# The effects of centralized public procurement on prices and competition

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# Introduction

- Public procurement (PP) suffers from a **pathological lack of competition**
  - Median number of bidders is only 2 (Jääskeläinen and Tukiainen, 2019)
  - Simple auction theory and empirical evidence: **leads to high prices**
  - **Scale is huge** (13 % of GDP in OECD): even small relative efficiency gains could lead to substantial savings in public spending

- Centralized public procurement (CPP) has been proposed as one **key tool for enhancing efficiency**
  - Lower unit costs through economies of scale
  - Using better procurement skills
  - Eliminating overlapping admin costs
  - May make harder to meet the needs of individual buyers

- This chapter: CPP in the Finnish context
  - **Empirical evidence on causal effects** on prices and competition **across all industries** using comparable price measures
  - Existing evidence focuses on narrowly defined industries, mostly using Italian data. **We provide external validity on both dimensions.**

# Literature

- Economics and management (see e.g. Albano & Sparro, 2010)
  - CPP is most useful for **standardized items** and services needed **in large scale** and for **local PP units** with **similar demand** and **low procurement skills**
  - Trade-offs: limited ability to tailor purchases for special needs and might result in excessively large contracts

- Game theoretic auction models: (see e.g. Dubois et al., 2021)
  - Mixed results on the price effects depending on specific assumptions

- Empirical literature (mostly in economics): (see e.g. Bandiera et al. 2009; Lotti et al. 2022)
  - Mostly based on policy-changes: introducing or mandating the use of CPP
  - **Significant negative price effects** (2-30%)
  - Not much evidence on quality effects or process costs due to lack of data

# Institutional setting

- **Based on the Finnish PP law** and EU directives
  - First-price sealed bid auctions or scoring auctions, if above the tendering thresholds
  - Follows a standard procedure from preparation to choosing the contract type, publishing the tender, and choosing the winner
  - In parallel, local PP units can choose **whether to procure themselves or outsource to CPP units**

- **CPP units are defined by the law**: entities established to provide procurement services and –support for their stakeholders
  - Different from so called “in-house centralized units”
  - CPP units seem to prefer contract types that offer more flexibility (e.g. framework agreements and dynamic systems)
  - The use of CPP has been encouraged widely.
  - TED: about 15% of PP contracts procured through CPP in Finland

# Data

- Data from electronic bidding platform Cloudia Oy (2013-2017 September):
  - 14,000 tenders of 204,000 procurement objects (auctions)
  - 470,000 bids and over 2 million potential bidders
  - We observe:
    - Tender characteristcs (e.g. procurer name and type, tendering procedure)
    - Procurement object characteristics (e.g. CPV codes)
    - Identities of potential bidders (proxied by visiting the tender website) and actual bidders
    - Submitted bids (in euros), and the winning bid(s)

- We identify CPP units manually by their names
  - 15 units from a total of about 300
  - We cannot identify ”in-house” centralized units

