ECONOMIC TOOLS USED IN EX-ANTE SCREENING TO UNCOVER CARTELS

DOES LOOKING UNDER THE LAMP POST REALLY WORK?

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ACE Bologna, 16.11.2018

Cartels hide –
and we want to find them

But looking under the lamp post –

Does it really work?

- Most observed cartels are illegal
- Highly selected group of animals
- The degree of '*light*' differs according to:
  - Industry
  - Type of cartel
  - Number of firms involved

CARTELS?

NO CARTELS?

More structural econometric approaches

- Use data on convicted cartels estimating structural models
  - **Porter and Zona, 1999:** The Ohio school milk case, prices were lower when (transportation) costs were higher which is inconsistent with competition but quite consistent with a particular collusive scheme.
  - **Bajari and Ye, 2003:** Firms' bids are independent under the competitive model and lack of independence is taken as evidence consistent with collusion
  - **Pesendorfer, 2000**: Compare cartels with and without side payments, has implications for market share development (side payments allows for more fluctuating market shares.

More structural econometric approaches

- Use data on demand and cost to uncover underlying (hidden) collusive behavior
    - **Porter, 1983, Lee and Porter, 1984 and Ellison,1994**: Study the Chicago-Atlantic seaboard railway cartel from the 1880s. The two first allow for two hidden states of the industry [collusion and price-war] utilize an imperfect indicator to identify the collusive state of the industry. Ellison extends their empirical work by bringing in a Markov structure for the hidden process
    - **Knittel and Stango, 2003:** Allow for latent tacit collusion in the local U.S. credit card markets
- Use data from cartel registry and industry characteristics to uncover cartels
    - **Hyytinen, Steen and Toivanen, 2018**: Use Hidden Markov models to infer the underlying cartel status across all industries in Finland during the legal cartel era.

Common challenge with these models:

- *Ex post* evaluations

- Needs too often comprehensive data

- Technically pretty challenging

A need for simpler tools to detect cartels:
Screening markets through *Collusive Markers*

Screening

- *"Screening refers to a process whereby industries are identified for which the existence of a cartel is likely. An industry that is picked up by a screen is one that warrants not prosecution but rather a more intense investigation which directly contrasts collusion and competition as competing explanations of market behavior."*

Joseph Harrington, 2006

Harrington's Collusive Price Markers:

1. LEVEL: A higher list (or regular) price and reduced variation in prices across customers.

2. PATTERN 1: A series of steady price increases is preceded by steep price declines.

3. PATTERN 2: Price is subject to regime switches.

4. IMPORT COMPETITION: Price rises and imports decline.

5. CORRELATION: Firms' prices are strongly positively correlated.

6. PAYMENT CONDITIONS: A high degree of uniformity across firms in product price and other dimensions including the prices for ancillary services.

7. VARIANCE: Low price variance.

But Harrington's *'low price variance' marker is still only* **tentative**
AND, based on 'evidence' from international cartels' pricing policy – ***not*** *bid rigging*

- Harrington, 2006:
  - *"… the difficulty is that we do not know whether there was more or less price harmonization under collusion. … evidence that lack of price harmonization arose under collusion and that cartels sought to eliminate it."*
  - *"… without collusion, firms would supply to meet demand in each country and this would allow arbitrage opportunities to be exploited and prices equalized across countries…*
  - [BUT] *"With collusion, firms were typically restraining supply… and this could allow disparities in price to exist across countries."*

- [THUS]: *"On the basis of this argument, the* [price variance] *… collusive marker is tentatively put forth."*

The *'low price variance'* marker has *still* led to several empirical papers on *variance screening:*

the standard deviation (σ_j) divided by the arithmetic mean (μ_j) of all bids submitted for contract j:

$$CV_j = \frac{\sigma_j}{\mu_j}$$

- Esposito and Ferrero, 2006: Fuel- and market for baby food in Italy
- Bolotova, Connor and Douglas, 2008: Lysine and citrid acid
- Abrantes-Metz et al, 2006: Frozen fish, US
- Abrantes-Metz et al, 2012: Libor Dollar market
- Jimenez and Perdiguero, 2012: Fuel market Canary Islands
- Ragazzo, 2012: Gasoline markets in Brazil
- Mena-Labarte, 2012 and Estrada and Vasques, 2013: bid-rigging drug markets, Mexico
- Imhof, 2017: Bid-rigging Asphalt market Switzerland

