set in the range 0.03 % and 0.1% of the contract value, calculated on daily basis;
  - their total amount can't exceed 10 % of the contract's value;
  - they can be disputed in local civil court of law.

EMPIRICAL EVIDENCE FROM ITALY, 2000-2006

- 88 percent of contracts for public works are delivered with delays (AVCP);
- 36 percent of contracts for service and furniture (CONSIP) record at least one infringement
  - among all these, 82 percent refers to delays in delivery;
  - in only 3 percent of these, penalties have been enforced;

Average duration of civil trials is 911 days (min 205 and max 2221, sd 294 days).

OUR SIMPLE STORY

- the opportunism of contractor Firm (F) in delaying delivery can be fostered by the inefficiency of the local courts of law;

- we consider a setting where the Contracting Authority (CA) has larger litigation cost than the F:

  - F can rise a *nuisance suit** (Shavell and Rosenberg, 1988) to avoid paying the enforced penalty and to grab the advantage from delay;

  - the CA can decide not to enforce penalties

  $\rightarrow$ this could lead to the F's noncompliance.

**a suit in which the plaintiff (F) is able to obtain a positive settlement from the defendant (CA), even though the defendant knows the plaintiff's case is sufficiently weak that he would be unwilling or unlikely actually to pursue his case to trial (p.3, S-R 1988)*

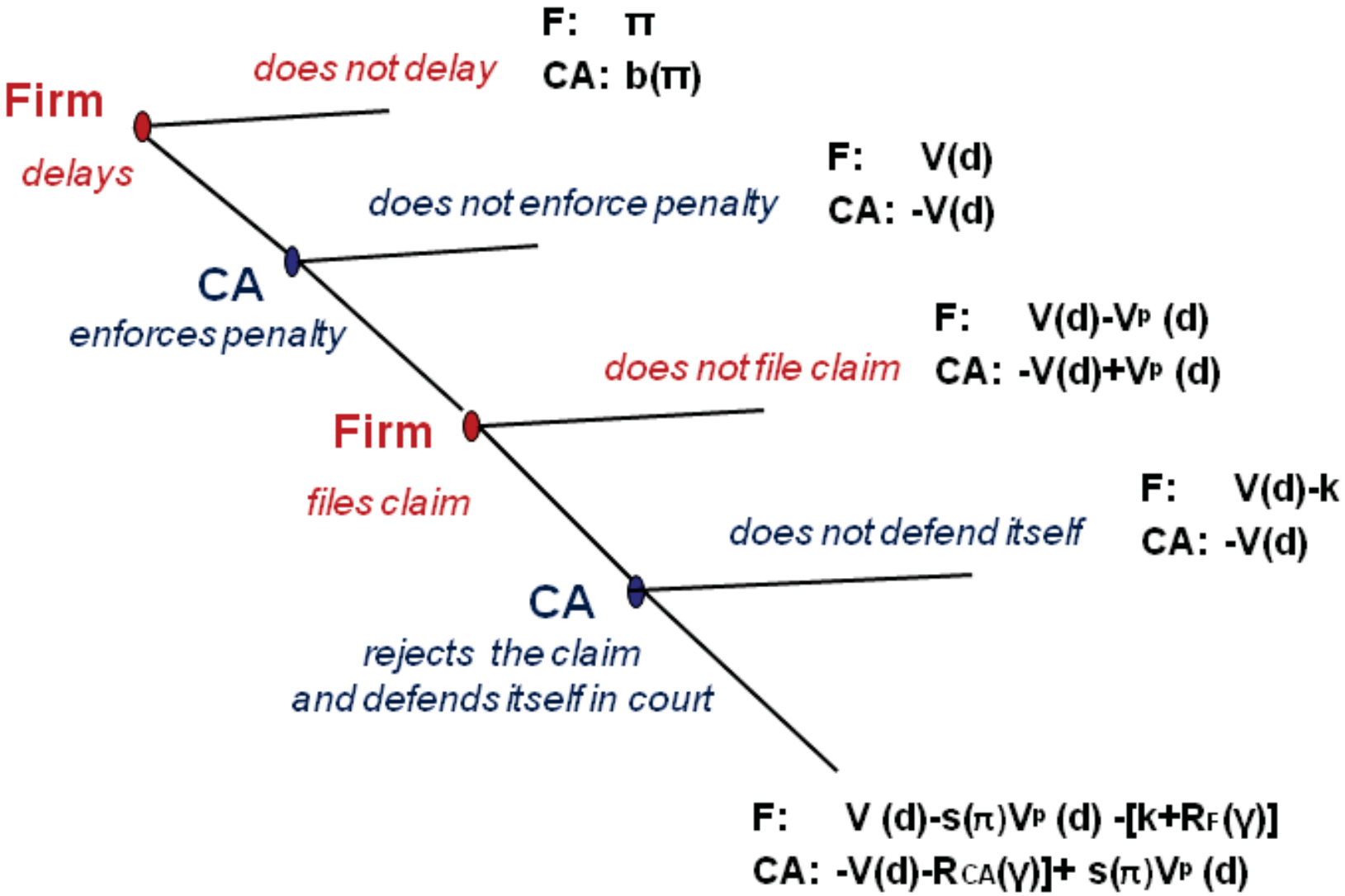
A SIMPLE MODEL OF EQUILIBRIUM DELAY: ASSUMPTIONS

