

Collusion and Cartels: Recent Policy Successes and Future Legal Challenges

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Introduction

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- ① Policy: What is the state of competition policy?

Introduction

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 - *Explicit collusion* is when coordination occurs using express communication.
 - *Tacit (or non-explicit) collusion* is when coordination occurs without express communication.
- 1 Policy: What is the state of competition policy?
 - 2 Law: What are the boundaries of unlawful collusion?

State of Competition Policy



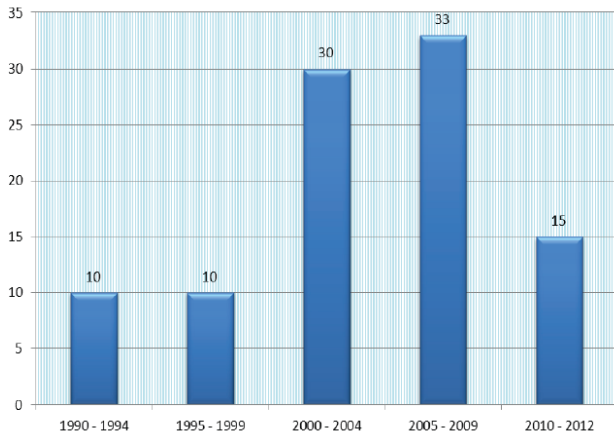
- 1 Recent developments in the fight against cartels
- 2 Critical analysis of leniency programs
- 3 New policy directions

State of Competition Policy

- A revolution in the European perspective on cartels in the last 20 years
 - Mario Monti, former European Commissioner for Competition (2000):
"Cartels are cancers on the open market economy."
 - Neelie Kroes, former European Commissioner for Competition (2009):
"I don't want to merely destabilize cartels. I want to tear the ground from under them."
- Wide-spread adoption of competition laws
- Increased enforcement
 - more resources, more cases
 - penalty formulas allow for higher fines

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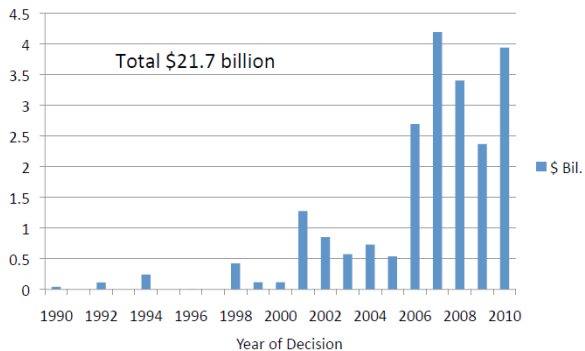
Cartel Cases Decided, European Commission, 1990-2012



State of Competition Policy

Deterrence

European Commission Fines Imposed, 1990-2010



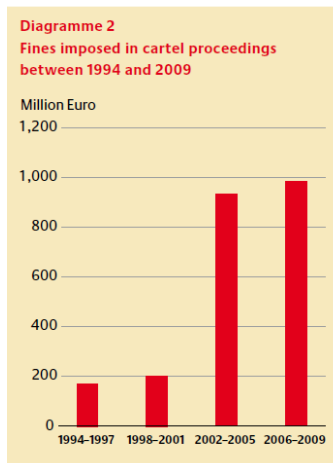
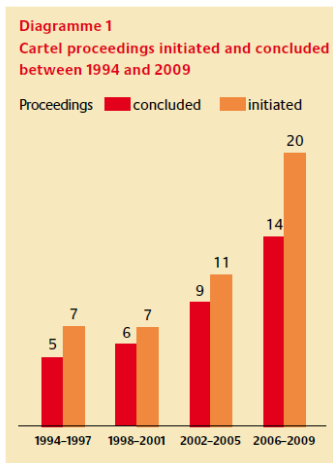
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State of Competition Policy

Cartel Cases and Fines, Bundeskartellamt, 1994-2009



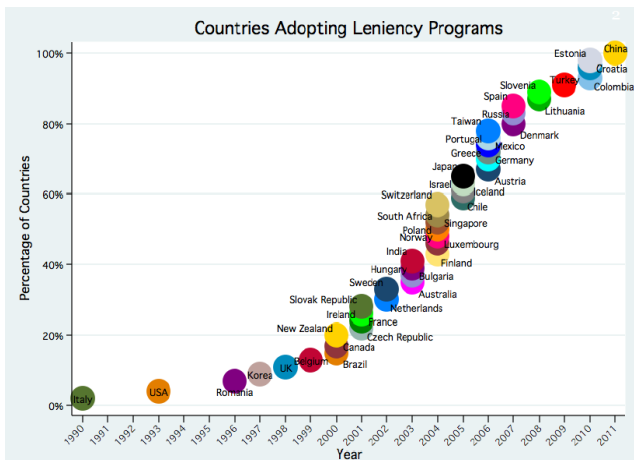
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Leniency Programs

- A *leniency program* offers reduced penalties to cartel members in exchange for cooperating with enforcement authorities.
- 1993: U.S. Dept of Justice revised corporate and individual leniency programs
- 1996: European Commission adopted leniency program
- More than 50 jurisdictions have leniency programs (Feb 2010)