BUT here we mostly talk *collusion, or not*

Which has led researchers to look for markers with *partial collusion*

- Today's Swiss case on road construction and bid rigging
- Even more recently: A Norwegian case on partial collusion in local energy markets in Norway: Skjeret and Garcia Pires, 2018
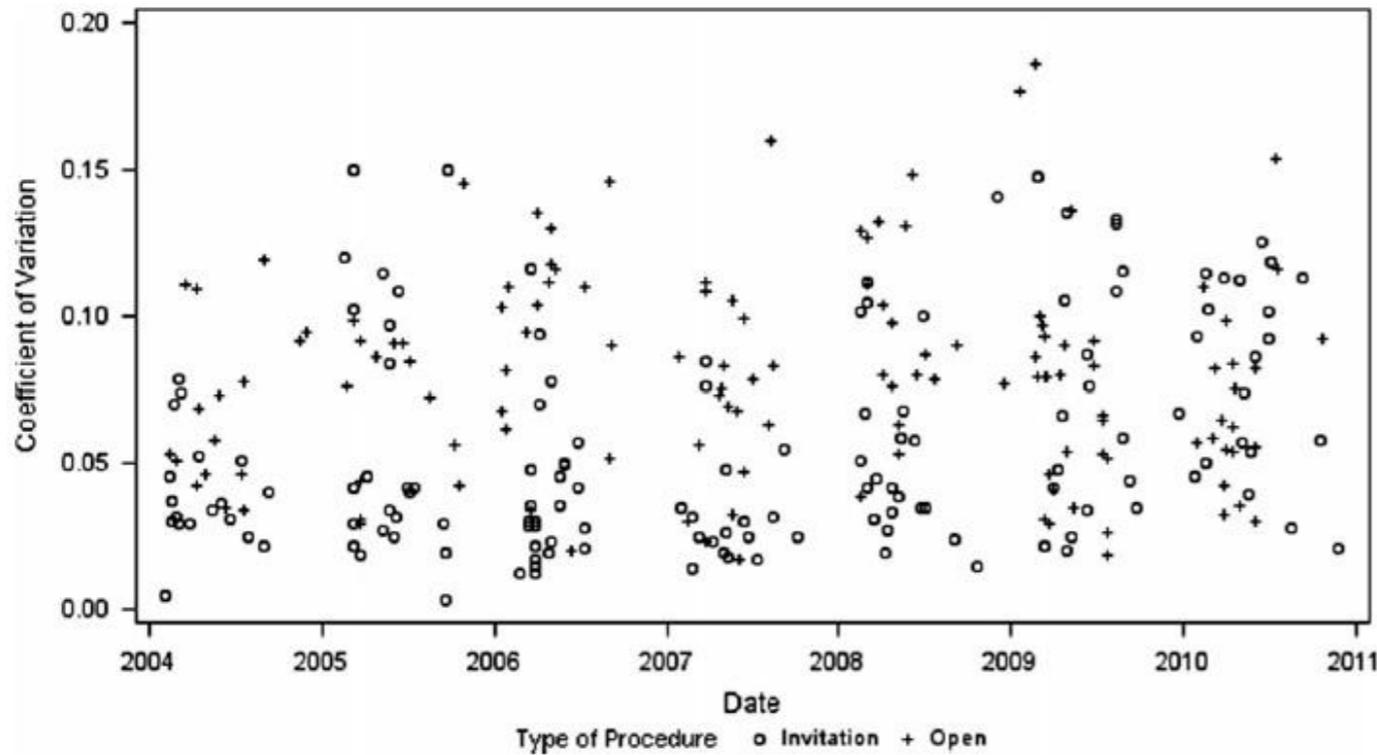
Both these studies also provide a measure of coefficient of variation: $CV = \dfrac{\sigma}{\bar{p}}$

In the Swiss case for prices across contracts, in the Norwegian case for prices over time across markets

And do we see a strong pattern in the *CV*?