# Defining prices

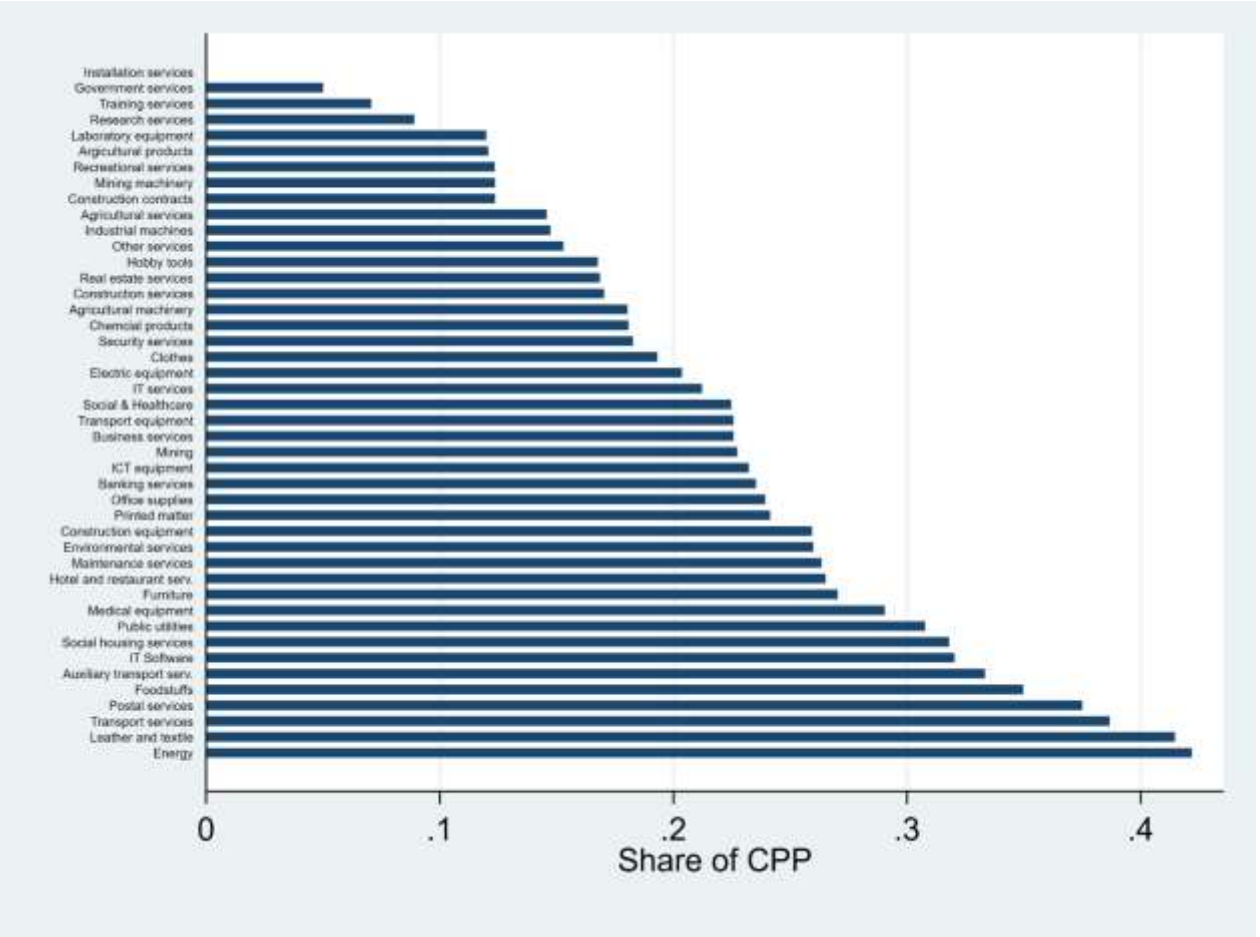
- **We aim for comparability across products and industries**
  - The observed industry classification (CPV code) is not precise enough for unit prices in most cases
  - Need to define relative prices