CA delegates the execution of a contract (task and delivery time) to F
Π is the monetary transfer from CA to *F*
$b(\Pi)$ is the *CA*'s utility from the executed contract
F, capacity constrained, gets positive value $V(d)$ from postponing execution.

F's extra-day in execution, determines a damage $-V(d)$ to CA's, which is compensated by penalty $V^P(d)$ once enforced.

- Regularity assumptions on the functions $V(d)$ and $V^{\mathsf{P}}(d)$:
  - $V(0) = 0$, $V^{\mathsf{P}}(0)$=0;
  - $V(d)$ and $V^{\mathsf{P}}(d)$ are continuous function;
  - $V(d)$ is strictly concave and $V^{\mathsf{P}}(d)$=*Nd* is linear, for *N*>0.
- Following Rosemberg and Shavell (1985), we assume
  - legal cost to dispute: $R_{CA}(\gamma) \geq R_F(\gamma) \geq$0; average duration of trial: (γ).
  - $k_F \geq$0 is a small *F*'s fixed administrative cost to file the claim.
  - *F* files a claim to recover an expected fraction of the enforced penalty $(1-s)V^{\mathsf{P}}(d)$, with $1 \geq s >$0.

A SIMPLE MODEL OF EQUILIBRIUM DELAY: GAME TREE



A SIMPLE MODEL OF EQUILIBRIUM DELAY: PROPOSITION

Figure 2: *Proposition 1*

$\hat{d} \Rightarrow \quad k_F + R_F(\gamma) \leq (1\text{-}s(\pi))V^P(d)$

$\tilde{d} \Rightarrow \quad R_{CA}(\gamma) > s(\pi)V^P(d)$

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

Let d^* the number of days of delay *F* chooses to maximize the function V(d), i.e., $d^* = \text{argmax}(V(d))$

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

COMPARATIVE STATICS

Simple inspections of conditions defining the interval $[\hat{d}, \tilde{d}]$ highlight that:

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

- ii) the interval of equilibrium delays is moving on the right side - i.e. higher value of $\hat{d}$ and $\tilde{d}$ - as the parties' legal cost $R_F(\gamma)$ and $R_{CA}(\gamma)$, increases with γ;

- iii) since $R_{CA}(\gamma)$ is increasing in (γ) at a higher rate than $R_F(\gamma)$ - i.e. *CA* suffers the social welfare loss due to further delays until the end of the trial in the time citizens can start using the public work - the values of d for which *CA* will not defeat the claim in court and not enforce the penalty becomes larger as γ increases.

DATA

Contracts for the procurement of public works (source AVCP):

- 15 regions for 2000-2006, 40,521 contracts;
- 54.8% of the sample include municipalities as CA;
- The average value of the contract is 582,000 euros;
- 75.7% awarded through open competitive auctions; 9.7% negotiations; the rest with restricted procedures.

