Screening for Bid Rigging: Does it Work?

Belgian Competition Authority
Brussels, 2. May 2017

Samuel Rutz
Bid Rigging and Public Procurement

- Bid rigging involves groups of firms conspiring to raise prices or lower the quality of the goods or services offered in public tenders.
- Government procurement as percentage of GDP and as share of total government expenditures (2013):

The Fight Against Bid Rigging

- The fight against bid rigging is a priority in many countries and also a much debated issue on the international level; e.g. several OECD policy roundtables in the last decade.
- To actively reinforce the fight against bid rigging ComCo decided in 2008 to initiate a long-term project.
- Three pillars:
  - Prevention
  - Detection
  - Prosecution

- meetings with cantonal governments and their procurement bodies
- organization of workshops and training courses
- rigorous prosecution, break-up and sanctioning of bid rigging cartels

analysis of procurement data provided by cantonal procurement bodies
Why Screening?

- Bid rigging cartels are not uncommon in Switzerland:
  - 2008  Road construction cartel in the canton of Ticino
  - 2009  Submission cartel between electricians in the canton of Berne
  - 2012  Road construction cartel in the canton of Aargau
  - 2013  Road construction cartel in the canton of Zurich
  - 2014  Submission cartel between tunnel washing firms
  - 2016  Road construction cartel in the canton of St. Gallen

- In most cases there was inside information available (i.e. there was a whistle blower or a leniency application)

- Screening is a way to mitigate the dependency of external information and thereby increase deterrence
Screening Literature

- **Structural method**: analysis of the market structure to identify factors that are known to enhance/sustain collusion (e.g. Grout and Sonderegger, 2005)

- **Behavioural method**: analysis of bidding behaviour of firms

  (1) «Sophisticated» models
  - require a lot of information (e.g. cost, capacity, distance)
  - modelling of a competitive auction process as a counterfactual

  (2) Price- and quantity-related markers
  - use the information contained in the structure of the bids or in the market shares
  - help to distinguish competitive from collusive behaviour
  - Harrington (2007): Serve to screen an industries; no proof for collusion!
Screening in Practice

Based on the literature on price- and quantity-related markers, Comco’s goal was to develop an screening tool with the following properties:

1. **Modest data requirements**: Screening exercises will often have to rely on limited available public data; gathering detailed information will immediately raise suspicion.

2. **Simplicity**: The screening tool should be simple to apply.

3. **Flexibility**: The screening tool should be easy to adapt to different situations.

4. **Reliable results**: Results should be reliable enough to convince a competition authority to open an investigation.
The Data Gathering Process

▪ A prerequisite for any screening exercise is the availability of data
▪ Cantons were cautious to cooperate with ComCo:
  – Confidentiality issues
  – Compilation of submission data is complex and costly; often there is no central, electronic database
  – Uneasiness about the consequences of positive detection results
  – Some of the cantons were too small to produce a representative sample
Sample and Descriptive Statistics (I)

- In the end ComCo found a canton that was willing to cooperate
- Submission data from the construction sector – mainly road construction – for the years 2004 – 2010:

<table>
<thead>
<tr>
<th>Overview over the Sample (2004-2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of submissions</td>
</tr>
<tr>
<td>Number of submitted bids</td>
</tr>
<tr>
<td>Number of involved firms</td>
</tr>
<tr>
<td>Number of bids from consortiums</td>
</tr>
<tr>
<td>Number of winning bids from individual firms</td>
</tr>
<tr>
<td>Number of winning bids from consortiums</td>
</tr>
<tr>
<td>Total value of all 282 projects (in CHF million)</td>
</tr>
</tbody>
</table>
Sample and Descriptive Statistics (II)

- Number and value (in CHF million) of submissions:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>35</td>
<td>26</td>
</tr>
<tr>
<td>2005</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>2006</td>
<td>44</td>
<td>23</td>
</tr>
<tr>
<td>2007</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>2008</td>
<td>40</td>
<td>22</td>
</tr>
<tr>
<td>2009</td>
<td>46</td>
<td>28</td>
</tr>
<tr>
<td>2010</td>
<td>40</td>
<td>32</td>
</tr>
</tbody>
</table>
The Variance Screen

- The most comprehensively tested marker is the variance screen.
- Several studies show that in times of collusion prices are less responsive to effective costs than in a competitive environment (e.g. Abrantes-Metz et al., 2006 or Bolotova et al., 2008)
  → i.e. price variability is lower in a collusive environment
- Mainly an empirical phenomenon, for theoretical explanations see however Athey et al. (2004) or Harrington and Chen (2006)
- To implement the variance screen the coefficient of variation (CV) is normally used:

\[
CV_j = \frac{\text{standard deviation} (\sigma_j)}{\text{arithmetic mean} (\mu_j)}
\]
Road Construction Cartel in the Canton of Ticino

Development of the CV between 1996 und 2006

[Graph showing the development of the coefficient of variation (CV) for projects chronologically ordered between 01.01.1999 and 18.03.2005.]
Results for our Sample

Development of the CV between 2004 und 2010
Observation: In many bid rigging cases the difference between the loosing bids was systematically smaller than the difference between the winning bid and the second best bid.