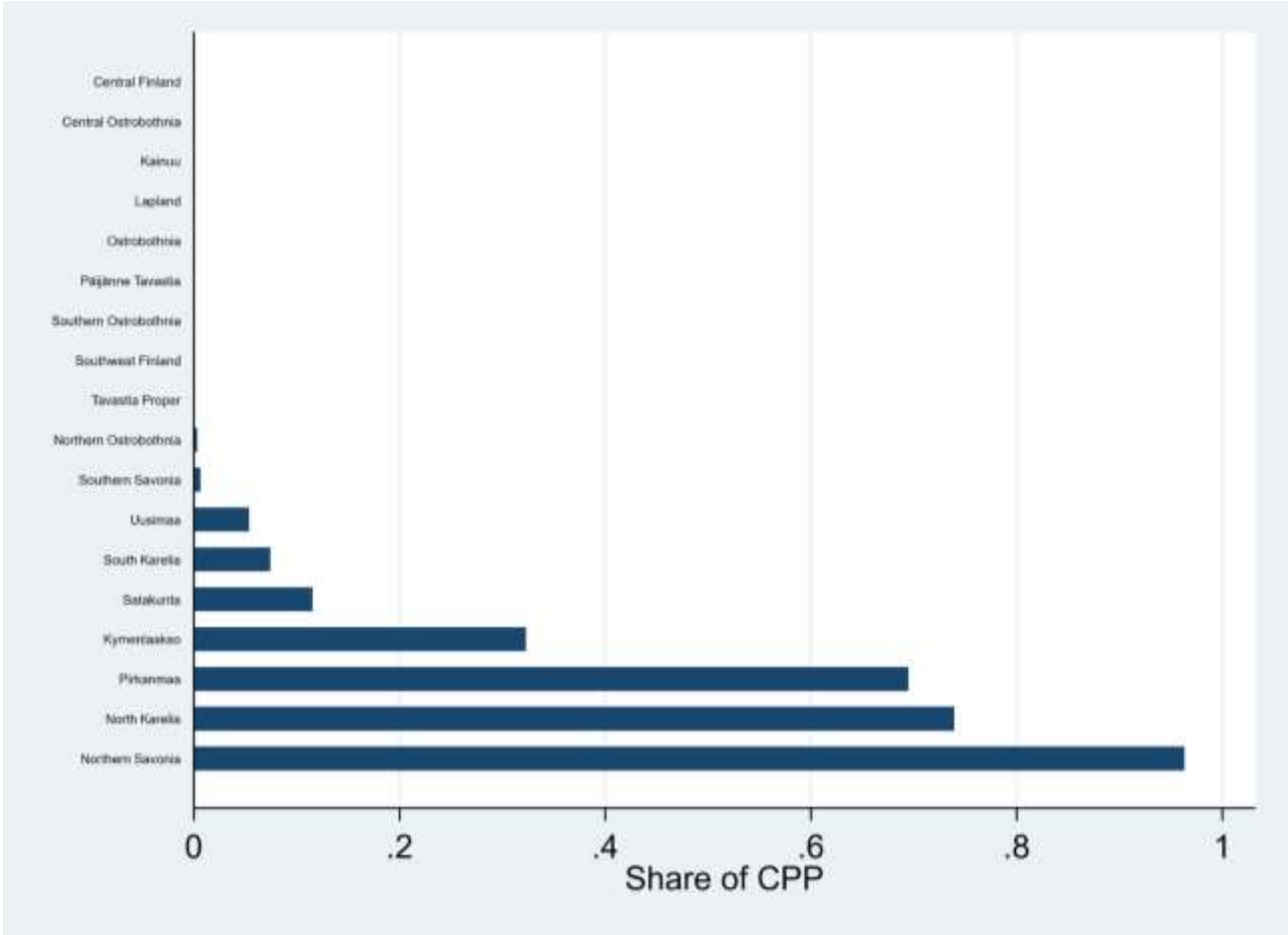
- **Win margin** = (second lowest bid – lowest bid) / second lowest bid
  - Measures the intensity of competition
  - Comparable across products and industries
  - Can be calculated for auctions with at least two bids (majority of the data)
  - Does not correlate perfectly with winning bids

- **Relative price difference** = (engineer estimate – realized price) / engineer estimate
  - More accurate price measure than win margin
  - BUT, can be calculated only at tender level, and for a small subset of data with both reported engineer estimates and quantities.

# Figure 1: Share of CPP by industry and region

- Lack of regional variation due to multiple reasons
- Data still rich enough!