Delays in delivery are the difference between expected and actual end of the works

Duration of trials at provincial level is provided by ISTAT

OUR EMPIRICAL RESULTS

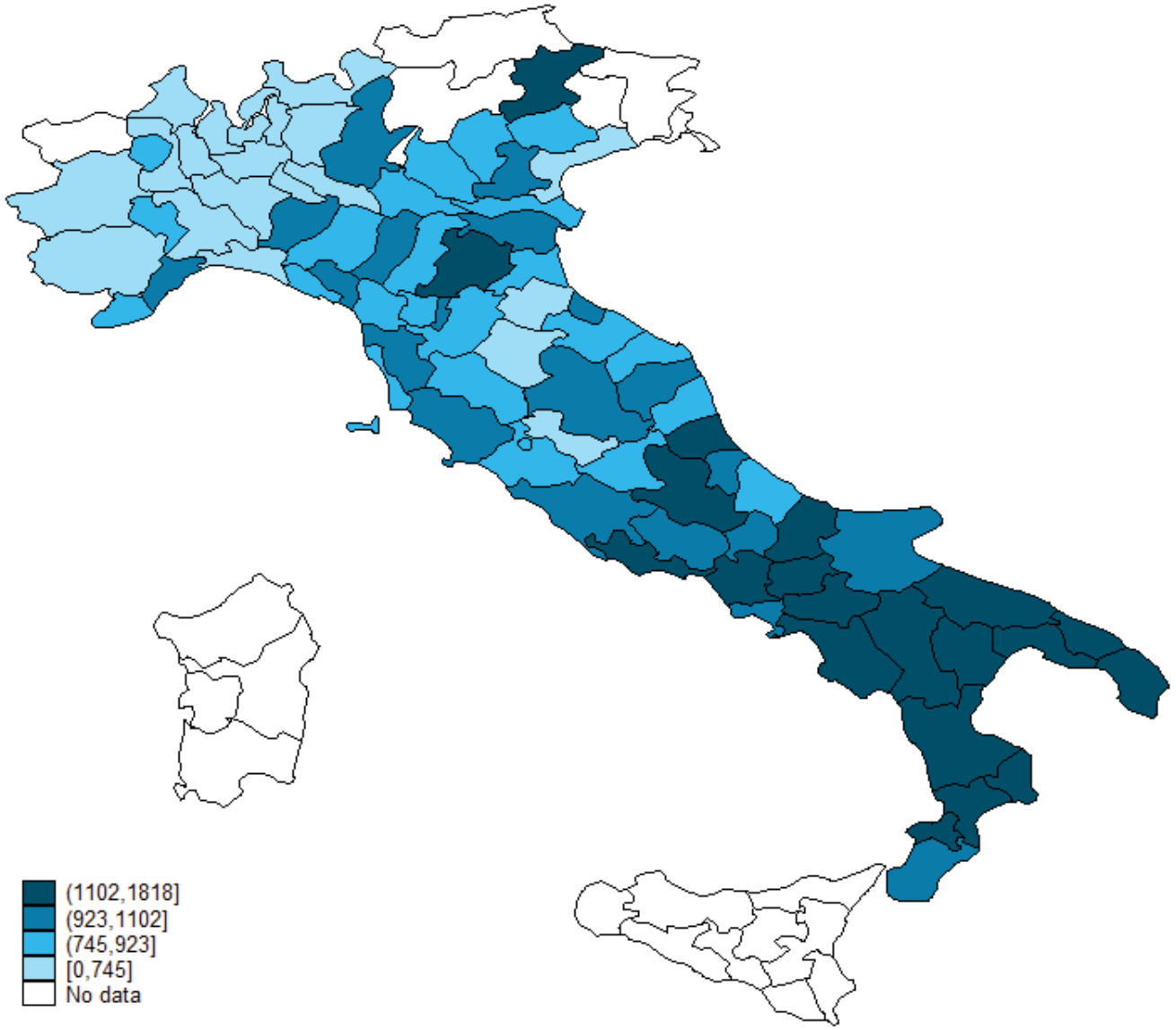
We show that *in province where the duration of trials is longer*:

- public works are delivered with longer delays; and
- the effect is larger for more complex projects (i.e. for higher value projects).
- large sized firms have higher probability of win than small sized firms;
- CA tends to retain a larger final payment (i.e. share of the payment);

