Institutions, Firms, and Public Procurement
Evidence from Italy

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Introduction

Public procurement

- involves the contracting-out of given tasks from public administration to selected private firms
- represents a large share of public expenditure (15% of GDP in OECD countries)
- is regulated in almost any aspect of the process (from the awarding phase to the execution and completion phases)

A relatively large body of economists study how to design and implement sound procurement policies in order to achieve

- best-value for money for the purchasing of goods and services of public utility
- strategic objectives concerning innovation, environmental and SMEs issues

The interest is usually on how to effectively

- ▶ pursue the selection of firms to reduce adverse selection problems
  - ▶ e.g.: what's the best awarding mechanism?

- ▶ regulate the execution phase of the contracts to reduce moral hazard problems
  - ▶ e.g.: what's the optimal penalty to apply to under-performing firms?

- ▶ adapt rules to the heterogeneous social, institutional and political environment
  - ▶ e.g.: is there a unique set of best-practices that can be adopted by economies more or less exposed to potential corruption?

Empirical public procurement

- As in many other fields of the discipline, we have observed an exponential increase in empirical analyses

  - Studies on Italian procurement are numerous relative to other countries (e.g., Decarolis 2014; Decarolis and Conley 2016; Coviello and Mariniello 2014; Coviello and Gagliarducci 2017; Bucciol and Chillemi 2014; Chiappinelli 2016)

- At a first glance, the public procurement field may seem ideal to empirically assess the effects of different regulation and quality of institutions on firms' and buyers' behaviors, given

  - the explicit regulation framework
  - the heterogeneity in regulation across countries (regions), types of the contracts, types of public buyers, etc.
  - the participation in the contract transaction of heterogeneous types of contracting authorities (CA), firms, and institutions
  - the presence of detailed micro-level (contract-level) data on public expenditure

Identification issues in empirical public procurement

However, the empirical identification suffers of both usual problems and field-specific ones

- ▶ Presence of confounding factors (given the heavily regulated market)
    - ▶ Frontier econometric techniques for the evaluation of the causal impact can complement the availability of micro data to refine the identification strategy
    - ▶ However, canonical applications require randomly assigned changes/thresholds
    - ▶ In reality: changes in regulation follow long debates on well-known problems and suffer the typical 'one-reform many-policies problem'

- ▶ (Sometime) poor quality of data
    - ▶ e.g.: is poor data collection an endogenous phenomenon?

Identification issues in empirical public procurement

In the public procurement setting

- ▶ It is often useful to complement the application of causality techniques with narrative analyses of the regulation, political and historical context
  - ▶ such that the relative weight of the confounding factors may appear

- ▶ The presence of pooled cross-sections with large N and large T (firms observed more than once per year) can allow the inclusion of a large set of fixed effects to mitigate the omitted variable problem
  - ▶ e.g.: significant presence of small and micro firms $\rightarrow$ no balance-sheet info $\rightarrow$ firm-year fixed effects

- ▶ The focus on a single country allows to reduce the omitted variable problem

The rest of the presentation

This presentation

- ▶ focuses only on traditional procurement
- ▶ focuses on procurement of public works
- ▶ does not make a review of the literature on public procurement
- ▶ simply offers a description of the available data for Italy and three examples of applied research works

The rest of the presentation

Three abstracts of empirical studies on Italian public procurement where it is underlined the role of

- ► inefficient external institutions $\Rightarrow$ firm's opportunistic behavior $\Rightarrow$ poor procurement performance:
  - ► the case of the court enforcement

- ► rigid regulatory provisions $\Rightarrow$ limits to the organization of firm's supply-chain $\Rightarrow$ poor procurement performance:
  - ► the case of the Italian regulation of subcontracting

- ► non-standard auction format $\Rightarrow$ relevance of firms' sophistication and experience when competing for the public contract:
  - ► the case of the Italian average bid (beauty-contest) auctions

1. The role of external enforcement

Explicit contracting and contract enforcement

- In Italy, penalties for delaying the completion of works are included in the initial contract and can eventually be disputed in local civil courts

- The preeminent role played by explicit contracting makes the efficiency of the judicial system relevant

- However, the enforcement of the contracts might be significantly costly (Djankov et al. 2003)

Simple testable hypothesis

High costs (e.g. longer trials) for contract enforcement may reduce:

