Bid Rigging and Digitalization

Need for Detection Tools and Screening Mechanisms

University of Cambridge – Initiative for Market Studies

4th Cambridge Symposium on Competition Policy

10 March 2025

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All views are personal

Outline

- **Importance of public procurement – negative effects of bid rigging**

- **Enforcing against bid rigging**

- **Detection tools and screening mechanisms: overview**

- **Detection tools and screening mechanisms: challenges putting them into practice**

Importance of public procurement

- OECD countries spend approximately **13-15%** of their **GDP** in public procurement

- **EU**: around **€2 trillion per year**; Belgium: €80 billion per year

- In many sectors such as energy, transport, waste management, social protection, infrastructure/construction and the provision of health or education services, **public authorities** are the **principal buyers.**

- **High-quality public services**: use of procurement to boost jobs, growth and investment, and to create an economy that is more innovative, resource and energy efficient, and socially-inclusive

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Importance of public procurement

- **Even more important given current global context:** global political instability urging need to reconsider defence strategy, increased risk of pandemics, climate challenges and global warming, including energy crises, increasing inequality urging the need to reconsider social support in education and health care…
=> Increased pressure on government spending

- Importance of well-managed and efficient procurement: improving public procurement can yield big savings. Even a 1% efficiency gain could save €20 billion per year for Europe.

- And taking into account potential negative effects of **bid rigging**
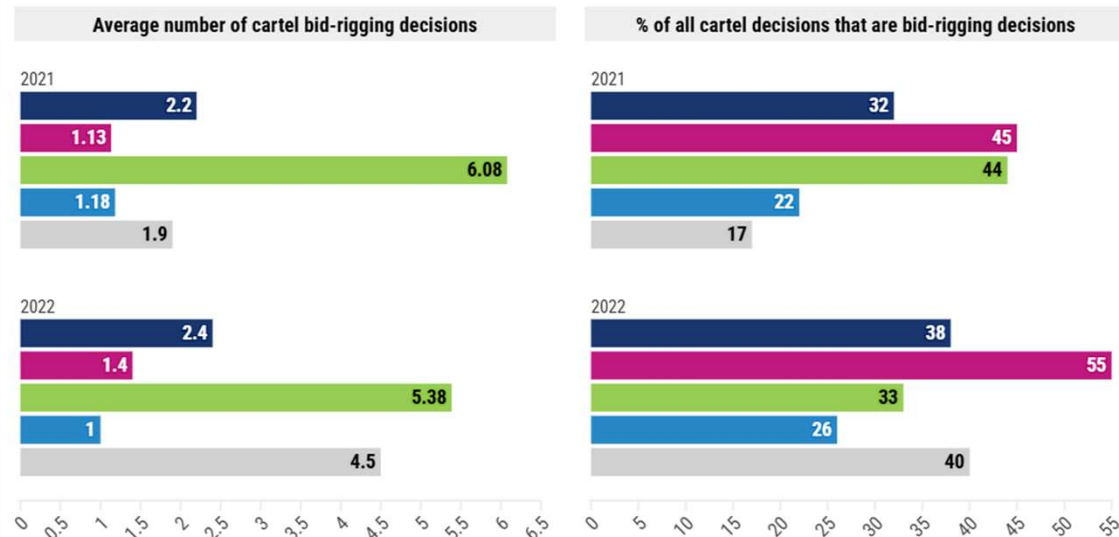
Negative effects of bid rigging

- **Bid Rigging:**
  - Illegal collusion in public tenders where competitors agree on bids (prices, winners, etc.) to distort competition;
  - Tactics include cover bidding, bid rotation, market allocation, or bid suppression, all aiming to predetermine the winner while faking competition.

- **Why detecting bid-rigging matters:**
  - Undermines fair procurement;
  - Inflates prices; and,
  - Wastes taxpayer money.