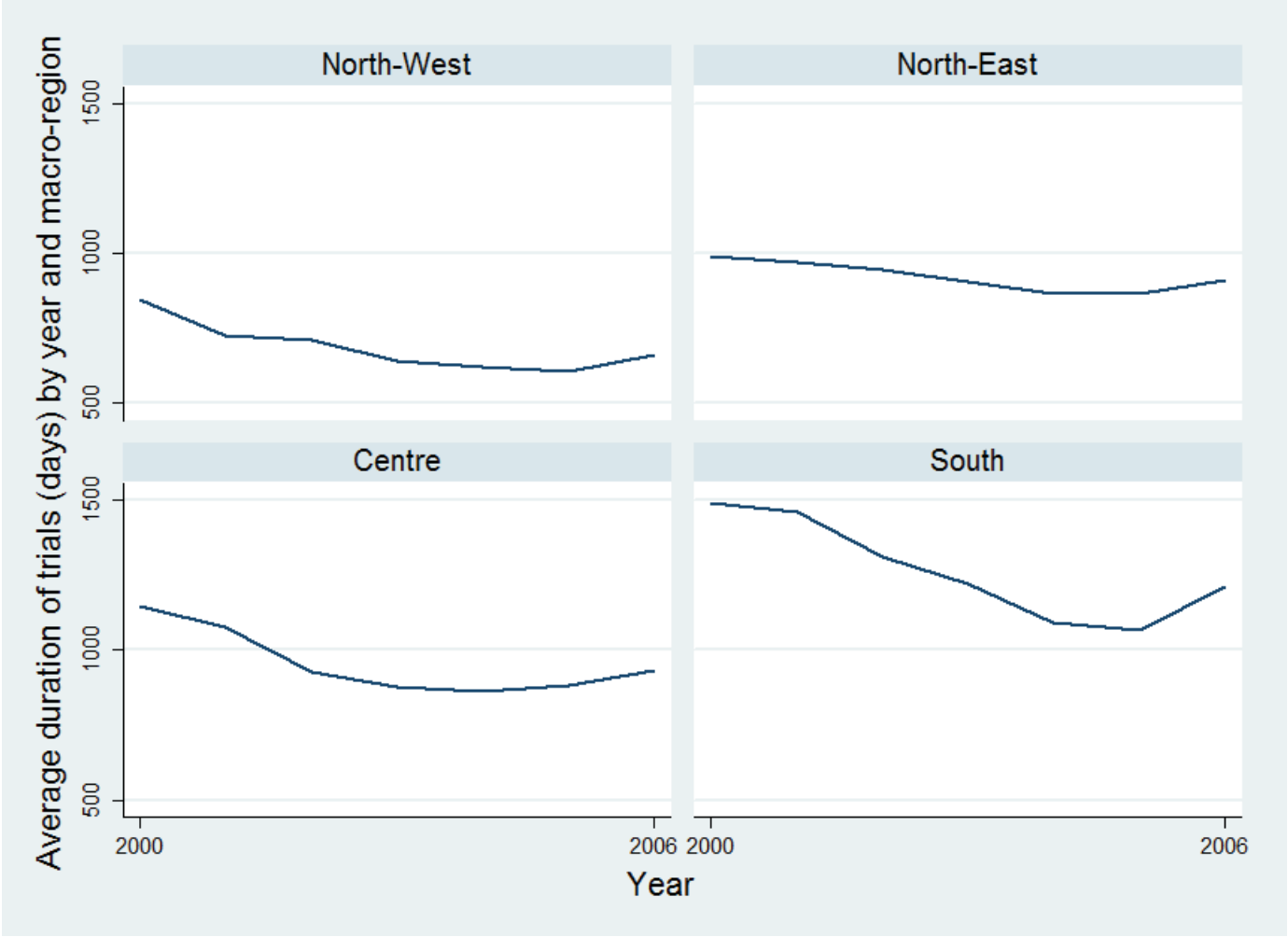
We also test whether other findings might be related to competing interpretations. The effects of the local courts inefficiency is robust after having controlled:

- the role of corruption (i.e. an indicator of corruption in the provinces);
- the role of CA fiscal restraints (i.e. we control for the tightness of the municipalities' budgets larger that 5,000 inhabitants after 2001, respect to other municipalities).

