



Going Once... Going Twice... Reported!

Cartel Stability and the Effectiveness
of Leniency Programs in
Experimental Auctions

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Motivation

Dutch construction cartel

- 2001: TV-program *Zembla* reveals huge construction cartel in the Netherlands
 - Shadow accounts with side-payments
 - 1986-1998
 - Nation-wide
 - 3000 rigged bids
- 2002: Dutch AA (NMa) starts leniency program
 - 486 leniency applications
 - Substantial fine reductions

Motivation

- Fighting collusion is a primary concern for auctioneers
(Klemperer 2000)
- In the 1980s, 75% of the US cartel cases were related to auctions
(Krishna 2004)
- Advantage of first-price auctions: Cartels are stable in English auctions, but not in first-price auctions
(Robinson 1985; Marshall & Marx 2007)
- Still, in practice, bidders are often able to collude in first-price auctions
(Scherer 1980; McAfee & McMillan 1992; Porter & Zona 1993, 1999; Pesendorfer 2000)

Motivation

- Apparently, many cartels are able to overcome deviation incentives of first-price auctions
 - Possibly because of repeated interaction
(Blume & Heidhues 2002; Abdulkadiroglu & Chung 2003; Aoyagi 2003, 2007; Skrzypacz & Hopenhayn 2004)

- Antitrust authorities fight cartels
 - Detection & punishment
 - Leniency programs

- Detection & punishment
 - 13% - 17% probability of getting caught
(Bryant & Eckard 1991, Combe, et al., 2008)
 - Fine = Maximally 10% of annual turnover

Motivation

- Leniency programs
 - Fine reduction up to complete immunity
 - 1978: US
 - 1996: EU
 - Successful after modifications
- Mixed theoretical support for leniency programs
 - Cartel deterrence
 - Cartel stability
 - Market effect (exploitability, tacit collusion, agency problems)

Motivation

- Our method
 - Lab experiment

- Why a lab experiment?
 - Field evidence difficult to obtain: cartels are illegal
 - Control as much as possible for endogenous factors

- Setting
 - Explicit collusion
 - Weak cartels
 - Repeated interaction
 - Common value
 - Symmetric bidders
 - Competition authority

Experimental design

- 3 bidders
- 40 rounds
- No rematching
- $v = 10$

- Treatment Leniency
 1. Cartel formation (yes/no)
 2. The auction
 3. Reporting
 4. Cartel discovery
 - Not reported (15%, fine = 10)
 - Reported (100%, fine = 0, 5, 10)

Experimental design

- Treatment Antitrust
 1. Cartel formation (yes/no)
 2. The auction
 3. Cartel discovery (15%, fine = 10)

- Treatment Agreement
 1. Cartel formation (yes/no)
 2. The auction

- Treatment Baseline
 1. The auction

Experimental design

- 4 x 2 between-subjects design

	First-price auction	English auction
Baseline	6	7
Agreement	8	7
Antitrust	9	5
Leniency	7	8

groups per treatment

Screen shots

The screenshot shows a window titled "MainForm" with a close button in the top right corner. The window is divided into three main sections:

- Left Panel:** Labeled "informatie" at the top. It contains a text label "ronde:" followed by a text box containing the number "1". Below this is another text label "stap in deze ronde:" followed by a text box containing the question "wilt u een afspraak maken?". At the bottom of this panel, there is a text label "verdienste:" followed by a text box containing the value "28.0".
- Center Panel:** Contains the question "Wilt u een afspraak?" followed by the instruction "Zo ja, druk dan op de knop JA. Zo nee, druk op de knop NEE.". Below the text are two rectangular buttons: one labeled "JA" and one labeled "NEE".
- Right Panel:** A solid yellow rectangular area with the text "Maak uw keuze." written in black.

Screen shots

The screenshot shows a window titled "MainForm" with a close button in the top right corner. The window is divided into three main sections:

- Left Panel (informatie):** Contains the text "informatie" at the top. Below it, "ronde:" is followed by a text box containing the number "1". Underneath, "stap in deze ronde:" is followed by a text box containing the text "is er een afspraak?". At the bottom of this panel, "verdiensite:" is followed by a text box containing the number "28.0".
- Middle Panel:** Contains the text "Er is WEL een afspraak gemaakt." followed by "De afspraak is dat u NIET een getal invoert. U ontvangt 2.5 punt van degene die volgens de afspraak wel een getal invoert." Below this text is a large rectangular button labeled "alles gelezen".
- Right Panel:** A yellow rectangular area containing the text "Druk op <alles gelezen>, als u alles gelezen heeft."