- ▶ The willingness of the CA to exercise its contractual rights
- ▶ The credibility from the threat of contractual remedies for firm's poor performance

$\Rightarrow$ The opportunism of contractor firm may be fostered $\Rightarrow$ firm's noncompliance (i.e. larger delays)

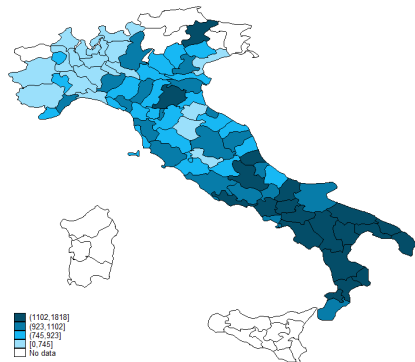# Simple correlation (2000-2006, average by province)

Delays in completion of public works
88% of works show delays
average delay: 153 days
max delay: 1578 days
(source: AVCP)
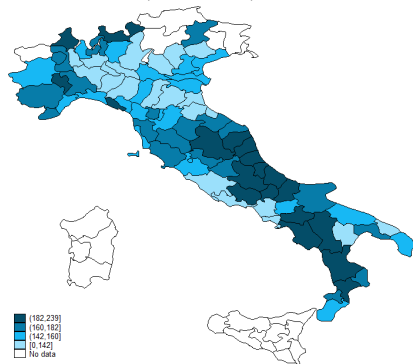
Duration of civil trials
average duration of civil trials: 889 days
important over-time variation
(source: ISTAT)

Data and estimated reduced-form regression

We use AVCP data for 40,521 contracts issued in 15 regions during 2000-2006

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

- *Delay* is difference between expected end and actual end of the work *i*
- *J* represents the duration of civil trials in first instance courts in province *p* at time *t*
- *X* is a set of variables for the project *i*
  - characteristics of the project: reserve price (average 582,000 euros), main category of work (roads: 30.4%)
  - type of the auction (75.7% open competitive auctions)
  - type of the *CA* (54.8% municipalities)
- Other controls:
  - *Q*, with *p* and *t* variability (i.e. the province's population and GDP p.c.)
  - *T*, year dummy variables, to adjust for temporal shocks
  - *P*, province fixed effects, to exploit with-in province variation of trials' length, OR CA's fixed effects, to better account for *CA*'s characteristics and location

Main results

- ▶ Longer is the average duration of the civic trials, longer the delay in the completion of public works

- ▶ Back-of-the-envelope:
  - ▶ moving from the province at the 75th percentile of the duration of trials to the province at the 25th percentile we have a reduction of average delays by 7%

- ▶ The result suggests that firms tend to relax their time constraints when public buyers are protected by weaker external enforcement

Robustenss checks and other results

Our results are robust to

- Competing interpretations (the role of corruption, the role of CA's fiscal restraints)
- Different measurement of duration trials
- Quality of data: focus on Piedmont and Lombardy
- Instrumental variables: supply of justice at the beginning of 1990s

We also find that longer duration of trials are associated with

- larger delays for more complex project
- higher probability of win by large sized firms
- larger final payment retained by the CA

2. The role of optional vs mandatory subcontracting

Moretti Luigi, Paola Valbonesi.
"Firms' Qualifications and Subcontracting in Public Procurement:
An Empirical Investigation",
Journal of Law, Economics, and Organization, 2015

The provisions of the Italian qualification system allow us to make a distinction between firms that:

- ▶ do not have all the required qualifications for the categories of works of the project must subcontract by law to qualified firms (i.e. with complementary qualifications, vertical subcontracting)

- ▶ have all the required qualifications for the categories of works of the project have the choice to subcontract to qualified firms (i.e, with similar qualifications, horizontal subcontracting) or to execute the works

Simple testable hypothesis

Is the firm's subcontracting position (by choice or by law) associated with different rebates?