State of Competition Policy

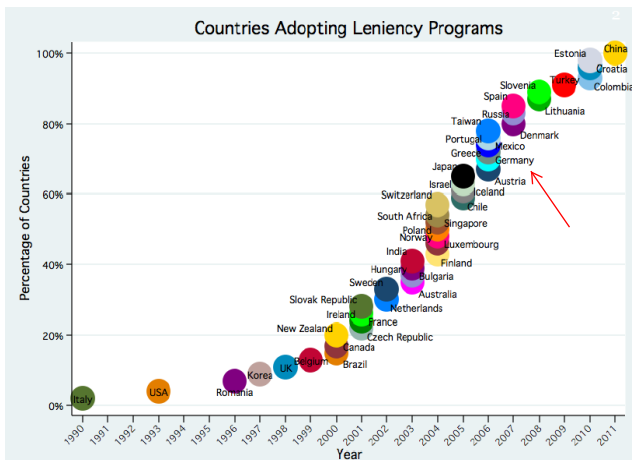
Leniency programs



Source: Borrell, Jiménez, and García (2012)

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Leniency programs



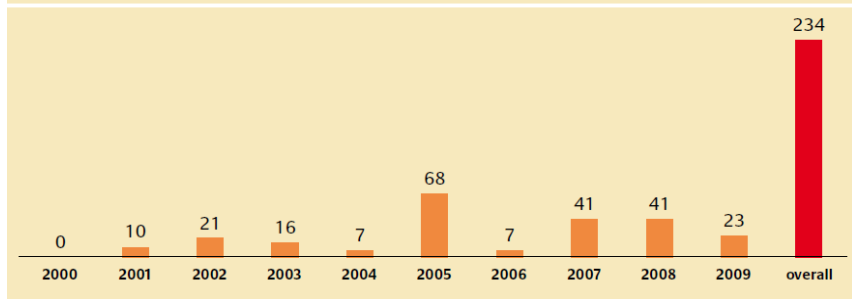
Source: Borrell, Jiménez, and García (2012)

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Leniency Programs

"Effective Cartel Prosecution: Benefits for the Economy and Consumers"
(Bundeskartellamt, 2010)

Diagramme 4
Number of leniency applications filed 2000–2009



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Leniency Programs

"Effective Cartel Prosecution: Benefits for the Economy and Consumers" (Bundeskartellamt, 2010):

The first version of the Leniency Programme was already a success. This can be seen by the number of leniency applications filed ... more than 230 leniency applications have already contributed to successfully uncover, end and punish cartel agreements.

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Leniency Programs



Luis Berenguer Fuster
Head, Comisión Nacional de la Competencia (Spain)

"The leniency program entered into force on Thursday, 28 February 2008. On Friday 22nd February, I received a phone call telling me that there were people queuing at the entrance of the CNC. I could hardly believe it."

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Leniency Programs

Are leniency programs reducing the frequency of cartels in an economy?

- Are they increasing the discovery of cartels?
- Are they aiding in prosecution?
- Are they enhancing penalties?
- Are they shutting down cartels?
- Are they deterring cartels from forming?

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Leniency Programs

Some concerns about leniency programs

- 1 Leniency applications are coming from dying cartels
 - EC official raised this concern at a conference in June 2006.
 - Leniency program may then be raising penalties but is it destabilizing cartels?
- 2 Leniency applications could be reducing non-lenieny enforcement.
 - EC economists raised this concern in a 2007 article: "DG Competition is now in many ways the victim of its own success; leniency applicants are flowing through the door of its Rue Joseph II offices, and as a result the small Cartel Directorate is overwhelmed with work."
 - Could the cartel rate go up because non-lenieny enforcement is sufficiently weakened?

State of Competition Policy

Leniency Programs

Harrington & Chang (*Journal of European Economic Association*, 2009; Working Paper, 2012)

- Heterogeneity across industries: industries differ in a parameter that affects cartel stability (e.g., firm demand elasticity)
 - Explains why cartels are more common in some industries.
- Heterogeneity in an industry across time: market conditions (e.g., demand) are iid.
 - Explains why cartels may collapse (irrespective of competition policy).

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Leniency Programs

- Cartel birth - If an industry enters the period not as a cartel then
 - with probability κ it has the opportunity to form a cartel which it does if market conditions are such that collusion is stable
 - with probability $1 - \kappa$ it remains a competitive industry
- Cartel death - If an industry is a cartel then it dies when
 - collusion is not stable (because of market conditions) or
 - detected, prosecuted and convicted by the competition authority (CA) either due to
 - the leniency program
 - an investigation without use of the leniency program

State of Competition Policy

Leniency Programs

- Non-leniency enforcement is the probability of detection/prosecution/conviction (without use of the leniency program)
 - probability of detection is exogenous
 - probability of prosecution is chosen by the CA in choosing its caseload (in order to minimize the cartel rate)
 - probability of conviction is decreasing in the CA's caseload (due to resource constraint)
- Steady-state equilibrium is characterized by
 - stationary distribution of cartels
 - non-leniency enforcement rate

State of Competition Policy

Leniency Programs

Concern #1: Many leniency applications are coming from dying cartels.

- In equilibrium, all leniency applications come from dying cartels.
 - When collusion is stable, firms do not want to apply for leniency in order to preserve a future collusive profit stream.
 - When collusion is unstable, firms race for leniency.
- Leniency program is still destabilizing cartels
 - In anticipation of a race for leniency upon cartel collapse, expected penalties are higher.
 - This makes collusion less profitable and widens the set of conditions whereby cartel collapse occurs.

Result: Even if all leniency applications come from dying cartels, a leniency program can still be destabilizing cartels.

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Leniency Programs

Concern #2: Leniency applications could reduce non-lenieny enforcement.