Screen shots

MainForm [X]

informatie
ronde:
stap in deze ronde:

verdienste:

De afspraak is dat u NIET een getal invoert.

Kies het bod dat u uit wilt brengen door op een van de getallen te klikken. "ik voer geen getal in" betekent dat u GEEN bod uitbrengt.

0	1	2	3	4	5	6	7	8	9	10
ik voer geen getal in										

Maak uw keuze.

Screen shots

The screenshot shows a software window titled "MainForm" with a close button in the top right corner. The window is divided into three main sections:

- Left Panel (Information):** Contains the text "informatie" at the top. Below it, "ronde:" is followed by a text box containing the number "1". Underneath, it says "stap in deze ronde:" followed by a white box containing the text "rapporteren van afspraak?". At the bottom left, "verdiensite:" is followed by a text box containing "28.0".
- Center Panel (Question and Instructions):** Contains the question "Wilt de afspraak rapporteren? Dat kost u 1 punt." followed by the instruction "Zo ja, druk dan op de knop JA. Zo nee, druk op de knop NEE." Below the text are two buttons: "JA" on the left and "NEE" on the right.
- Right Panel (Instruction):** A vertical yellow box containing the text "Maak uw keuze."

Theoretical predictions

- English auction
 - (Tacit) collusion feasible in equilibrium in all treatments
 - Winning bid = 0 in all treatments
 - Winning bids are the same with or without explicit collusion
 - Only explicit collusion in treatment Agreement
- First-price sealed-bid auction
 - (Tacit) collusion might be feasible in equilibrium in any of the treatments
 - Bidding 10 is weakly dominated
 - One-shot equilibrium outcome: Winning bid = 9
 - Winning bids are the same with or without collusion
 - Chain store paradox
 - Only explicit collusion in treatment Agreement

Earlier experimental findings

English auction

First-price auction

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Kagel 1995

English auction

First-price auction

\geq

Hu *et al.* 2008

Bigoni *et al.* 2008ab

Agreement

\approx

Leniency

>

Antitrust

Hinloopen & Soetevent 2008

Antitrust

\approx

Baseline

\approx

Agreement

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Leniency

Experimental results

	Baseline		Agreement			
			<i>Overall</i>	<i>Non-cartels</i>	<i>Cartels</i>	
<i>FP</i>	7.1		5.0	9.4	3.5	
<i>EN</i>	8.1		4.3	9.6	2.1	
	Antitrust			Leniency		
	<i>Overall</i>	<i>Non-cartels</i>	<i>Cartels</i>	<i>Overall</i>	<i>Non-cartels</i>	<i>Cartels</i>
<i>FP</i>	7.1	8.6	5.0	6.2	7.5	2.9
<i>EN</i>	5.9	9.7	3.5	5.8	9.3	1.9



Experimental results

- Result 1:

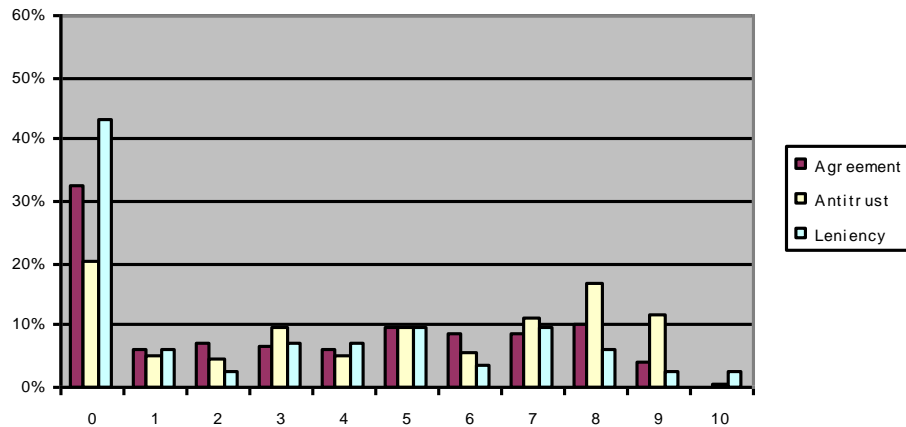
- Across all treatments cartels establish lower winning bids than non-cartels