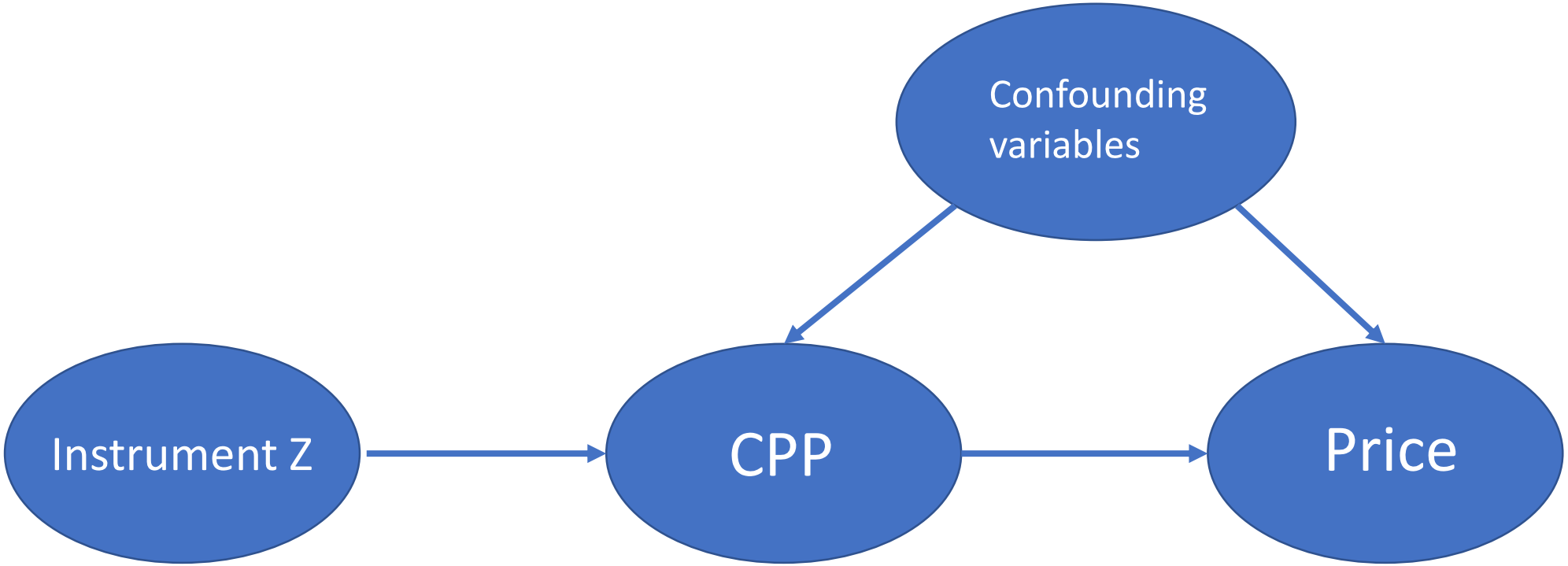



# Table 2: Means of relevant variables by CPP status

Panel A: Full data

| | Tender All | Tender CPP=0 | Tender CPP=1 | Auction All | Auction CPP=0 | Auction CPP=1 |
|---|---|---|---|---|---|---|
| CPP | 0.21 | 0.00 | 1.00 | 0.26 | 0.00 | 1.00 |
| Win margin | . | . | . | 0.24 | 0.24 | 0.23 |
| Rel. price difference | 0.37 | 0.35 | 0.44 | . | . | . |
| n | 2.47 | 2.38 | 2.84 | 2.13 | 2.18 | 1.99 |
| N | 5.99 | 5.82 | 6.63 | 7.53 | 7.34 | 8.08 |
| n/N | 0.44 | 0.43 | 0.44 | 0.32 | 0.33 | 0.28 |
| No bids | 0.34 | 0.35 | 0.28 | 0.37 | 0.37 | 0.37 |
| Scoring auction | 0.50 | 0.50 | 0.52 | 0.48 | 0.45 | 0.54 |
| Partial bidding allowed | 0.25 | 0.23 | 0.32 | 0.51 | 0.49 | 0.58 |
| Procurement objects | 14.66 | 13.78 | 17.87 | . | . | . |

# Method: **instrumental variable** approach



# Defining an instrument

- Idea: come up with an instrument Z that affects the choice of CPP, but not the outcome P. This helps to uncover the causal relation of interest (CPP to P)

- Our instrument: **Region-level centralizing norms**
  - Rationale: there probably exists similar procedures across different tenders within a location despite contracting for different types of goods or services.
  - Calculated for each CPV-region pair leaving out information on own industry
  - Assumption 1: The norms affect the choice of using CPP, but P only through CPP.
  - Assumption 2: The instrument is correlated with CPP conditional on other covariates. This is testable.

# Estimation

- Instrument: $$Z_{lk} = \sum_{p \neq k} (S_{lp} - S_{NATp})$$

- Estimation through two-stage least squares regression

- First stage: %22HG = Ù0 + Ù1 <HG + „"HÙ2 + äP + ÛG + óHG

- Second stage: 2HG = Ú0 + Ú8 %ã22HG + „"HÚ2 + äP + ÛG + ñHP

# Results – first stage

Panel B. Dependent variable: CPP (tender level)