A leniency program could cause non-lenieny enforcement to be

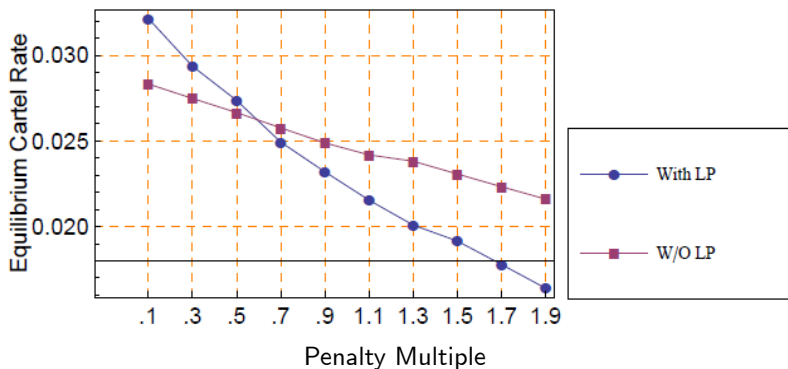
- *weaker* because there are fewer resources available to prosecute them.
- *stronger* if the leniency program deters cartel formation so there are fewer cartels and fewer non-lenieny cases to prosecute.

Result: A leniency program can weaken non-lenieny enforcement to the extent that the cartel rate is higher.

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Leniency Programs

Proportion of Industries that are Cartelized

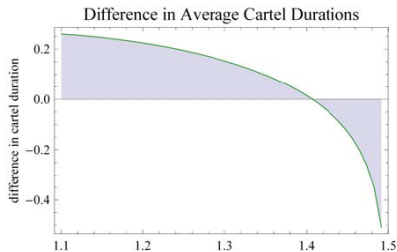


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Leniency Programs

A leniency program results in fewer cartels forming but those that form have longer duration \Rightarrow cartel rate to rise.

- Least stable cartels are deterred from forming because of a potential race for leniency.
- Most stable cartels have longer duration because non-lenieny enforcement is weaker.



Industry type (less stable cartels \rightarrow)

State of Competition Policy

Leniency Programs

A leniency program raises the cartel rate when

- leniency cases are still reasonably resource-intensive and
- penalties are low.

Takeaway: Budgetary resources and penalties are critical complements to a leniency program.

Takeaway: Importance of evaluating the impact of competition policy on the cartel rate.

State of Competition Policy

Policy Directions

- 1 Screening
- 2 Whistleblower rewards
- 3 Private damages
- 4 Criminalization

State of Competition Policy

Policy Directions: Screening

Screening is the use of market data to identify markets where collusion is suspected.

- Purpose of screening is to identify markets worthy of investigation.
- Screening has been performed with some success in Brazil, Mexico, The Netherlands, South Africa.
- Leniency programs and screening are complements:
 - *Screening enhances the efficacy of a leniency program*: The more likely a cartel member believes it'll be caught, the more apt it is to apply for amnesty.
 - *Leniency program enhances the efficacy of screening*: A cartel that is identified through screening may induce firms to apply for leniency.

State of Competition Policy

Policy Directions: Whistleblower Programs

Whistleblower program offers rewards to individuals who report a cartel but are not part of the cartel.

- Suspicions may come from industrial buyers or uninvolved employees of the colluding firms (e.g., sales representatives)
- Korea (2002, 2005) - rewards of up to 1 billion Korean Won (approx. 700,000€)
- UK OFT (2008) - rewards of up to £100,000
- Hungary (2010) - at least 1% of government fine to a maximum of 50 million forints (approx. 165,000€)
- U.S. Dept of Justice is wary because of the "threat to witness credibility."

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Policy Directions: Private Damages

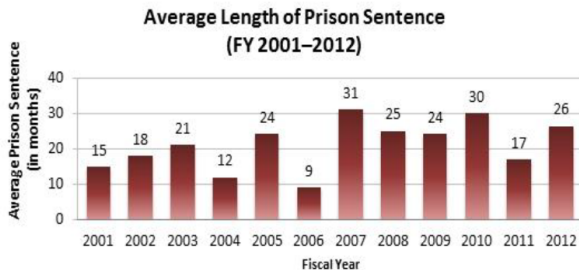
| | Damage Multiple | Indirect Purchaser Suits Allowed? | Focus |
|------|-----------------|--------------------------------------|--------------|
| U.S. | Treble* | No (except some states) | Penalization |
| EU | Single | Yes | Compensation |

State of Competition Policy

Policy Directions: Criminalization

U.S. Department of Justice, Antitrust Division

- 1998 - 2004: 44% of defendants were sentenced to jail.
- 2004 - 2010: 74% of defendants were sentenced to jail.
- LCD cartel - DOJ argued for a 10 year sentence for President and Executive Vice President of AU Optronics. Judge gave 3 years.



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Policy Directions: Criminalization

Over half of EU member states have criminalized certain cartel offenses.

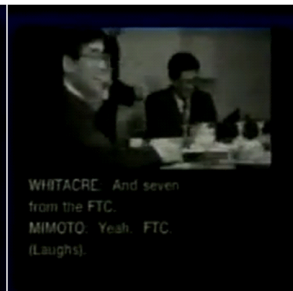
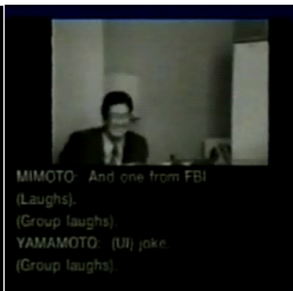
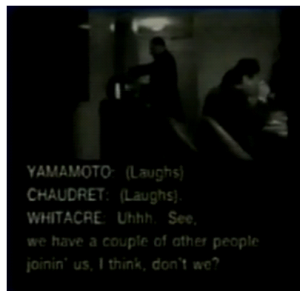
| Country | Maximum sentence (years) | Comment |
|-------------------|--------------------------|------------------|
| Brazil | 5 | |
| Denmark | 1.5 | |
| France | 4 | |
| Germany | 5 | bid rigging only |
| Ireland | 5 | |
| Israel | 5 | |
| Republic of Korea | 3 | |
| Japan | 3 | |
| Russia | 7 | |
| United States | 10 | routinely used |
| United Kingdom | 5 | marine hoses |