- Result 2:

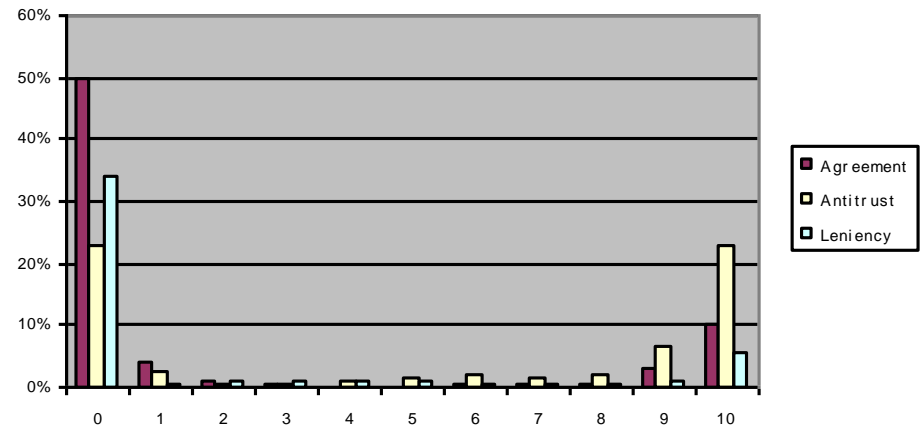
- Cartels establish a lower winning bid in EN than in FPSB

Experimental results

First-price sealed-bid auction



English auction



Frequency distribution winning cartel bids



Experimental results

- Result 1:

- Across all treatments cartels establish lower winning bids than non-cartels

- Result 2:

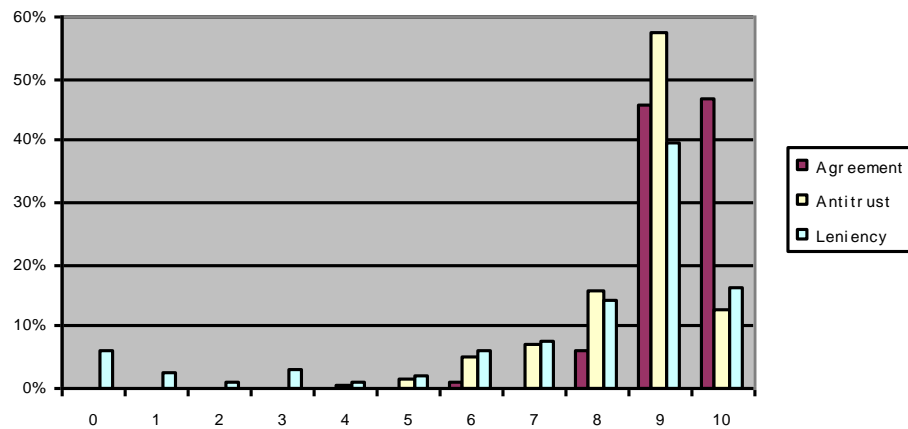
- Cartels establish a lower winning bid in EN than in FPSB

- Result 3

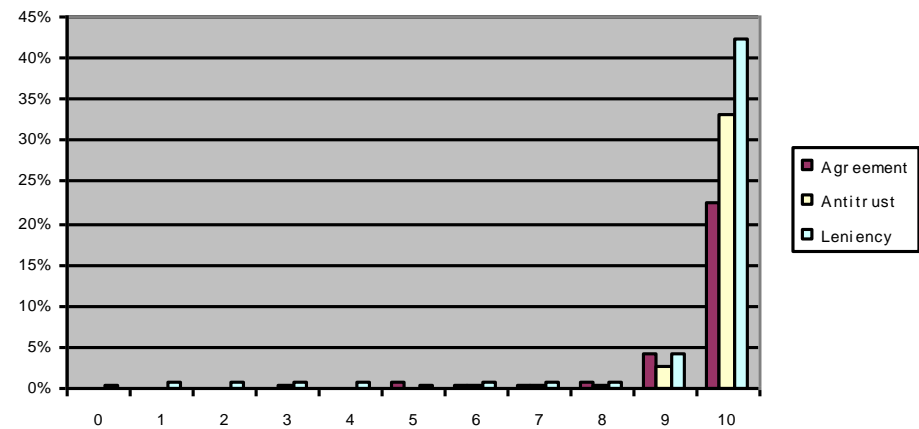
- Non-cartels establish a lower winning bid in FPSB than in EN