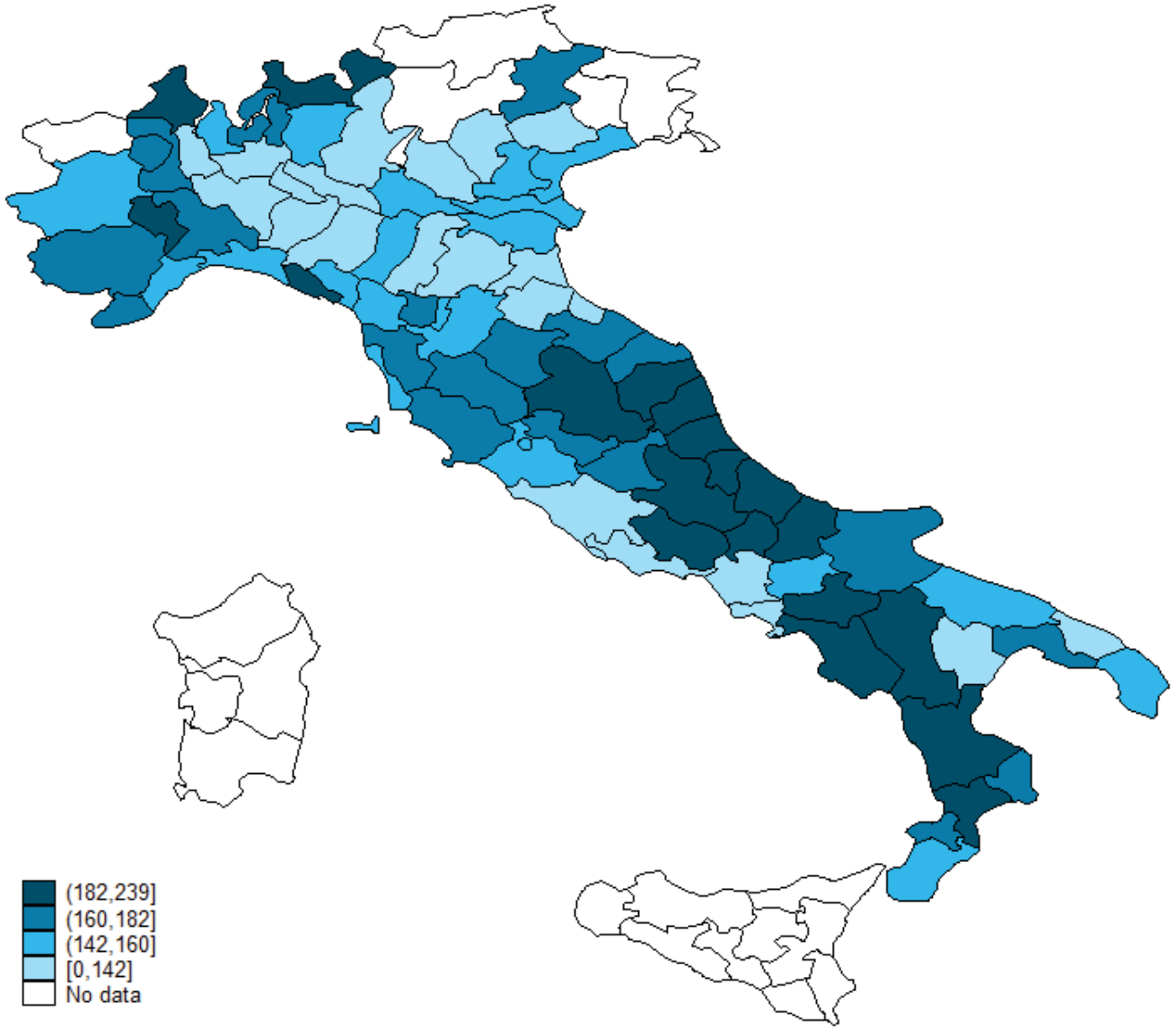
CROSS-SECTIONAL DURATION OF TRIALS IN ITALY



WITHIN PROVINCE VARIATION OF DURATION OF TRIALS



DELAYS IN EXECUTION OF CONTRACTS



EMPIRICAL MODEL

$$Delay_{ipt} = \alpha + \beta_1 J_{pt} + \beta_2 X_i + \beta_3 Q_{pt} + \beta_4 T_t + \beta_5 P_p + \epsilon_{ipt}. \quad (1)$$