INTERMISSION

KARTELL SCHNITZER

Cartel Bloopers (Schnitzer)

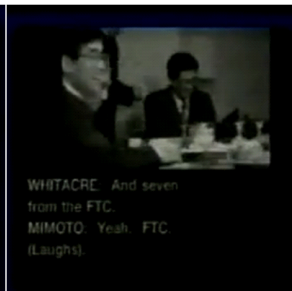
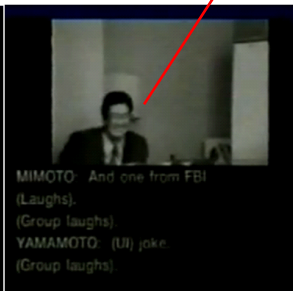
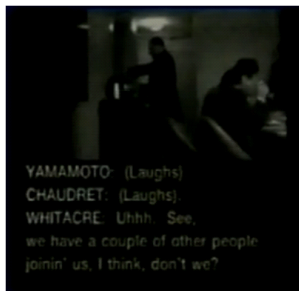
Meeting of the Lysine Cartel
January 18, 1995 - Atlanta, Georgia USA



Cartel Bloopers (Schnitzer)

Meeting of the Lysine Cartel
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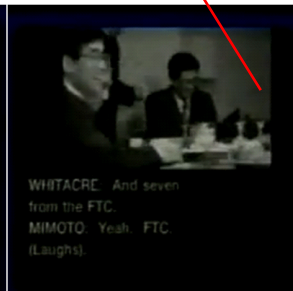
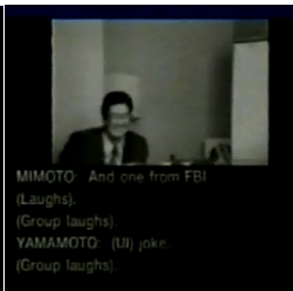
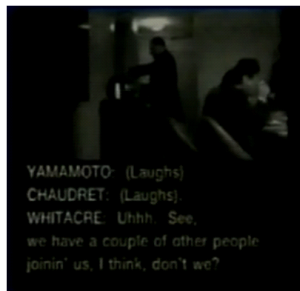
And one for
the FBI



Cartel Bloopers (Schnitzer)

Meeting of the Lysine Cartel
January 18, 1995 - Atlanta, Georgia USA

And seven for
the FTC



Cartel Bloopers (Schnitzer)

Hasbro (UK Office of Fair Trading, 2003)

- Toy manufacturer Hasbro organized a price-fixing agreement between retailers Argos and Littlewoods with respect to Hasbro's products.

Cartel Bloopers (Schnitzer)

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Cartel Bloopers (Schnitzer)

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- Email from Hasbro Sales Director Mike Brighty to Neil Wilson and Ian Thomson (19 May 2000):
-

'Ian ... This is a great initiative that you and Neil have instigated!!!!!!!!!!!! However, a word to the wise, never ever put anything in writing, its highly illegal and it could bite you right in the arse!!!! suggest you phone Lesley and tell her to trash? Talk to Dave. Mike'

Cartel Bloopers (Schnitzer)

Feb 1982: Phone call between Robert Crandall (CEO, American Airlines) and Howard Putnam (CEO, Braniff Airlines)



Cartel Bloopers (Schnitzer)

- **Crandall:** I think it's dumb as hell for Christ's sake, all right, to sit here and pound the **** out of each other and neither one of us making a ****ing dime.

Cartel Bloopers (Schnitzer)

- **Crandall:** I think it's dumb as hell for Christ's sake, all right, to sit here and pound the **** out of each other and neither one of us making a ****ing dime.
- **Putnam:** Do you have a suggestion for me?

Cartel Bloopers (Schnitzer)

- **Crandall:** I think it's dumb as hell for Christ's sake, all right, to sit here and pound the **** out of each other and neither one of us making a ****ing dime.
- **Putnam:** Do you have a suggestion for me?
- **Crandall:** Yes. I have a suggestion for you. Raise your goddamn fares twenty percent. I'll raise mine the next morning. You'll make more money and I will too.

Cartel Bloopers (Schnitzer)

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- **Putnam:** We can't talk about pricing.
- **Crandall:** Oh bull ****, Howard. We can talk about any goddamn thing we want to talk about.

Defining the Boundaries of Unlawful Collusion

FBI video tape of a meeting of the lysine cartel
March 1994 - Maui, Hawaii



Defining the Boundaries of Unlawful Collusion

Spectrum Auctions (Germany, 1999)

- German government auction of ten blocks of spectrum.
- Bidding rule: any bid must be at least 10% higher than the current high bid.
- Mannesman's initial bids:
 - Blocks 1-5: 20 million DM/megahertz
 - Blocks 6-10: 18.18 million DM/megahertz
- Why 18.18? Adding 10% to 18.18 is 20.
- Was Mannesman signaling to T-Mobil that each should win 5 blocks at 20 million?
- In the next round, T-Mobil bid 20 million on blocks 6-10. There were no subsequent bids.