→**The EC indicates that collusion can increase contracts costs by up to 60% above competitive levels. This practice has the potential to drain public budgets and discourage honest bidders. Even one rigged large tender can cost millions in excess payments.**

Enforcement actions: some statistics

Average number of cartel bid-rigging decisions (left) and percentage of all cartel decisions that are bid-rigging decisions (right), 2021-2022
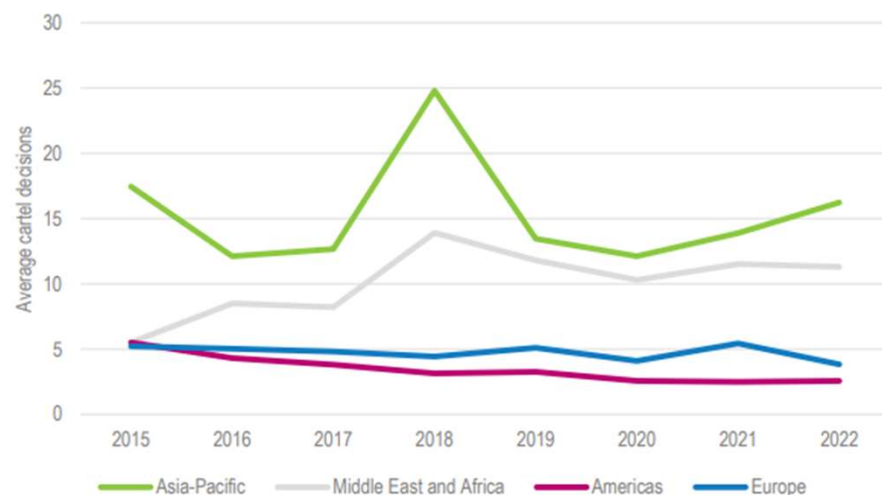
Cartel bid-rigging decisions increased by 9.7% from 154 tot 169 between 2021 and 2022, but these are the only two years for which OECD CompStats data for bid-rigging decisions exist.

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Enforcement actions: some statistics

Figure 2.7. Average number of cartel decisions, by region, 2015-22

Note: Data based on the 68 jurisdictions in the OECD CompStats database that provided data for cartel decisions for eight years.
Source: OECD CompStats database.

Longer statistics on cartel decisions: Europe even declining;

Regional differences
- due to difference in occurrence of infringements?
- due to difference in enforcement priorities?
- change of nature/complexity?
- ....

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Enforcement: multiple tools

Prevention / Advocacy

- Raising awareness via guidelines
- Adjustment of public procurement rules making them less vulnerable to bid rigging practices
- Communicating clearly on bid rigging decisions
- Compliance programs

Detection

- Whistleblower tool (reactive)
- Promotion of leniency program and settlement procedures (reactive)
- Dawnraids (reactive)
- Data screens and detection tools (reactive or proactive)

Sanctioning

- Fines
- Prison sentences (in some jurisdiction)
- Communication / press attention

Recent working paper *(2024, see ref list)* of Iossa et.al. "Using Multiple Tools to Enhance Competition in Public Procurement

Enforcement: multiple tools

- In September 2024, the OECD started a <u>project</u> funded by the European Union to help Austria, Bulgaria, Croatia, Cyprus, Greece and Romania fight bid rigging in public procurement, increase compliance with competition law and promote competition in public contracts.

- Joint collaboration projects within ECN on screening tools

- BCA: for nr of years on list of priority note to the Minister + several efforts to strengthen its enforcement instrumentarium (separate detection and public procurement unit, online whistleblower tool, priority treatment of infringement cases, revision of guidelines (in progress), data screening tools (in progress)…)

- The CMA is testing a new artificial intelligence (AI)-driven tool designed to detect collusion in bidding processes

Enforcement: case examples (BCA)

- **BCA – recent decisions:**
  - Private security services sector
  - Fire protection services sector

- **The private security services case:**
  - Infringing companies: Securitas, G4S and Seris
  - Participation in various cartel practices: the distortion of public procurement ("bid rigging") and other tender procedures, but also price fixing agreements and no-poaching arrangements
  - From 2008 until 2020
  - Fines totaling 47 095 112 euros - leniency program: Securitas full immunity of fine, G4S and Series reduced fines
  - Settlement procedure: additional fine reduction (10%)