| | (1)<br>OLS | (2)<br>OLS | (3)<br>OLS |
|---|---|---|---|
| Instrument Z | 1.018*** | 0.969*** | 0.975*** |
| | (0.154) | (0.150) | (0.144) |
| Scoring auction | | | 0.005 |
| | | | (0.012) |
| Partial bids allowed | | | -0.001 |
| | | | (0.023) |
| Engineer estimate disclosed | | | -0.087** |
| | | | (0.041) |
| Number of OBS | 13317 | 12255 | 10305 |
| Mean(CPP) | 0.223 | 0.230 | 0.241 |
| R-sq | 0.604 | 0.653 | 0.702 |
| F-stat | 43.423 | 41.651 | 45.598 |
| Industry FE | No | Yes | Yes |
| Year FE | No | Yes | Yes |
| Regional controls | No | Yes | Yes |

# Results – Win margin

| Dependent variable: Win margin (auction level) | | | | | | |
|---|---|---|---|---|---|---|
| | (1) OLS | (2) OLS | (3) OLS | (4) IV | (5) IV | (6) IV |
| CPP | -0.011 | -0.010 | -0.005 | -0.025** | -0.034* | -0.030 |
| | (0.011) | (0.011) | (0.013) | (0.012) | (0.020) | (0.021) |
| Scoring auction | | | 0.012 | | | 0.013 |
| | | | (0.010) | | | (0.010) |
| Partial bids allowed | | | -0.035 | | | -0.036 |
| | | | (0.024) | | | (0.025) |
| Engineer estimate disclosed | | | -0.000 | | | -0.002 |
| | | | (0.013) | | | (0.012) |
| Number of OBS | 99932 | 91102 | 77315 | 99932 | 91102 | 77315 |
| Mean(Win margin) | 0.236 | 0.234 | 0.236 | 0.236 | 0.234 | 0.236 |
| R-sq | 0.000 | 0.078 | 0.083 | . | 0.077 | 0.083 |
| Industry FE | No | Yes | Yes | No | Yes | Yes |
| Year FE | No | Yes | Yes | No | Yes | Yes |
| Regional controls | No | Yes | Yes | No | Yes | Yes |

# Results – Relative price difference

| Dependent variable: Relative price difference (tender level) | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | OLS | OLS | OLS | IV | IV | IV |
| CPP | 0.081*** | 0.057* | 0.059** | 0.061* | 0.049 | 0.037 |
| | (0.029) | (0.031) | (0.027) | (0.033) | (0.033) | (0.036) |
| Scoring auction | | | -0.019 | | | -0.019 |
| | | | (0.017) | | | (0.017) |
| Partial bids allowed | | | -0.051 | | | -0.052 |
| | | | (0.060) | | | (0.059) |
| Number of OBS | 1354 | 1217 | 1112 | 1354 | 1217 | 1112 |
| Mean(Rel. Price difference) | 0.374 | 0.374 | 0.365 | 0.374 | 0.374 | 0.365 |
| R-sq | 0.017 | 0.153 | 0.210 | 0.016 | 0.152 | 0.210 |
| Industry FE | No | Yes | Yes | No | Yes | Yes |
| Year FE | No | Yes | Yes | No | Yes | Yes |
| Regional controls | No | Yes | Yes | No | Yes | Yes |

# Results – Number of actual bidders

Panel B: Dependent variable: Number of actual bidders (tender level)

| | (1) OLS | (2) OLS | (3) OLS | (4) IV | (5) IV | (6) IV |
|---|---|---|---|---|---|---|
| CPP | 0.440* | 0.332 | 0.282 | 0.425 | 0.315 | 0.268 |
| | (0.232) | (0.211) | (0.222) | (0.291) | (0.304) | (0.312) |
| Scoring auction | | | -0.247** | | | -0.247** |
| | | | (0.100) | | | (0.099) |
| Partial bids allowed | | | 0.561** | | | 0.560** |
| | | | (0.245) | | | (0.243) |
| Engineer estimate disclosed | | | -0.062 | | | -0.065 |
| | | | (0.126) | | | (0.133) |
| Number of OBS | 13317 | 12255 | 10305 | 13317 | 12255 | 10305 |
| Mean(n) | 2.499 | 2.531 | 2.519 | 2.499 | 2.531 | 2.519 |
| R-sq | 0.005 | 0.049 | 0.060 | 0.005 | 0.049 | 0.060 |
| Industry FE | No | Yes | Yes | No | Yes | Yes |
| Year FE | No | Yes | Yes | No | Yes | Yes |
| Regional controls | No | Yes | Yes | No | Yes | Yes |