Defining the Boundaries of Unlawful Collusion

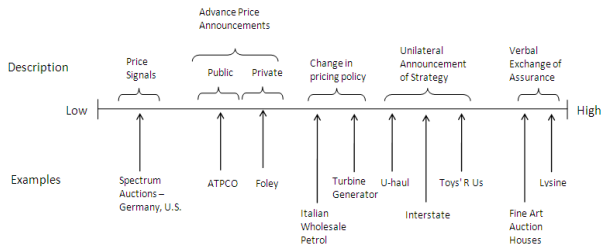
Spectrum Auctions (Germany, 1999)

- This is tacit collusion and it is lawful.
- If Mannesman and T-Mobile had spoken to each other and exchanged assurances that each would buy 5 blocks for 20M then that is explicit collusion and is unlawful.
- Welfare effects are the same.

Defining the Boundaries of Unlawful Collusion

The more direct is a method of communication,

- the more effective it is at producing coordination
- the more likely it is to result in prosecution.



- Most of these collusive practices are
 - untouched by recent advances including leniency programs
 - likely to be increasingly deployed given that enforcement against explicit collusion has become more effective

Defining the Boundaries of Unlawful Collusion

Overview

- 1 Current definition of "unlawful collusion"
- 2 Critique of current legal practice
- 3 Developing a socially optimal definition of unlawful collusion

Defining the Boundaries of Unlawful Collusion

Existing Law: Definition

- Section 1 of the Sherman Act (U.S., 1890): “Every contract, combination, ... or conspiracy in restraint of trade ... is declared to be illegal.”
 - U.S. Supreme Court has developed the doctrine that an *agreement* to restrain trade is unlawful.
- Article 101 (1) TFEU (EU, 1999) - “incompatible with the common market [are] all agreements between undertakings ... which have as their object or effect the prevention, restriction or distortion of competition.”

Defining the Boundaries of Unlawful Collusion

Existing Law: Definition

- U.S. Supreme Court has defined an agreement as or as requiring
 - a "unity of purpose or a common design and understanding, or a meeting of minds" (*American Tobacco Co. v. United States*, 1946)
 - "mutual consent" (*Esco Corp. v. United States*, 1965)
 - "a conscious commitment to a common scheme designed to achieve an unlawful objective" (*Monsanto Co. v. Spray-Rite Serv. Corp.*, 1984)
- EU General Court has defined an agreement as or as requiring
 - "joint intention" (*ACF Chemiefarma*, 1970)
 - "concurrence of wills" (*Bayer v. Commission*, 2000)
- Unlawful collusion is "mutual understanding to suppress competition."

Defining the Boundaries of Unlawful Collusion

Existing Law: Disagreement

Survey of Legal Scholars: June 2012

Question: Is the verbal exchange of assurances between firms evidence of an agreement or is it, in and of itself, an agreement?

- George Hay (Cornell University, School of Law): *I think that the plaintiff in your case would say simply that the exchange constitutes an agreement.*
- Keith Hylton (Boston University, School of Law): *A verbal exchange of assurances would constitute an agreement, and not merely acts that facilitate an agreement.*

Defining the Boundaries of Unlawful Collusion

Existing Law: Disagreement

Question: Is the verbal exchange of assurances between firms evidence of an agreement or is, in and of itself, an agreement?

- William Page (U. of Florida, School of Law): *That is definitely an agreement, if by "exchange of assurances" you mean an exchange of conditional promises about future prices. That's close to the common law definition of a contract.*
- William Kovacic (George Washington University, School of Law; former Chairman, Federal Trade Commission): *The bell of agreement rings at the moment [assurances] have been exchanged (either by words or conduct). This idea borrows heavily, it seems, from ideas developed in contract law.*

Defining the Boundaries of Unlawful Collusion

Existing Law: Disagreement

Question: Is the verbal exchange of assurances between firms evidence of an agreement or is, in and of itself, an agreement?

- Jonathan Baker (American University, School of Law): *I will assume that the firms have in mind the same terms of coordination when they assure each other that they will implement those terms. Under such circumstances, the exchange of assurances is evidence of an agreement.*
- Gregory Werden (U.S. Department of Justice, Antitrust Division): *The exchange of spoken assurances is very strong evidence of the agreement. It is always possible for either or both parties to say that they did not mean what they said in the exchange, and if the court can be convinced of that, there was no agreement.*

Defining the Boundaries of Unlawful Collusion

Existing Law: Disagreement

Question: Is the verbal exchange of assurances between firms evidence of an agreement or is, in and of itself, an agreement?

Louis Kaplow (Harvard School of Law):
I've wrestled with precisely your question endlessly. I'm firmly of the view that (A) all courts and commentators would deem a verbal exchange of assurances as an agreement, (B) but they have no consistent definition of agreement and probably couldn't explain why they believe (A).



Defining the Boundaries of Unlawful Collusion

Existing Law: Confusion

Scholars are of mixed views because the U.S. judicial system is confused.

- U.S. Supreme Court: Communication devoid of mutual understanding can be an agreement.
 - The Court views an express exchange of assurances to raise price as an agreement even if subsequent behavior is inconsistent with the presence of mutual understanding.
- U.S. Supreme Court: Mutual understanding devoid of communication is not an agreement
 - Conscious parallelism is lawful (it is even a defense), while recognized by the Court as the same as unlawful collusion in terms of effect.
 - Collusion through *mamihlapinatapai* (from the Yaghan language of Tierra del Fuego): "It is that look shared between two people that reflects unspoken understanding."

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

Currently, two competing definitions of an agreement.

- Subjective Definition: An agreement is *mutual understanding* to restrain trade.
- Objective Definition: An agreement is *communication* with the intent to restrain trade.

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

Evaluating consistency with evidentiary standards in some cases.