Switzerland

Norway

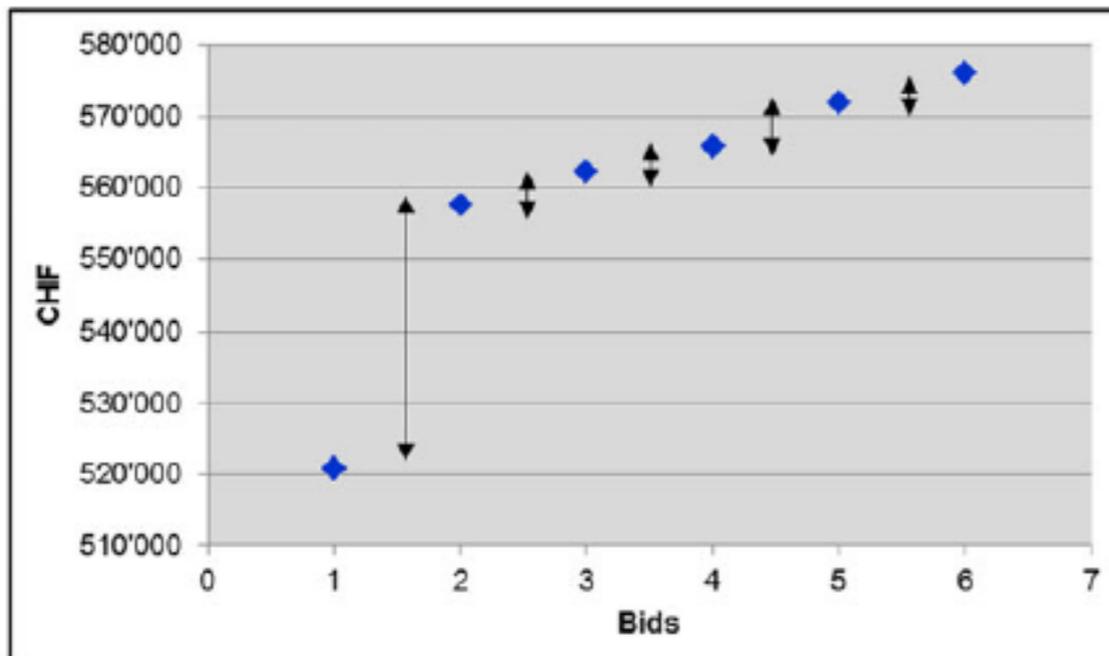Some between 'Open' or 'Invited' procedures

HARDLY none?

Both studies pushes 'new' measures:

- Imhof, Karagök and Rutz, 2017: Assume that the distance between the lower two bids always are higher than the distance(s) between the highest bids *(Why, is not clear to me – what theory supports this?)*
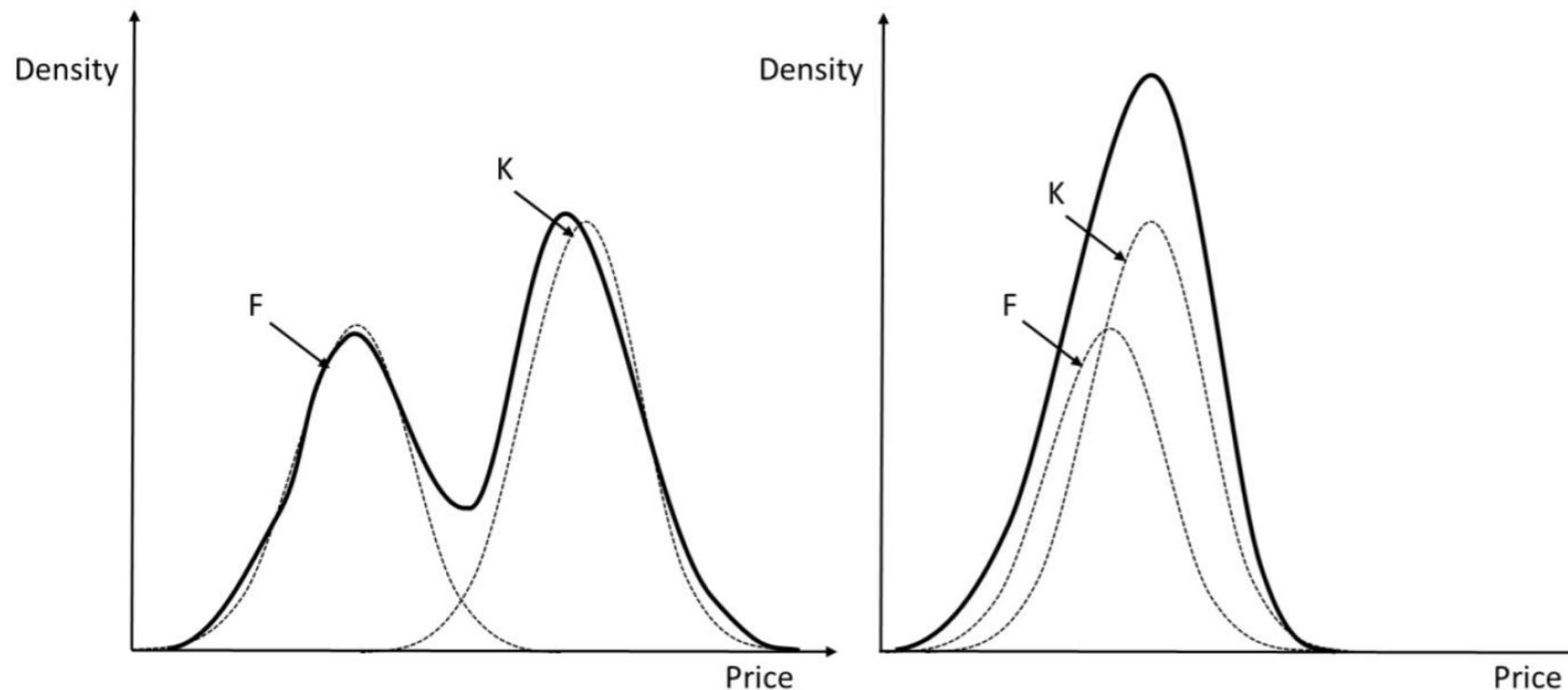

