Markups and Public Procurement

Evidence from Czech Construction Tenders

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December 10, 2024

Motivation

- Public procurement accounts for approximately 12% of GDP in OECD countries (OECD, 2021).
- Expenditures on public tenders account for approximately one-seventh of the Czech GDP and around 35
- Existing literature highlights inefficiencies in public procurement due to:
  - Lack of transparency and competition.
  - Procurement discretion and political favoritism.
- Firm-level market power in public procurement, reflected in markups, serves as a proxy for the efficiency of government spending.
- **Research Question**: How does public procurement influence markups in the Czech construction sector?

This Paper

- Employs a structural framework to infer the distribution of markups.
- Examines markup trends in the Czech construction sector (2006–2021) using firm-level financial data.
- Investigates the relationship between public procurement and markups by comparing firms supplying public and private projects.
- Key causal effects findings:
  1. Positive, statistically and economically significant.
  2. Declining over time.

Background

Markups in Czech Construction Tenders

- Markups, defined as price-to-marginal-cost ratios, serve as a proxy for market power and competition.
- In terms of specific industries, the majority of Czech public procurement projects are for construction (49.6 percent during 2006-18).
- Public Procurement literature highlights factors affecting efficiency:
  - Lack of competition: Czech Republic, Titl (2023); USA, Kang and Miller (2022).
  - Discretion in Hungary: Szucs (2024); Italy: Decarolis et al. (2020).
  - Politics: Czech Republic, Baranek & Titl (2024); Lithuania, Baltrunaite (2020).

Contribution–Rather than only making comparisons between different tenders, this study benchmarks the competitiveness of public procurement against that of markets serving private clients. Furthermore, it avoids relying on expert cost estimate data, which prior studies have used to assess efficiency.

Data

Data Overview

- Data sources:
  - Financial data on Czech construction firms (2006–2021).
  - Public procurement data from Czech government records.
- Sample:
  - Covers 1,297 firms with at least two consecutive years of data.
  - Focuses on firms with contracts in both public and private sectors.
- Key variables:
  - Markup (μ_{it}):
    The ratio of sales revenue ($P_{it}Q_{it}$) to the cost of goods sold ($P_{it}^{V}X_{it}^{V}$), adjusted by the output elasticity of variable inputs (θ_{it}^{V}) obtained from production function estimation.
  - Public Procurement (W_{it}):
    Indicator denoting whether a firm derived sales from the government in a given year.

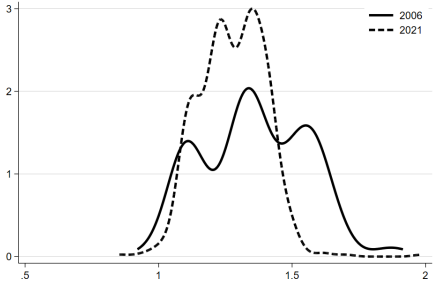
Results

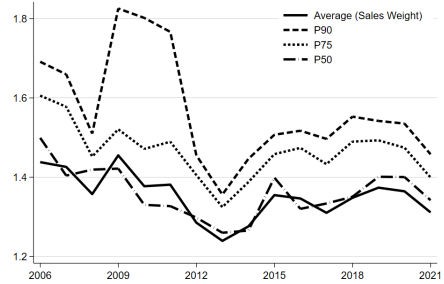
Main Findings

- Evolution of markups:
  - Aggregate markups declined from 1.4 in 2006 to 1.3 in 2021.
  - Decline primarily driven by firms with higher initial markups.
- Impact of public procurement:
  - Firms participating in public procurement exhibit significantly higher markups compared to private sector counterparts.
  - Results are derived using causal panel methods and unconfoundedness-based approaches.
- Implications:
  - Estimated average treatment effect on government contractors is approximately 15%, indicating increased pricing power in public procurement.
  - Temporal analysis reveals a decline in treatment effects, from 30% in 2006 to 10% in 2021, consistent with institutional improvements in the Czech Republic.

Evolution of Markups

Figure 1: The Distribution of Markups $\hat{\mu}_{it}$ Over Time





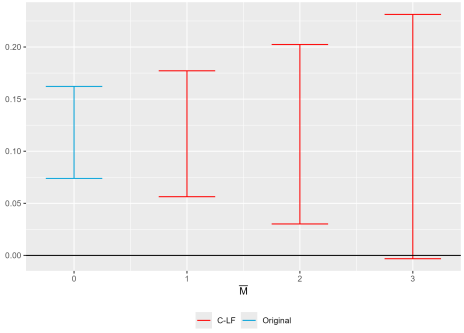
Unconfoundedness

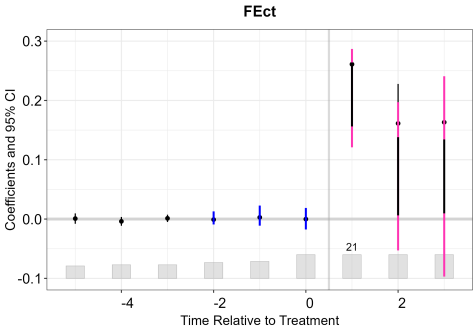
Table 1: ATT Given Unconfoundedness and Placebo Estimates