- Typical evidence
 - Documented communication that is insufficient to establish there was an agreement (e.g., one firm announced at a private meeting that it will increase price)
 - Coordinated market behavior (e.g., all firms raised price around the same time)
 - Combined evidence can be sufficient to establish there was an agreement.
- Under a communication-based definition of agreement, this evidence does not fit well.
 - It sheds no light on the properties of communication (what was said) but rather only on the implications of the communication.
 - Market behavior is typically irrelevant to establishing whether or not there was communication with the intent to restrain trade.

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

These evidentiary standards fit well within a mutual understanding-based definition of agreement.

Practices that coordinate ⇒ **Mutual Understanding** ⇒ *Market behavior that suppresses competition*

- Ex ante behavior that facilitates mutual understanding
 - Example: announcement to raise price
- Ex post behavior that is the result of mutual understanding
 - Example: parallel price increases

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

Another weakness of a communication-based definition of agreement

- Consider managers of two firms communicating with each other using a technology for which a message is received and understood with probability p .
- Manager of firm 1's message: "Let's both raise our prices by 10%."
- If received, manager of firm 2's message: "Agreed."
- With probability p^2 , both messages are sent and received.

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

- Definition requires there to be a threshold value p^* such that $p \geq p^*$ (talking on the phone?) is an "agreement" and $p < p^*$ (price signals?) is not an agreement.
- It imposes a binary partition to what is more naturally a continuum of communication practices that differ in terms of their efficacy.
- Verbal exchange of assurances should be treated as a highly effective means of *reaching* an agreement.
- It should be prohibited as a facilitating practice, not as an agreement.

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

Pricebot Conundrum

- A *pricebot* is an automated price-setting algorithm intended to maximize profit.
- Suppose two competitors independently deploy a pricebot to set prices.
- The output of a pricebot is unpredictable to managers.
- Unbeknownst to managers, pricebots have adapted to collusive pricing rules and generate high profits.

Defining the Boundaries of Unlawful Collusion

Existing Law: Objective vs. Subjective Definitions

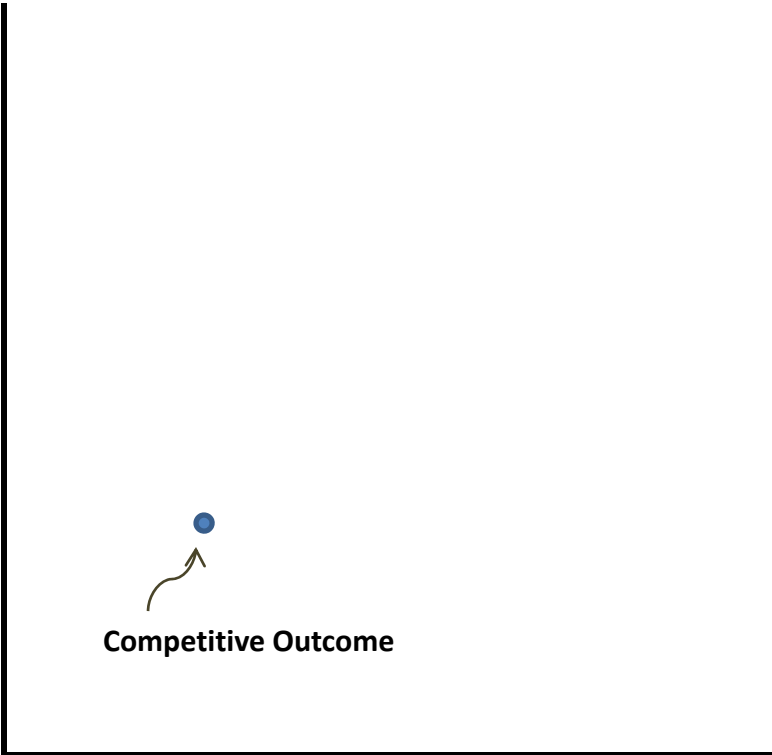
- Is the outcome supracompetitive? Yes
- Can economists determine there is (economic) collusion? Yes
- Is it unlawful collusion? No
 - Objective: No communication
 - Subjective: No mutual understanding
 - Managers do not know how price was set.
 - Software programs do not "understand" (see philosopher John Searle's Chinese room argument)

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

- If individual firm profit maximization and equilibrium implied a unique outcome then either society
 - would have to be satisfied with the outcome or
 - would need to regulate.
- The basis for laws prohibiting collusion is the existence of multiple equilibria that differ in terms of social welfare.
 - Static Nash equilibrium: price \geq perfectly competitive price
 - Dynamic (repeated game) equilibria: price $>$ static NE price
 - Higher prices are sustained by the threat of a punishment if a firm sets a lower price.
- Competition law is intended to keep firms away from equilibria with lower welfare.
- How do we define the law in order to achieve that goal?