Enforcement: case examples (BCA)

- **The fire protection services case:**
  - Infringing companies: ANSUL/SOMATI FIE and SICLI groups
  - Participation in various cartel practices: manipulating public procurement procedures ('bid rigging'), mainly for the sale, hire and/or maintenance of extinguishers and hose reels
  - From 2009 until 2016
  - Settlement procedure
  - Fines totaling 2 200 000 euros - leniency program: Ansul full immunity of fine, Sicli reduced fine

Enforcement: examples other NCAs

- CNMC:
  - 2021: File and document management service companies, bid rigging between 2016 and 2019. Spain's Ministry of Defence, Ministry of Development and the Reina Sofia National Art Centre among the public administrations affected
  - 2022: a fine of €203.6m on the six main national construction firms for manipulating public tenders to build infrastructure between 1992 and 2017 (>25 years)
- CMA:
  - 2024: launch of investigation into suspected bid-rigging in relation to a key government fund for improving the condition of school buildings.
- ACM:
  - 2023: Illegal price-fixing agreements involving four bids for contracts for the manufacturing of distance signs
- ....

Enforcement actions

- **Some insights:**
  - Essential needs (transport, safety/security, construction, …) requested by vulnerable clients (schools, municipalities, assistance centers, social housing, …)
  - Sometimes multilayered covering different practices
  - Sometimes enormous budgets and complex assignments involved (with highly specialized technical requirements, making it difficult for the procuring authority to properly assess whether the submitted bids are consistent with a competitive offer)
  - Large tendered public contracts often involve long term agreements. Several rounds of tendering may have passed before the cartel has been detected, allowing the infringement to take place over a long period of time.
  - But today's decision cases still mainly in traditional sectors and industries

  ⇒ **Are we ready for bid rigging enforcement in the newly digitalized and digitalizing world?**

Bid rigging in a digitalized world

- **Digital Transformation of Procurement:**
  - Move to *e-procurement* and online bidding platforms, potentially increasing speed and volume of tenders.
  - This digitalization creates:
    - <u>Transparency opportunities</u> (large, standardized data);
    - <u>New risks</u> (such as algorithmic bidding by firms).
- **Online bidding and algorithmic bidding:**
  - Automated bidding software and algorithms, likely to become more prevalent
  - These methods allow real-time bid adjustments and could facilitate tacit collusion (where algorithms learn tacit coordination on prices for instance)

→ Traditional manual analysis likely to struggle in keeping up with the review of public procurement, automated detection tools therefore becoming increasingly important.

Bid rigging in a digitalized world

- **Role of AI in public procurement:**
  - Can be adopted by public bodies for review and selection of bidders
    - →How to procure for these tools ? Raises ethical questions and potentially create additional complexity (how to guarantee fair, unbiased, transparent and explainable review of bids?).
    - →Develop in-house?

  - Can be adopted by companies to elaborate or apply their bid strategy in public procurement
    - →How to guarantee algorithms behave in a pro-competitive and explainable way?

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Detection tools and screening mechanisms

- **Statistical detection (or red flags)**:
  - Suspicious pricing patterns : identical or similar prices, low variance in prices, etc.;
  - Stable market shares;
  - Bidding behaviour: cover bidding, bid rotation, unexpected withdrawals of bids, large price gaps…
  - Etc.

Detection tools and screening mechanisms

- **Machine learning detection**:
  - Supervised learning: past known cases labelled as collusive or competitive used to train a model that becomes able to recognize patterns humans would not have been able to, on new tender data. Advantage is ability to assess all potential indicators simultaneously (in the sense that a given number of indicators in isolation would not suggest collusion, but taken together as in ML model, it can suggest collusion).
    - Limitation: requires extensive, quality data with significant human input (labels, indicators construction).
  - Unsupervised learning: models capable of detecting anomalies in data, such as outliers (deviations from competition baseline) or clusters, without relying on labelled data.

