

Bid Rigging in Swedish Procurement Auctions

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Aim and Motivation

- Collusion distorts competition
- Procurement auctions frequently used by governments to buy goods and services
- Value of these contracts a large part of GDP
- Important to develop methods to detect and deter collusive behaviour
- The aim of this paper: screen the Swedish asphalt industry for collusive behaviour
- Potential cartel in the asphalt industry

How are procurements auctioned and how can bidders collude?

- Asphalt-paving contracts
- Auction format: sealed-bid first-price auction
- Different ways to collude
- Why suspect bid rigging?
- The analysis focuses on differences in the bidding behaviour between competitive and non-competitive firms
- Competitive bids submitted independently
- If bid rigging is occurring bids may be correlated
- Illegal agreement or tacit collusion?

Related literature

- Literature on auctions
- Two approaches to analysing bidding behaviour
 - Reduced-form models
 - Structural models, Paarsch (1992)
- Collusion in auctions:
 - Porter & Zona (1993, 1999)
 - Pesendorfer (2000)
 - Eklöf (2000)
 - Bajari & Ye (2003)

Theoretical Framework

- N firms bid competitively on one single indivisible object
- Independent Private Values (IPV)
- Assymmetric bidders (Maskin & Riley, 2000)
- Firms are risk neutral and maximise their profit:

$$p_i(b_i, c_i; B_{-i}) = (b_i - c_i) \prod_{j \neq i} [1 - F_j(B_j^{-1}(b_i))]$$

Analysis

- Implication of the theoretical model: firms should bid independently, conditional on firm- and auction-specific characteristics
- The implication of the model can be tested with empirical methods
- Reduced form bid-level estimation
- Test residual for correlation tests for firms in pairs
- Negative (and positive) correlation: a case for collusion? Other explanations?

Data

- Data from procurement auctions between 1992 and 2001(2002)
- Asphalt-paving contracts
- Five regions (2/3 of the country)
- In total 536 auctions
- In total 2859 bids
- Total value approximately 2.7 billion SEK
- In total 53 firms bid at least once

Empirical specification

$$\ln b_{it} = x_{it}' \mathbf{b}^b + d_{it}' \mathbf{b}^d + \mathbf{e}_{it}^b$$

where x_{it}' includes own and competitors' distance to the site,

and d_{it}' includes plant ownership, firm- and auction dummies

Estimate with OLS

Sample-selection bias?

- Not all potential bidders participate
- Biased estimates?
- Control for bias with Heckman's two-step method

$$SUBM_{it}^* = z_{it}' \mathbf{b}^s + d_{it}' \mathbf{b}^d + \mathbf{e}_{it}^s$$

$$\hat{\mathbf{l}}_{it} = \frac{\mathbf{f}(z_{it}' \mathbf{b}^s + d_{it}' \mathbf{b}^d)}{\Phi(z_{it}' \mathbf{b}^s + d_{it}' \mathbf{b}^d)}$$

$$\ln b_{it} = x_{it}' \mathbf{b}^b x_{it} + \mathbf{b}_1 \hat{\mathbf{l}}_{it} + d_{it}' \mathbf{b}^d + \mathbf{e}_{it}^b$$

Spearman rank correlation test

$$r_s = 1 - 6 \left[\frac{\sum d_i^2}{n(n^2 - 1)} \right]$$

- Where d_i is the difference in rank between the absolute value of the i :th residual

Carrying out the tests

- Correlation coefficients for all firm pairs that participate in >20 auctions simultaneously
- The whole material
- Each year separately
- The larger contracts

Results

- 49 pairs tested, negative correlation observed for 20 pairs
- In total a stable group of 9 firms show up in the different tests
- All firms accused of bid rigging show up (except for one)
- Firms not accused show up
- The three largest firms show up in almost every test, both together and together with other firms

Conclusions

- Existence of Bid Rigging?
 - Collusion both profitable and feasible for at least the largest firms
 - The largest firms show up in a large number of the tests
 - The results indicate collusion; there is a case for further investigation into this market
 - Results consistent with evidence gathered in a different way
- Alternative explanations for the findings?
 - Dependence among certain firms
 - Unobserved firm heterogeneity not controlled for
 - Tacit collusion