- where J is our measure of average duration of trials in province p at time t.
- X is a set of variables for:
  - characteristics of the project: reserve price, type of work involved, main category of work (i.e. proxy for the project's dimension or complexity);
  - characteristics of the auction (i.e., type of auction);
  - type of the *CA*.
- we also included other variables as:
  - Q, with province and time variability (i.e. the province's population),
  - P, province fixed effects, to exploit with-in province variation of trials' length,
  - T, year dummy variables, to adjust for temporal shocks,
  - *CA*'s fixed effects, to better account for *CA*'s characteristics and location.

MAIN RESULTS

	(1)	(2)	(3)	(4)	(5)	(6)
DEPENDENT VARIABLES	**Delays in completion of works (days)**					
Duration of trials	0.00182	0.06142*	0.00161	0.06166**	0.00939	0.08274***
	(0.007)	(0.033)	(0.007)	(0.030)	(0.007)	(0.030)
Duration of trials^2		-0.00003*		-0.00003**		-0.00003**
		(0.000)		(0.000)		(0.000)
Reserve price	2.83227***	2.83373***	6.35360***	6.35523***	2.95800***	2.96120***
	(0.299)	(0.299)	(0.410)	(0.410)	(0.269)	(0.269)
Reserve price^2			-0.02779***	-0.02779***		
			(0.002)	(0.002)		
Type of CA FE	X	X	X	X		
Category of works FE	X	X	X	X	X	X
Awarding mechanism FE	X	X	X	X	X	X
Province FE	X	X	X	X		
CA FE					X	X
Year FE	X	X	X	X	X	X
Province-year control	X	X	X	X	X	X
Observations	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
Mean outcome	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
SD Dur.	293.7	293.7	293.7	293.7	293.7	293.7
t-test[b(Dur.)+b(Dur.)^2=0]		3.44*		4.09**		
Linear effect +SD	0.534		0.473		2.759	
Effect +SD at mean Dur.		4.621		4.591		7.354
Effect +SD at 25th perc. Dur		8.021		8.017		11.65
Effect +SD at 75th perc. Dur.		2.001		1.952		4.046

OTHER RESULTS

We also find that:

- The effect of duration of trials on delays in the execution of works is larger for more complex project (i.e. higher reserve price).

- In province where the duration of trials is longer:
  - large sized firms have higher probability of win than small sized firms;
  - CA tends to retain a larger final payment (ie. share of the payment);

ROBUSTNESS CHECKS

i. **Competing interpretations**. Our results are robust after having controlled:

- the role of corruption (i.e. an indicator of corruption in the provinces - Golden and Picci 2005);
- the role of CA fiscal restraints (i.e. we control for the tightness of the municipalities' budgets larger that 5,000 inhabitants after 2001, respect to other municipalities; Nannicini et al 2012).

ii. **Different measurement of duration trials**. We obtain similar results when we use, the duration of trials taken as the:

- average from time T_0 to T_{-2}, where T_0 refers to the median year between the date of awarding and the date of expected delivery;
- average from time T_0 to T_{-2}, where T_0 refers to the year of the expected delivery.

iii. **Quality of data**. Our results are robust when we look at the regions with better quality in data collection (i.e. Piedmont and Lombardy).

RESULTS

- Longer duration of civil trials is associated with:
  - with larger delays in contract execution; and the effect is larger for more complex project (i.e. higher reserve price);
  - higher probability that a large F wins the contract;
  - higher final payment by the CA (but bounded by the law).

- These empirical results are compatible with a simple model according to which - for CA legal costs larger than F ones - there exists a interval of d where F strategically delays, and CA does not enforce the penalty:
  - this interval becomes larger with court inefficiency, and with higher value project.
- These results are robust to several controls:
  - Corruption;
  - CA's budget constraint restrictions;
  - different measurement of duration of trials.

Conclusion

Design of Rules on

- Firms' qualification screening
- Awarding procedure
- Contract execution

affects the new and complex public procurement objectives; they are also relevant in considering the rise of favoritism and corruption issues, not covered in this lecture by time constrain.

Thank you for your attention !

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