Thus: Look at relative bid distance

$$RD_j = \frac{\Delta_{j,l}}{\sigma_{j,lb}} \implies RD_j = \frac{x_2 - x_1}{\sqrt{\frac{\sum_{i=2}^{N}(x_i - \bar{\bar{x}})}{N - 2}}}$$

Both studies pushes 'new' measures:

- Skjeret and Garcia Pires, 2018: Based on a model by Deneckere and Davidson (1985), that there are two groups in the market simultaneously, one of fringe (F), one of kartel (K) firms

Thus: Look at higher distribution properties

Skewness: $= m_3 m_2^{-3/2}$

Kurtosis: $= m_4 m_2^{-2}$

Where: $m_r = \dfrac{1}{n}\sum\limits_{i=1}^{n}(p_i - \bar{p})^r$

Challenge 1a: Interpretation of statistical measures

Relative distance measure:

«In the case of the RD, this is relatively straightforward: a RD larger than 1 points to a conspicuous contract.»

(Imhof et al, 2017, p15)

$$RD_j = \frac{x_2 - x_1}{\sqrt{\dfrac{\sum_{i=2}^{N}(x_i - \bar{\bar{x}})}{N - 2}}}$$

Normalized around 1 in a competitive situation: *An absolute distance between two bids divided by the standard error across the other bids*??

*And: Doesn't RD's prediction come out opposite of the CV measure*

Challenge 1b: Interpretation of statistical measures

Skewness (dotted line) and **Kurtosis** (solid line)**:** Hard to interpret, they measure changes in the distribution tales and steepness of the distribution. BUT, I have not met many who can provide insight on these two concepts

Analysing electricity prices:
Significant drop in skewness late December of 2012, low skewness in the late summer of 2013, visa versa for kurtosis…

And indeed, coincides with unanticipated high prices – and clearly are structural breaks, **but still we need to know more**