Experimental results

First-price sealed-bid auction



English auction



Frequency distribution winning non-cartel bids



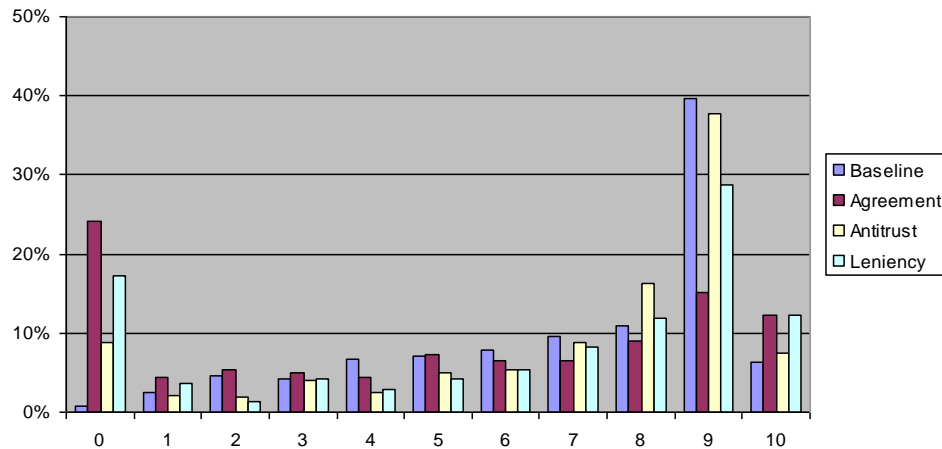
Experimental results

■ Result 4

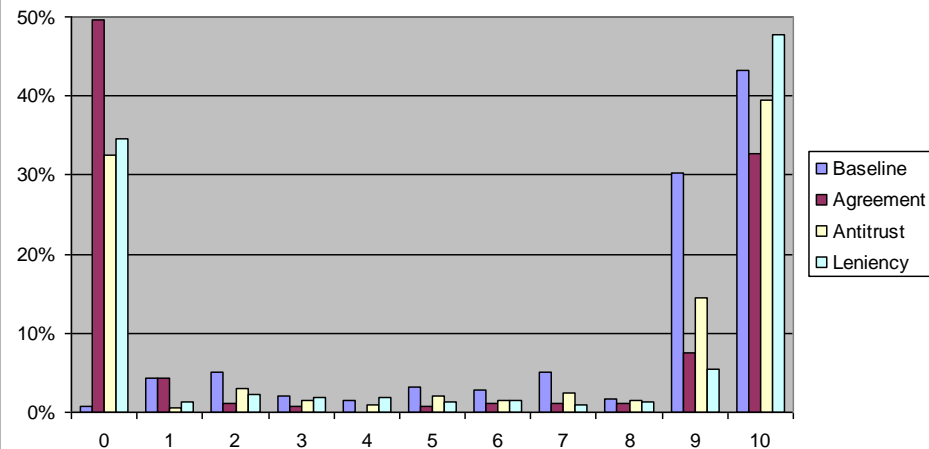
- Within treatments, the winning bids are not different between FPSB and EN