Effect on Markups	**Contract**	**Pre-Contract Average**
Difference-in-Means	0.12 (0.02)	0.03 (0.02)
Regression	0.16 (0.01)	-0.00 (0.01)
Oaxaca Blinder	0.15 (0.01)	0.00 (0.02)
GRF	0.13 (0.01)	0.03 (0.01)
NN Matching	0.15 (0.01)	0.01 (0.01)
PS Matching	0.13 (0.01)	-0.00 (0.01)
IPW	0.14 (0.02)	0.01 (0.02)
CBPS	0.15 (0.02)	0.00 (0.02)
Entropy Balancing	0.15 (0.03)	-0.00 (0.02)
DML-ElasticNet	0.16 (0.01)	-0.01 (0.01)
AIPW-GRF	0.15 (0.01)	0.00 (0.01)

Causal Panel 1

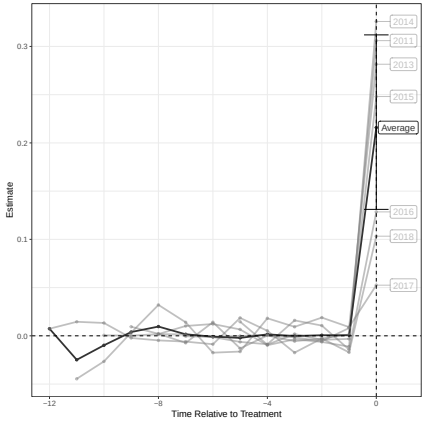
Figure 2: Balanced Panel Absorbing Treatment Sensitivity Analysis





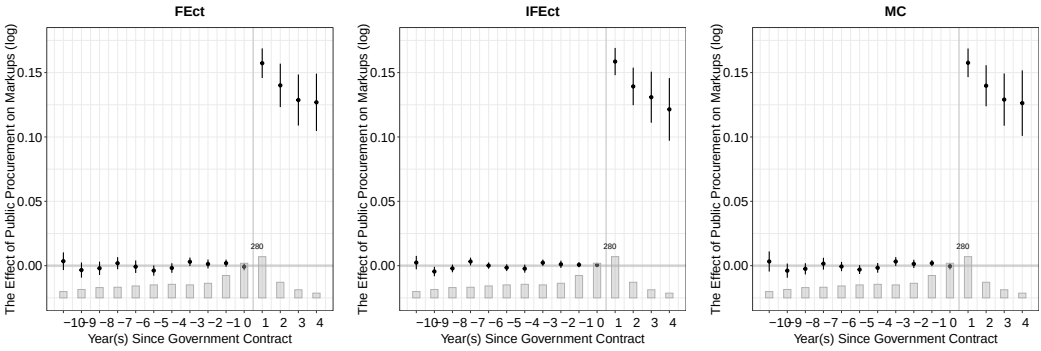
Causal Panel 2

Figure 3: Balanced Panel Augmented Synthetic Control: Cohort Aggregated On-impact ATTs



Causal Panel 3

Figure 4: Full Panel Non-absorbing Treatment Counterfactual Estimator Event Study



Causal Panel 4

Table 2: Full Panel Matrix Completion Year-Aggregated ATT Estimates

Year	ATT	Standard Err.	No. Treated
2006	0.294	0.016	12
2007	0.282	0.022	7
2008	0.300	0.014	8
2009	0.337	0.010	18
2010	0.273	0.017	9
2011	0.241	0.012	11
2012	0.236	0.013	18
2013	0.262	0.010	18
2014	0.301	0.008	20
2015	0.219	0.008	31
2016	0.092	0.008	34
2017	0.105	0.008	77
2018	0.100	0.006	68
2019	0.101	0.006	74
2020	0.118	0.007	78
2021	0.098	0.008	58

Conclusion

Conclusion

- **Summary:**
  - Findings serve as a benchmark for assessing the competitiveness of government projects relative to those in the private sector.
  - Estimates indicate that firm markups increase during contract years and suggest that treatment effects decline over time.
- **Policy Implications:**
  - There is scope to enhance the design and governance of procurement tenders to maximize taxpayer value.
  - Evidence supports the effectiveness of reforms aimed at eliminating single-bidding practices and increasing transparency.
- **Future Research:**
  - Extend the analysis to other sectors and perform cross-country comparisons.
  - Integrate findings from observational data with quasi-experimental methods (e.g., policy reforms).
  - Incorporate theoretical models to understand mechanisms–e.g., firms maximize public procurement payoffs in dynamic games.