# Results – Number of potential bidders

Panel B: Dependent variable: Number of potential bidders (tender level)

| | (1) OLS | (2) OLS | (3) OLS | (4) IV | (5) IV | (6) IV |
|---|---|---|---|---|---|---|
| CPP | 0.710** | 0.968*** | 0.827*** | 0.518 | 1.027*** | 0.865** |
| | (0.312) | (0.251) | (0.280) | (0.411) | (0.386) | (0.401) |
| Scoring auction | | | 0.315* | | | 0.316* |
| | | | (0.165) | | | (0.164) |
| Partial bids allowed | | | 1.286*** | | | 1.287*** |
| | | | (0.395) | | | (0.392) |
| Engineer estimate disclosed | | | -1.132*** | | | -1.127*** |
| | | | (0.186) | | | (0.191) |
| Number of OBS | 13317 | 12255 | 10305 | 13317 | 12255 | 10305 |
| Mean(N) | 6.081 | 6.104 | 5.829 | 6.081 | 6.104 | 5.829 |
| R-sq | 0.004 | 0.102 | 0.132 | 0.004 | 0.102 | 0.132 |
| Industry FE | No | Yes | Yes | No | Yes | Yes |
| Year FE | No | Yes | Yes | No | Yes | Yes |
| Regional controls | No | Yes | Yes | No | Yes | Yes |

# Results – Entry rate

Panel B: Dependent variable: Entry rate (tender level)

| | (1) OLS | (2) OLS | (3) OLS | (4) IV | (5) IV | (6) IV |
|---|---|---|---|---|---|---|
| CPP | 0.010 | -0.026 | -0.016 | 0.009 | -0.054 | -0.043 |
| | (0.032) | (0.026) | (0.025) | (0.038) | (0.039) | (0.038) |
| Scoring auction | | | -0.056*** | | | -0.056*** |
| | | | (0.012) | | | (0.011) |
| Partial bids allowed | | | -0.017 | | | -0.018 |
| | | | (0.036) | | | (0.036) |
| Engineer estimate disclosed | | | 0.090*** | | | 0.086*** |
| | | | (0.016) | | | (0.017) |
| Number of OBS | 12427 | 11413 | 9623 | 12427 | 11413 | 9623 |
| Mean(Entry rate) | 0.435 | 0.439 | 0.455 | 0.435 | 0.439 | 0.455 |
| R-sq | 0.000 | 0.057 | 0.068 | 0.000 | 0.057 | 0.067 |
| Industry FE | No | Yes | Yes | No | Yes | Yes |
| Year FE | No | Yes | Yes | No | Yes | Yes |
| Regional controls | No | Yes | Yes | No | Yes | Yes |

# Main results summary

- **A cautious interpretation of our results:** CPP seems to lead to slightly lower prices by attracting more potential bidders, from which a similar share of suppliers submit a bid, increasing slightly the number of competitors and hence the intensity of competition.
  - Any conclusions are subject to uncertainty due to lack of statistical power

- In line with prior literature, but magnitudes significantly lower. Possible reasons:
  - Existing studies from countries that are culturally/institutionally different from Finland
  - Indirect effects of CPP
  - CPP might work much better in different industries

- IV not suitable for single industry, but we have correlational evidence on cleaning industry
  - Price correlations are large

# Conclusion

- We study CPP's effects on prices and competition empirically with rich Finnish PP data
  - IV approach to identify causal effects
  - Normalized price measures
  - Across different industries

- Results:
  - CPP induces only modest negative price effects overall.
  - CPP does seem to enhance competition.
  - Despite using large data, there is considerable statistical uncertainty
  - Given the scale of PP at large, even small efficiency gains could have significant implications in absolute terms.

- Although qualitatively aligned with previous empirical evidence, our estimates are much lower in magnitude.
  - We discuss multiple possible explanations

- Discussed arguments do not tackle the fact that PP is working seemingly ineffectively in Finland as a whole, which calls for a change in PP design and policy.

- **Given the discussed and demonstrated strengths and weaknesses of CPP, centralization seems to have only a partial role in this process.**

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