- Firms that have the option to subcontract can have larger bargaining power with the subcontracts
    - they have the option to execute the work by themselves as well as less asymmetric information on costs
- ⇒ they can discount - ex-ante- their position
- ⇒ higher rebates (i.e. lower offered prices)

Simple correlation

- ▶ Bid-level data collected from 269 transcripts of auctions issued by the Regional Government of Valle d'Aosta (2000-2008)
- ▶ We can observe the name of each bidder (firm) and its offered rebate (bid) for each auctioned contract

	Mean rebate
Optional	17.348
Mandatory	16.272
Difference	1.076***

Characteristics of the auctioned contracts

		Bid-level data		
Variable	Obs.	Mean	Min	Max
Bid (Rebate, in %)	13331	17.210	0.001	43
Reserve price (euros)	269	1103786	155526.3	5267860
No. of participants	269	55.450	3	155
Expected duration (days)	269	311	79	1440
ABA	269	0.892	0	1
ABA + lottery	269	0.108	0	1
Road works	269	0.372	0	1
River and hydraulic works	269	0.297	0	1
Building	269	0.149	0	1

Bidders' characteristics

	Percentage
Local bidders (% of bids)	32.37
Bidders' size (% of bids):	
small	11.80
medium	52.86
large and co-operatives	22.01
Consortia (% of bids = % of bidders)	13.33
Subcontracting status (% of bids):	
Mandatory	12.86
Optional (excluding consortia)	73.81
Subcontracting status (% of bids):	
Always mandatory firms	1.40
Sometime optional and sometime mandatory firms	74.72
Always optional firms (excluding consortia)	10.55

Estimated reduced-form regression

$$Rebate_{ij} = \alpha + \beta_1 Optional_{ij} + \beta_2 Q_j + \beta_3 X_i + \epsilon_{ij} \tag{2}$$

- ▶ *Rebate* is the % discount on the reserve price offered by bidder *i* in auction *j*
- ▶ *Optional* is a dummy that takes value 1 if the bidder *i* has all the required qualifications for contract *j* and can freely choose to subcontract; it takes value 0 otherwise
- ▶ *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)

Main result:

- ▶ Firms in optional (horizontal) subcontracting position offer lower prices (higher rebates) than firms in mandatory (vertical) subcontracting

Robustness checks and other results:

- ▶ This effect is still significant when we focus on the sub-sample of bids offered by winning firms that actually did engage in subcontracting
- ▶ No significant difference in terms of post-awarding performance (such as cost and time overruns) between firms subcontracting by choice and by law

3. The role of sophisticated bidders in procurement auctions

Galavotti Stefano, Luigi Moretti, Paola Valbonesi.
"Sophisticated Bidders in Beauty-Contest Auctions",
(*Centre d'Economie de la Sorbonne WP* and *R&R*), 2017

Average bid auction

- In a standard procurement auction, the winner is the lowest price (= highest discount)

- In an average bid procurement auction, the winner is the price (discount) which is closest to some endogenous function (average) of all submitted prices (discounts) $\rightarrow$ beauty-contest games

- Average bid auctions are not uncommon: they are the most common awarding mechanisms for the public procurement of works in Italy. Examples can also be found in the US, Japan, Chile, China

- Depending on how the average is computed, we may have different types of average bid auctions

- Average bid auctions resemble "beauty-contest" games (e.g. guessing 2/3 of the average)
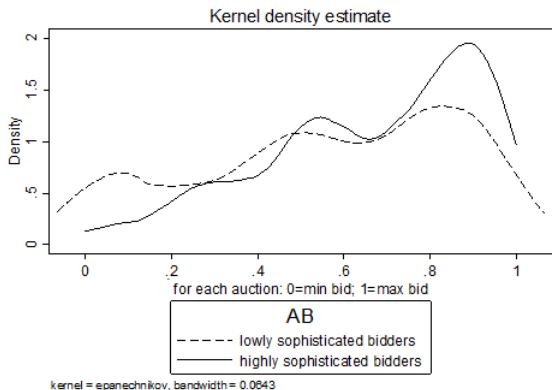
Italian average bid auctions (AB)
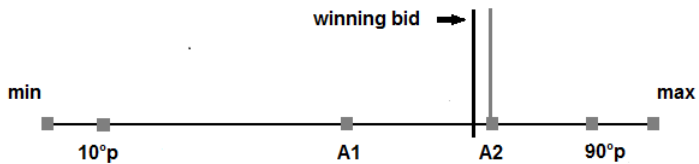
Cognitive hierarchy and testable hypothesis

▶ Real data on auctions issued by the Regional Government of Valle d'Aosta (2000-2005) show clear deviations from Nash Equilibrium bid (0% rebate)