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Detection tools and screening mechanisms

- **Network detection**:
    - Tenders and bids can be analysed as a graph, where proximity (measured for instance by co-bidding and exclusivity) between bidders could reveal collusive behaviour
    - Can be combined with machine learning techniques

- **Natural language processing (NLP)**: can become a valuable tool to generate new types of indicators, such as proximity in
    - texts submitted by different bidders (e.g. same errors or phrasing); or
    - metadata of bids (document creators, timestamps, IP addresses, etc.).

Detection tools and screening mechanisms

- **Advanced AI tools** (similar to what is being developed in relation to eDiscovery) can help further refine the analysis by reviewing the documents sent by the bidders and extracting further information

→ **All these approaches can (and probably should) be used in combination whenever possible**

Academic literature

- Imhof, Karagok & Rutz (2018): a method to detect bid rigging by applying mutually reinforcing screens to a road construction procurement dataset from Switzerland in which no prior information about collusion was available.

- Huber & Imhof (2019) combine machine learning techniques with statistical screens computed from the distribution of bids in tenders within the Swiss construction sector to predict collusion through bid-rigging cartels. More than 84 percent of the investigated processes in the sample is correctly classified.

- In a more recent study (2023), they proposed a novel approach based on deep learning that flags cartel participants based on their pairwise bidding interactions with other firms. They combine a so-called convolutional neural network for image recognition with graphs that in a pairwise manner plot the normalized bids of some reference firm against the normalized bids of any other firm participating in the same tenders as the reference firm, tested on Swiss and Japanese procurement data. See also Wallimann, H., Imhof, D. & Huber, M. (2023). An AI is trained to recognize graphs that show collusion and those that do not (based on labelled graphs).

⇒ **The model trained in one country does not perform too bad in another (although not yet optimal results). But this opens the opportunity to use labelled data from another country to train an AI that could show anomalies in unlabelled data in another**

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Academic literature

- Kawai K., Nakabayashi J., Ortner J., & Chassang S. (2023): Cartels participating in procurement auctions frequently use bid rotation or prioritize incumbents to allocate contracts, but establishing a link between observed allocation patterns and firm conduct has been difficult: there are cost-based competitive explanations for such patterns. By focusing on auctions in which the winning and losing bids are very close, it is possible to distinguish allocation patterns reflecting cost differences across firms from patterns reflecting non-competitive environments.

$\Rightarrow$ **The implementation of such machine learning models by using only bids data, without detailed firm data or costs require to have labels on the bids (collusive or competitive)**

- Interesting overview paper: Harrington & Imhof (2022),"Cartel Screening and Machine Learning"
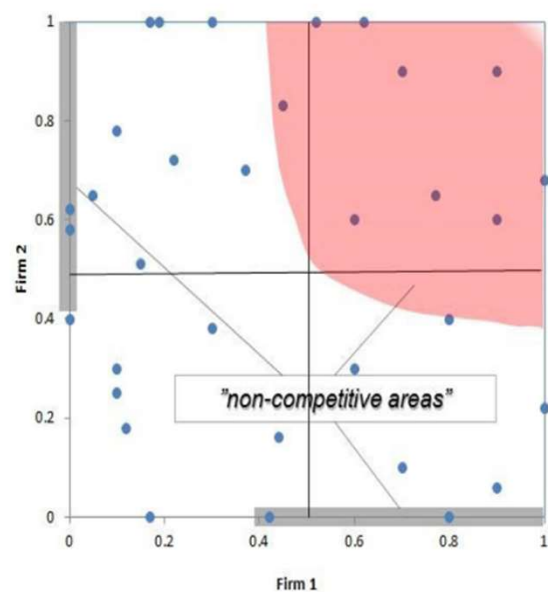
Academic literature

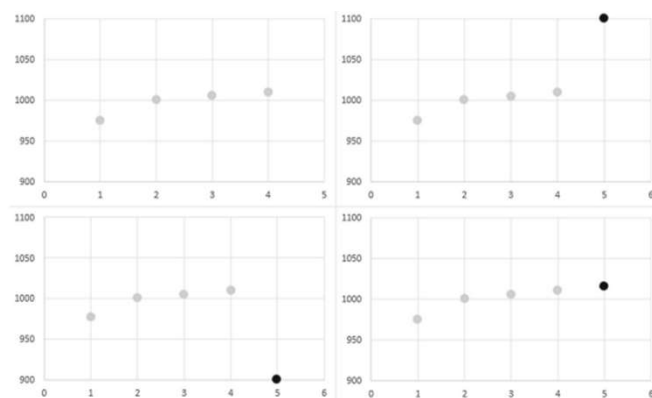Fig. 1. Example of non-competitive interactions between two firms.