Experimental results

First-price sealed-bid auction



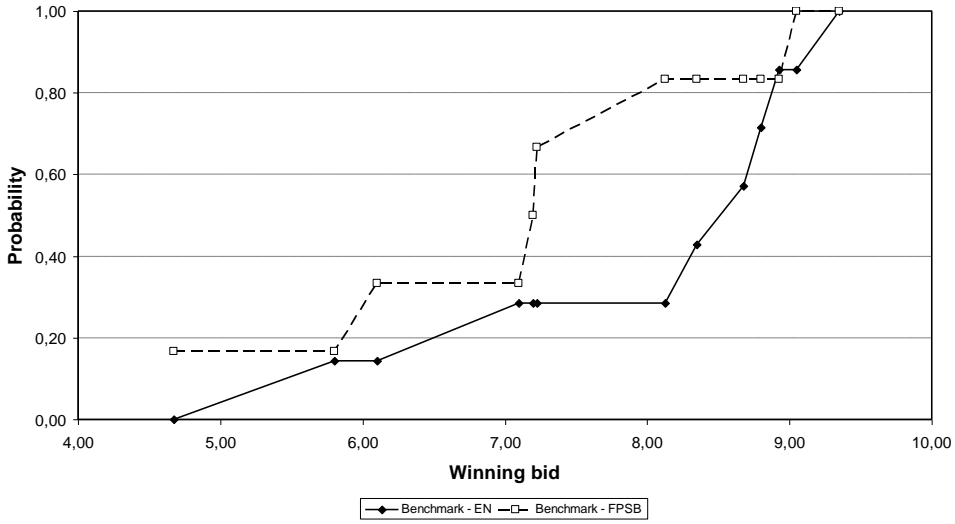
English auction



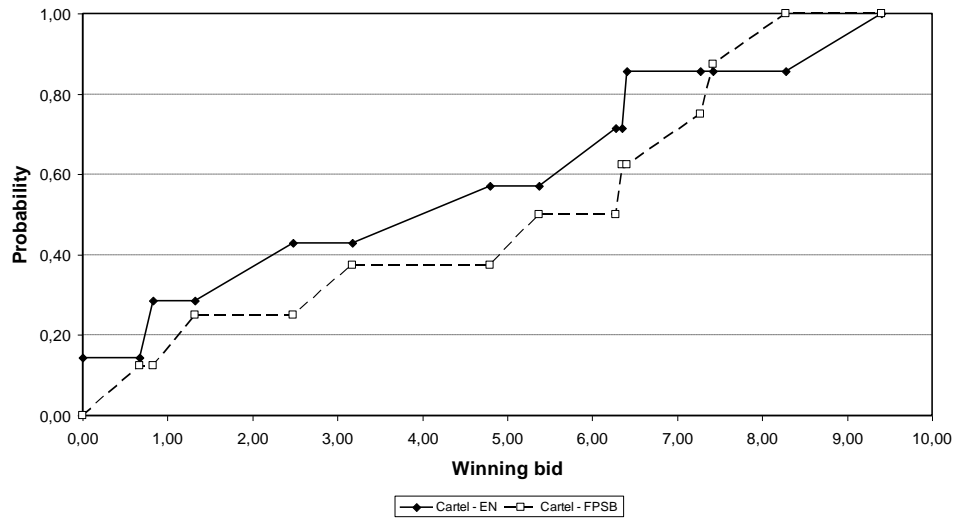
Frequency distribution winning bids



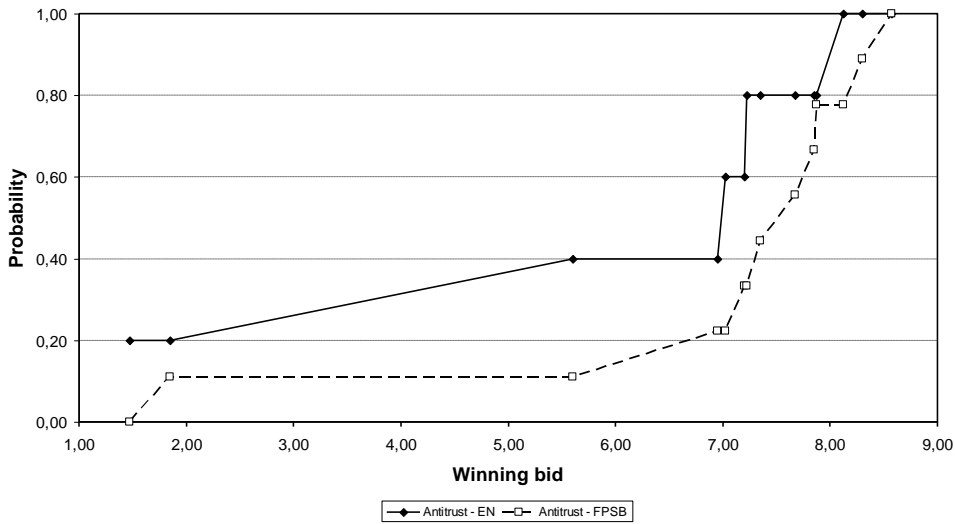
Baseline



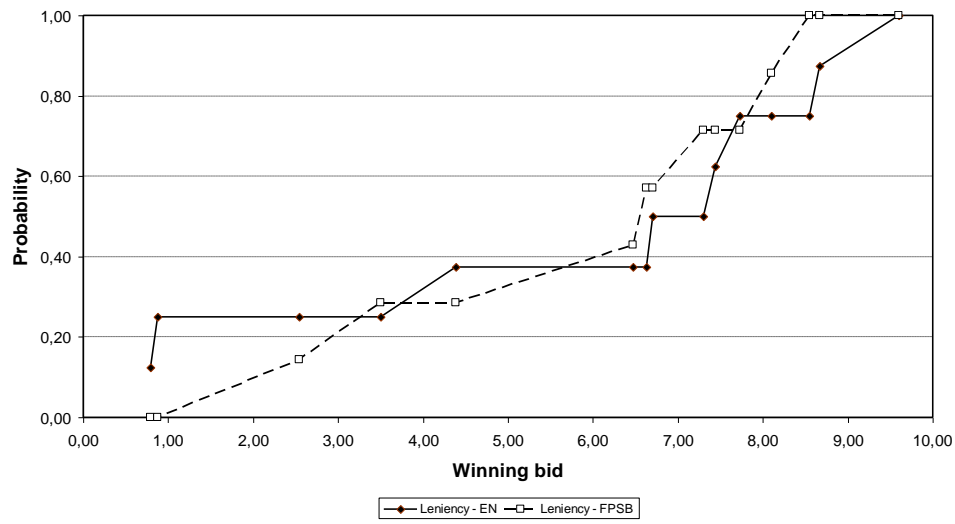
Agreement



Antitrust



Leniency



Experimental results: treatments



■ Result 5

- Introducing a cartel detection probability increases the average winning bid, and in particular the average winning cartel bid.

■ Result 6

- A leniency program does not affect the average winning bid nor the average winning cartel bid.

Experimental results: cartels

	Agreement	Antitrust		Leniency		
	<i>Formed</i>	<i>Formed</i>	<i>Detected</i>	<i>Formed</i>	<i>Reported</i>	<i>Revealed</i>
<i>FPSB</i>	74%	42%	11%	30%	68%	71%
<i>EN</i>	71%	62%	11%	48%	44%	53%

■ Result 7

- In FPSB an AA deters cartel formation; a LP deters cartel formation further
- In EN an AA deters cartel formation only if there is also a LP

Experimental results: cartels

	Agreement		Antitrust		Leniency	
	<i>Formed</i>	<i>Deviated</i>	<i>Formed</i>	<i>Deviated</i>	<i>Formed</i>	<i>Deviated</i>
<i>FP</i>	74%	27%	42%	40%	30%	21%
<i>EN</i>	71%	13%	62%	20%	48%	12%

■ Result 8

- Subjects are less likely to deviate in EN than in FPSB
- Subjects are less likely to deviate in Leniency than in Antitrust

Experimental results: Leniency Program

■ Result 9