Alternative price-marker: relative distance measure (RD)

$$RD_j = \frac{\text{difference between the two lowest bids (}\Delta_j)}{\text{standard deviation of the loosing bids (}\sigma_{j,lb})}$$
Interpretation of the Relative Distance Measure

- Intuitively:
  - $RD \equiv 1$: no difference in the bidding behavior of the winner and the rest of the bidders
  - $RD > 1$: cover bidding may have taken place
- However, it can be shown that the $RD$ depends on the number of bids and the assumed distribution
- The absolute value of the $RD$ has no/limited explanatory power
- Improvement of the RD?
Road Construction Cartel in the Canton of Ticino

Development of the RD between 1996 und 2006
Results for our Sample

Development of the *RD* between 2004 and 2010
Screening for Partial Collusion

- Intermediate result: there is no market-embracing, systematic collusive scheme observable
- However: Not all firms in our sample may be involved in a collusive scheme and collusion may be targeted at specific projects
- Multistep approach to identify partial collusion:
  - **Step 1:** Isolation of contracts and firms exhibiting a specific (conspicuous) bidding pattern from the data set
  - **Step 2:** Identification of groups of firms that regularly submit bids for the same conspicuous contracts
  - **Step 3:** Analysis of geographic bidding behavior
  - **Step 4:** Analysis of bid rotation schemes
Identification of Conspicuous Contracts and Firms

- Basic idea: Use benchmarks for the CV and RD from other bid rigging cartels in the construction sector to identify conspicuous contracts

- Simultaneous appliance of the variance and relative distance test to the data set:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>CV</th>
<th>RD</th>
<th>Number of Contracts</th>
<th>% of Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>\leq 0.06</td>
<td>&gt; 1</td>
<td>80</td>
<td>28.4 %</td>
</tr>
<tr>
<td>2</td>
<td>\leq 0.05</td>
<td>&gt; 1.15</td>
<td>65</td>
<td>23.1 %</td>
</tr>
<tr>
<td>3</td>
<td>\leq 0.03</td>
<td>&gt; 1.30</td>
<td>38</td>
<td>13.5%</td>
</tr>
</tbody>
</table>

- Independent of the chosen scenario, the observed suspect bidding behavior can exclusively be attributed to 17 of the 138 firms in the sample
Analysis of Firm Interaction

- There is no «automatic» process to identify possible groups of colluding firms
- Explorative process: Matrix quantifying how many times the 17 firms had participated in a conspicuous tender (scenario 1) at the same time as another suspicious firm
- In particular 6 firms seem to have interacted often and regularly:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>--</td>
<td>17</td>
<td>14</td>
<td>16</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>--</td>
<td>--</td>
<td>45</td>
<td>18</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>23</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>20</td>
</tr>
</tbody>
</table>
### Geographic Analysis

- Allocation of the conspicuous contracts to the different districts
- Number of submitted bids for conspicuous contracts of the six suspect firms, sorted by districts:

<table>
<thead>
<tr>
<th>Firm</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 (1*)</td>
<td>1 (0)</td>
<td>2 (1)</td>
<td>1 (0)</td>
<td>--</td>
<td>--</td>
<td>4 (0)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>2</td>
<td>13 (3)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>4 (0)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>17 (3)</td>
<td>8 (3)</td>
<td>4 (0)</td>
<td>--</td>
<td>6 (2)</td>
<td>2 (0)</td>
<td>10 (4)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>4</td>
<td>18 (5)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>5 (0)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>13 (5)</td>
<td>1 (0)</td>
<td>--</td>
<td>--</td>
<td>2 (0)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>16 (5)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>4 (0)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

* Actually won contracts
Bid Rotation and Cover Bidding

- Bid-rigging usually involves a rotation element to sustain collusion: The renouncement to submit a competitive bid must be rewarded in the future («tit for tat»)
- Typically, the reward for cover bidding or bid suppression is the assignment of future contracts
- Bid rotation is therefore likely to produce a distinct bidding pattern: whenever the designated winner submits a «low» bid, all other firms will submit a deliberately «high» bid.
- This pattern can graphically be visualized
- Procedure:
  1. Normalize bids to make them comparable: $b \in [0,1]$
  2. Pairwise plotting of the normalized bids in the $x/y$-space
Competitive and Non-competitive Bidding Behaviour

Interpretation:

- A point on the ordinate/abscissa implies that one of the two firms actually won the contract
- For all other points, none of the two firms won the contract
- **Green area:** One firm wins the contract, the other submits a cover bid
- **Red area:** firm 1 & 2 submit cover bids, a third firm wins the contract
- **White area:** Either firm 1 or 2 submits a competitive bid
Bidding Behaviour of Suspect Firms in District A
Road Construction Cartel in the Canton of Ticino
Conclusions and «Lessons Learned»

- Submission data is not easy to get
- Applying simple markers to a data set may not be enough to detect bid-rigging cartels; collusion may be «hidden» in the data set
- Screening exercises are – to a certain degree – case specific: There is no «one size fits all»-procedure
- «Tool box approach»: A combination of (more or less) standardized screens and tests seems a promising approach
- Based on the presented results ComCo opened in 2013 an investigation and conducted house searches
- ComCo did find evidence for collusion and sanctioned 8 firms in 2016
- The case is currently pending before the first appeal instance
Further Reading…

Contact
Dr. Samuel Rutz
Swiss Economics
Weinbergstrasse 102
CH-8006 Zürich
+41 44 500 56 27
samuel.rutz@swiss-economics.ch
www.swiss-economics.ch