Skjeret and Garcia Pires, 2018
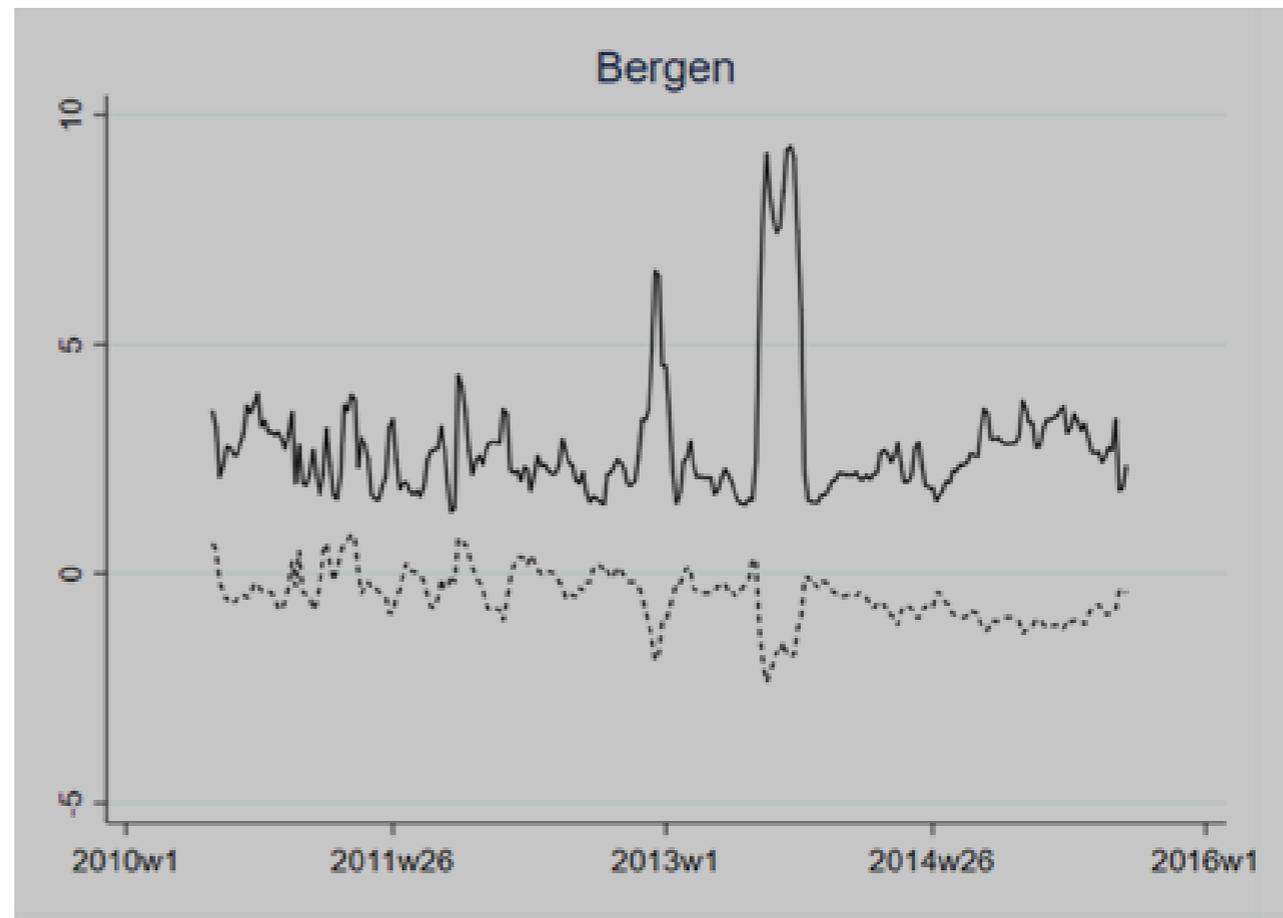
Challenge 2: Asymtotic results and potential usage of statistical tests need large numbers

SCREENING

- BIDS

  Methods very sensitive to the degrees of freedom, often there are very few bids per auction