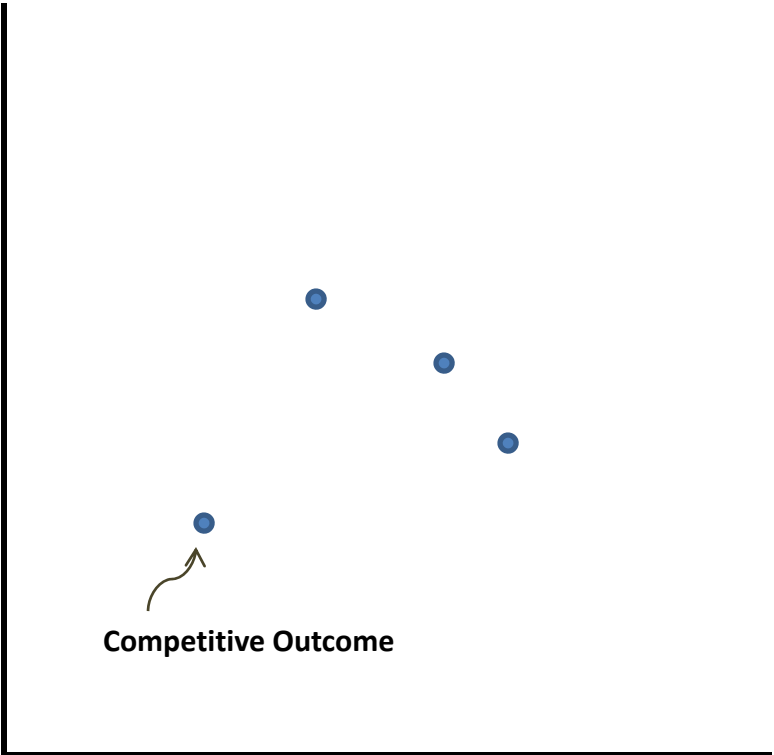
Price of firm 2



Competitive Outcome

Price of firm 1

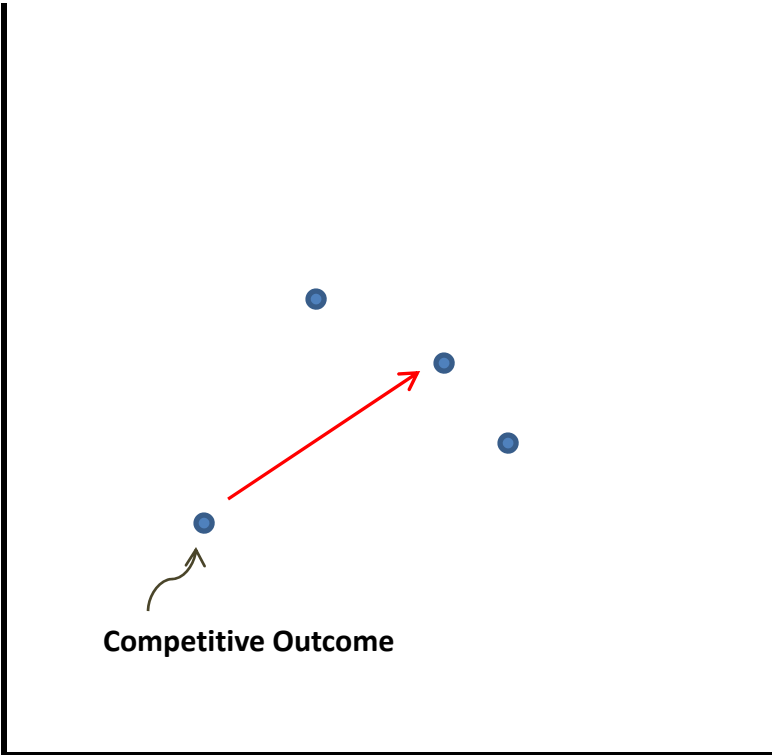
Price of firm 2



Competitive Outcome

Price of firm 1

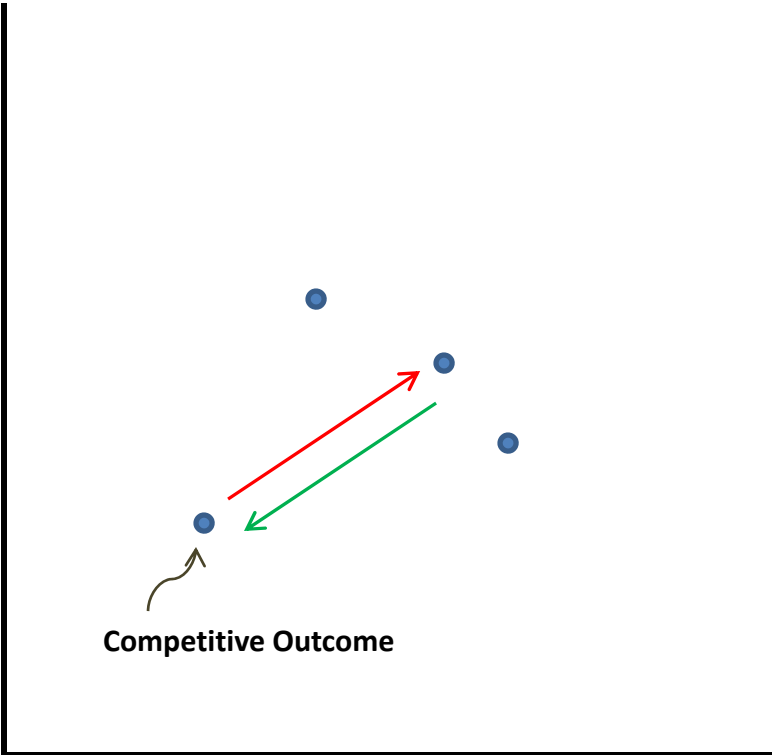
Price of firm 2



Competitive Outcome

Price of firm 1

Price of firm 2



Competitive Outcome

Price of firm 1

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Proposed desiderata for a law prohibiting collusion.

- 1 It is *beneficial* in that, if properly implemented, the law raises welfare.
- 2 It is *implementable* in that it is reasonable to expect
 - firms to know when they are violating the law (predictability, not remedy, is what matters).
 - the government to know when the law has been violated.
- 3 It is *equilibrium-consistent* in that there exists an equilibrium in which behavior is lawful.

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Candidates:

- 1 Outcomes
- 2 Strategy profiles (or equilibria)
- 3 Change in strategy profiles (or equilibria)

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Can an outcome be unlawful?