- Both the designated winner and the other cartel members are more likely to report the cartel if a deviation has occurred
- This is independent from the auction type, whether a bidder wins or not, whether the designated winner wins, the winning bid, and the round number

Experimental results: end-game

■ Result 10

□ There are pronounced end-game effects after round 35:

- Winning bid increases (more so in EN than in FPSB)
- Less votes in favor of collusion (more so in EN than in FPSB)
- More deviations from cartel agreements (more so in EN than in FPSB)

Conclusions

- Collusion more attractive in EN than in FPSB
 - Non-cartels submit higher winning bids in EN
 - Cartels submit lower winning bids in EN
 - Less deviation in EN

- Detection & punishment deter cartel formation
 - Costs of cartel formation are higher

- Ambiguous effects of leniency programs (compared to only detection & punishment)
 - Stronger cartel deterrence
 - More cartels detected
 - Less deviation
 - (Weakly) lower revenue

Conclusions

- Findings in line with some of the theory
 - Cartels are more successful in EN than in FP
(Robinson 1985; Marshall & Marx 2007)
 - In some settings, leniency programs are effective
(Motta & Polo 2003; Spagnolo 2004; Aubert et al. 2006)
 - Leniency programs provide extra “stick” for cartels
(Apesteguia et al. 2007)
 - Leniency programs induce tacit collusion
(Hinloopen & Soetevent 2008)

- Further research
 - Partial cartels
 - Private values