- PRICES

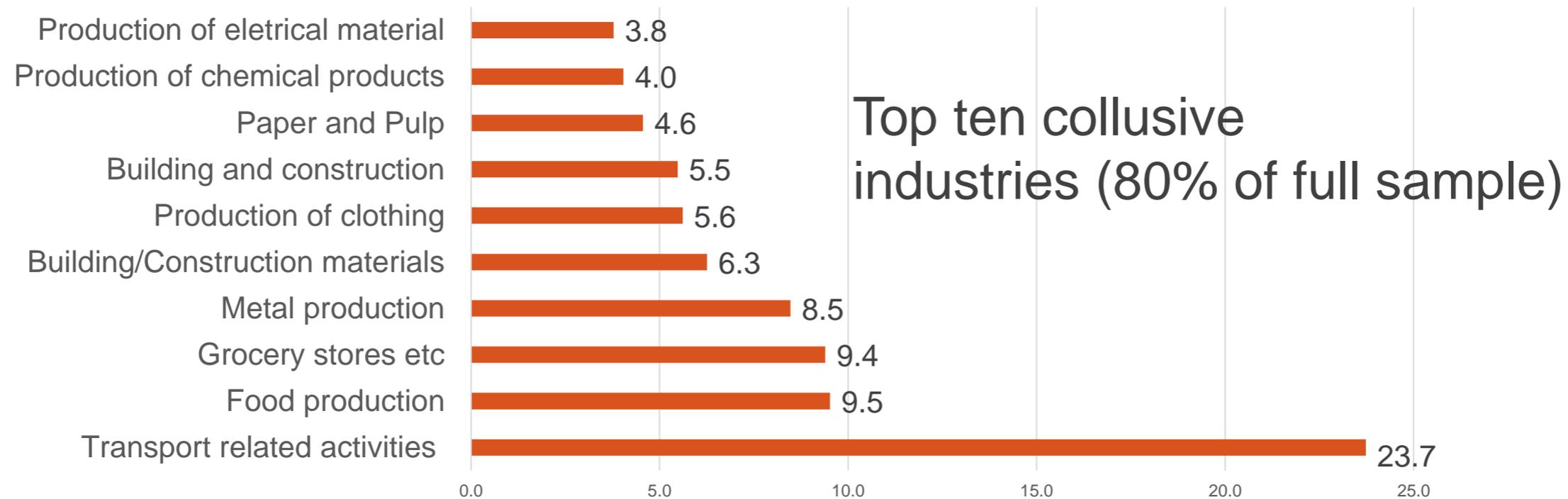 When measuring higher order moments of price development we need long data sets

TESTING

- If we are to make data decide, structural shift tests are needed – sensitive to data set size.

Challenge 3: The tests need priors on 'collusiveness' of industries

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- Priors on which industries to look closer on
  - Priors that mostly come from selected samples on illegal cartels
  - OR. Priors from less selected samples on legal cartels.

Top ten collusive industries (80% of full sample)

Industry	Value
Production of eletrical material	3.8
Production of chemical products	4.0
Paper and Pulp	4.6
Building and construction	5.5
Production of clothing	5.6
Building/Construction materials	6.3
Metal production	8.5
Grocery stores etc	9.4
Food production	9.5
Transport related activities	23.7

Statistics from >700 Norwegian Legal cartels 1950-1991

Challenge 4: The tests need priors on which critical size to use for the indexes

- Priors from the dataset on what is the critical values determining the difference between competitive and collusive regimes are needed
- Can we form priors across industries? – and countries?

Do we really believe that what we find for one industry/country, is valid in another industry/country?

Priors from the Swiss case

- *«...in the canton of Ticino, the CV amounted to **0.03** on average during the cartel phase. Additionally there were almost no rigged tenders with CV values higher than **0.05**.»*

  As opposed to in Ticinio, …
  *«the road construction cartel in the canton of Aargau, may serve as an **example** of a much more loosely organized cartel. …partial collusion between seventeen construction firms, and .. not targeted at all road construction contracts.. The average CV …amounted to **0.06**.»*

…«Thus, for an initial screen, one may arrive at the hypothesis that tenders with a CV above 0.06 and a RD below 1 are inconspicuous, and vice versa.» (Imhof et al, 2017, p15/16)

Beliving these numbers to be *general* needs a leap of faith…

Challenge 5: Cartel bidding is endogenous to cartel screening: *Also cartels will learn about screening tools*

- If we ever develop a really efficient screening tool, we should either never tell anyone, or never use it in a case

- WHY? As soon as it is out in the open, the cartels will adapt their behaviour

BUT this is not possible – how to condemn a cartel based on statistical economic evidence without revealing your method?

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And finally when all numbers are calculated and we leave it to the court?

If cartels are found out statistically – And we do not worry about false positives:

- How to charge them?
- What is necessary proof for an infringement
- Supportive or conclusive proofs

"In the US, economic evidence is generally insufficient to prove a violation of Section 1 of the Sherman Act. There needs to be evidence of explicit coordination among the suspected cartel members. Economic analysis can play a supportive role, however."…

Harrington, 2006

AND, he continues:

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*"…Nevertheless, since economic theory generally doesn't distinguish between tacit and explicit collusion - and it is explicit collusion that is illegal in most countries - **it is difficult for economic analysis to deliver definitive evidence** that observed behavior is consistent only with the presence of a hard-core cartel.*

Harrington, 2006