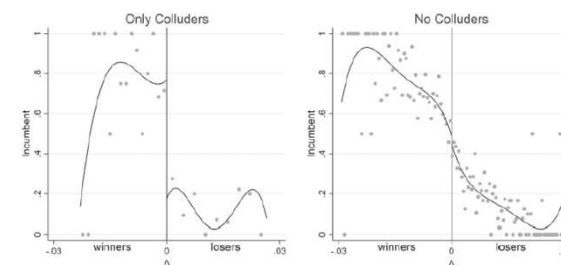Fig. 1 The potential effect of a competitive bidder

Huber & Imhof

FIGURE 3
Binned scatter plot for incumbency: Ohio school milk auctions

Notes: Left panel corresponds to Column (2) Panel (A) of Table 3 and right panel corresponds to Column (1), Panel (B) of Table 3. The curves in the figure correspond to fourth order (global) polynomial approximations of the conditional means.

Kawai K., Nakabayashi J., Ortner J., & Chassang S.

Wallimann, H., Imhof, D. & Huber, M.

Academic literature

- Carbone, C., Calderoni, F. & Jofre (2024): Network analysis component in the regression, where one independent variable is the embeddedness (a network analysis metric) which is good predictor (in combination with others) for bid rigging:
  - depending on the tender and how many of the cartelists are participating, the cartelist will adopt a different behavior.
  - the role of subcontracting is also a determinant of cartelists behaviours.

    "When analysing the whole sample, we noted that while in many cases cartel companies bid in large groups, in others they did not since relatively few of them participated together. This gave us the idea to explore whether cartel companies diversifed collusion strategies across auctions depending on the extent of the support they can rely on from their affiliates."

⇒**With data that are detailed enough, one can uncover subtleties that do explain firm behaviour in public procurement**

⇒**Recording detailed and complete data (on e.g. the relationship between firms across various tenders, subcontractors, etc) that can be analyzed by competition authorities, could help to detect these behaviours**

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Detection tools in practice: challenges

- **Detection tools generate leads, not proof**
  - Human judgement and hard evidence remain necessary

- **The data used can be sensitive**
  - GDPR compliance is crucial, more specifically when developing tools that gather and process data in combination (and hence make inference possible).
  - Personal data must be minimized and/or anonymized

- **The results of the analyses, and its consequences** (such as exclusion of bidders when suspicious behaviour is detected), **must be transparent** (i.e. avoid creating a black box that cannot be interpreted)

Detection tools in practice: challenges

- **Access to data and resources must be facilitated**
  - Example of BE where relevant data is only recently starting to be recorded in a standardized and systematic way, and where access to this data is an administrative burden (still in the making) and subject to political changes → **lack of access to historic, labelled data limits the possibility for in-house supervised learning model.**

  - Knowledgeable staff in-house for practical implementation (economists and/or data scientists) and balance between development of tools and case work → **small and mid-size agencies cannot easily allocate dedicated staff**

  →**Cooperation between agencies can play a key role**
  →**Insights from academic world**

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Detection tools in practice: challenges in particular wrt digitalized procurement

- Huge volumes of bidding data to be produced and analysed.
- Detecting anomalies likely to become more intensive and challenging.
- Collusive signals could become hidden or subtle in large data.
- There could be behaviours intended to hide collusive signals, such as randomization in bidding behaviour.

=> Are conventional red flags (identical bid forms, bid rotations, etc.) going to be sufficient?

=> Need for advanced detection tools relying on statistical screens and, possibly, AI.

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