▶ Camerer et al. (2004) suggest that experimental evidence on beauty contest games is well captured by *cognitive hierarchy* models

▶ Intuitively, we expect that firms with higher level of sophistication, having in mind a more comprehensive picture of how other firms think and bid, should bid closer to the optimal bid

Sophistication measure and simple correlation

- ▶ We construct a measure of sophistication that can change within the sample, to capture possible learning dynamics
- ▶ For each auction in our sample, we measure a firm's level of sophistication by the cumulative relative distance of that firm's bids from the reference point in the preceding auctions of that format to which she participated in

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.0843

Reduced-form estimated equation

$$\log |Distance_{ij}| = \alpha + \beta \log(BidderSoph_{ij}) + \gamma F_i + \sigma FP_{ij} + \theta P_j + \epsilon_{ij}$$

- $|Distance_{ij}|$ is the absolute distance between firm i's bid and auction j's reference point
- $BidderSoph_{ij}$ is our sophistication index
- P_j is a set of controls for auction/project j (number of participants, duration, size, type of work...)
- F_i is a set of controls for firm i (size, location); alternatively: firms' fixed effects, firm-year fixed effects
- FP_{ij} is a set of firm's characteristics which vary for each auction (backlog, subcontracting)

Results

Firms with higher level of sophistication offer bids closer to the winning threshold
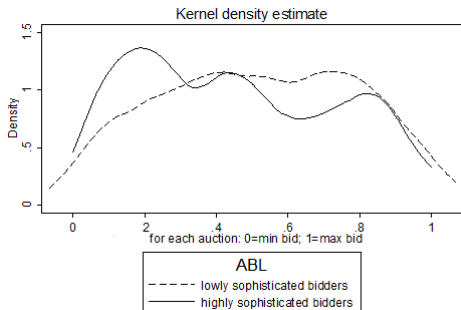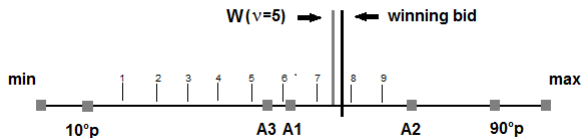
The result is robust to

- selection-bias
- firm-semester, or firm-type of work-year fixed effects
- controls for potential collusive groups
- Instrumental variable

We also show that

- pure participation experience is the main driver of sophistication
- more sophisticated firms do not have cost advantages

Other results: average bid with lottery

Results are confirmed when we look at a subsample of auctions of the Regional Government of Valle d'Aosta since 2006, where the average bid auction is combined with a lottery

- ► Efficient external enforcement matters also for standard contracts concerning the provision of basic public goods (Coviello et al. 2017)

- ► Flexibility in the organization of the supply-chain (through subcontracting) seems to be reflected in lower prices (but similar ex-post performance) respect to the mandatory/rigid organization of the suppy-chain (Moretti and Valbonesi 2015)

- ► A first empirical test using real-world data confirms theoretical and experimental evidence about the relevance of firms' ability to take into account competitors' behavior in average bid auction (Galavotti et al. 2017)

Conclusion: Future research

We can basically identify two broad 'good reasons' for studying the public procurement market

- ▶ Understanding the determinants of heterogeneous performance in public procurement contracts is key to achieve efficiency in public expenditure, particularly in times of tighter public budget restraints

- ▶ The public procurement market is an interesting setting where to empirically test theoretical hypotheses on the firms' reactions to regulation

There are several open issues, e.g.:

- ▶ understanding the trade-off between more flexible requirements for firms wishing to enter the public procurement market and reputation criteria

- ▶ how to positive influence innovation and environmental protection via public procurement expenditure

- ▶ understanding the political economy determinants of the procurement performance

Conclusion: Future research

For instance

- ▶ Delays in payments from the public administrations to private firms is often seen as a non-core problem as it is supposed that firms can cover the late payments through the banking sector

- ▶ However, survey data show that about two third of firms are constrained by late payments

- ▶ In Buso, Greco, Moretti (2017), we try to understand how the political budget cycle of Italian municipalities can contribute to the determination of the late payments

- ▶ Taking advantage of exogenous determinants of municipalities' electoral cycle, we show that during the electoral cycle municipalities delay payments so to have a source of 'precautionary savings'; while, in the last year of the cycle, they tend to pay the arrears

Thank you for your attention!