Proposal: It is unlawful to set excessive prices.

- It is not implementable: How is a firm to know when its price is excessive?

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Can a strategy profile (or equilibrium) be unlawful?

- Canonical collusive strategy profile:
 - A firm prices at \hat{p} ($>$ static NE price) if all firms have priced at \hat{p} in the past.
 - Otherwise, a firm prices at the static NE price.
- A supracompetitive price is individually rational by the threat that the future path will be punitive.
- U.S. Supreme Court
 - An unlawful agreement is "a conscious commitment to a common scheme designed to achieve an unlawful objective"
 - This sounds like a collusive equilibrium
 - At the same time, the Court has said there must be evidence of communication.

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Proposal: It is unlawful for firms to use the threat of a future punitive response to influence current prices.

- Takes care of the pricebot conundrum.
- Has parallels to the legal interpretation of predation
 - Predation: It is unlawful to threaten future aggressive pricing if a rival firm does not exit.
 - Collusion: It is unlawful to threaten future aggressive pricing if a rival firm does not set a high price.
 - The threat could be to act in a lawful manner (static NE).

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Is it implementable?

- Will firms know when they are violating the law?
 - Is the threat of punitive response (punishment) always "conscious"?
- Are economic methods up to determining whether observed behavior is the product of such a strategy?
 - Punitive response may never be observed.
 - Even if observed, difficult to control for demand and cost factors.

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Is it equilibrium-consistent? Is there always an equilibrium for which behavior is lawful?

- Consider a price game with homogeneous goods and a constant marginal cost (MC).
- Assume firms simultaneously choose price and there is a fixed cost.
 - Static NE is $\text{price} = \text{MC} < \text{AC}$.
 - Only equilibria may involve $\text{price} > \text{MC}$ which is sustained by a punitive threat.

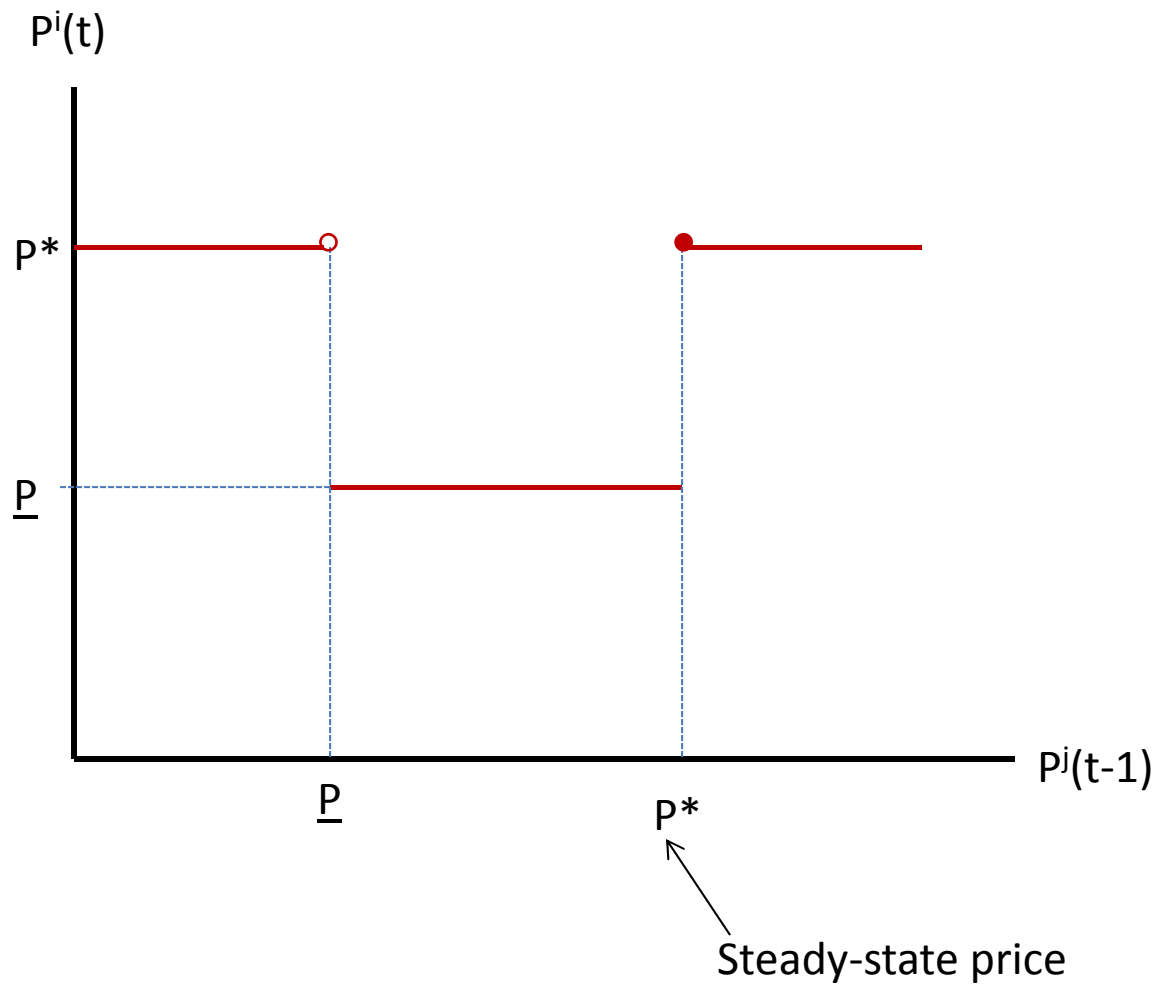
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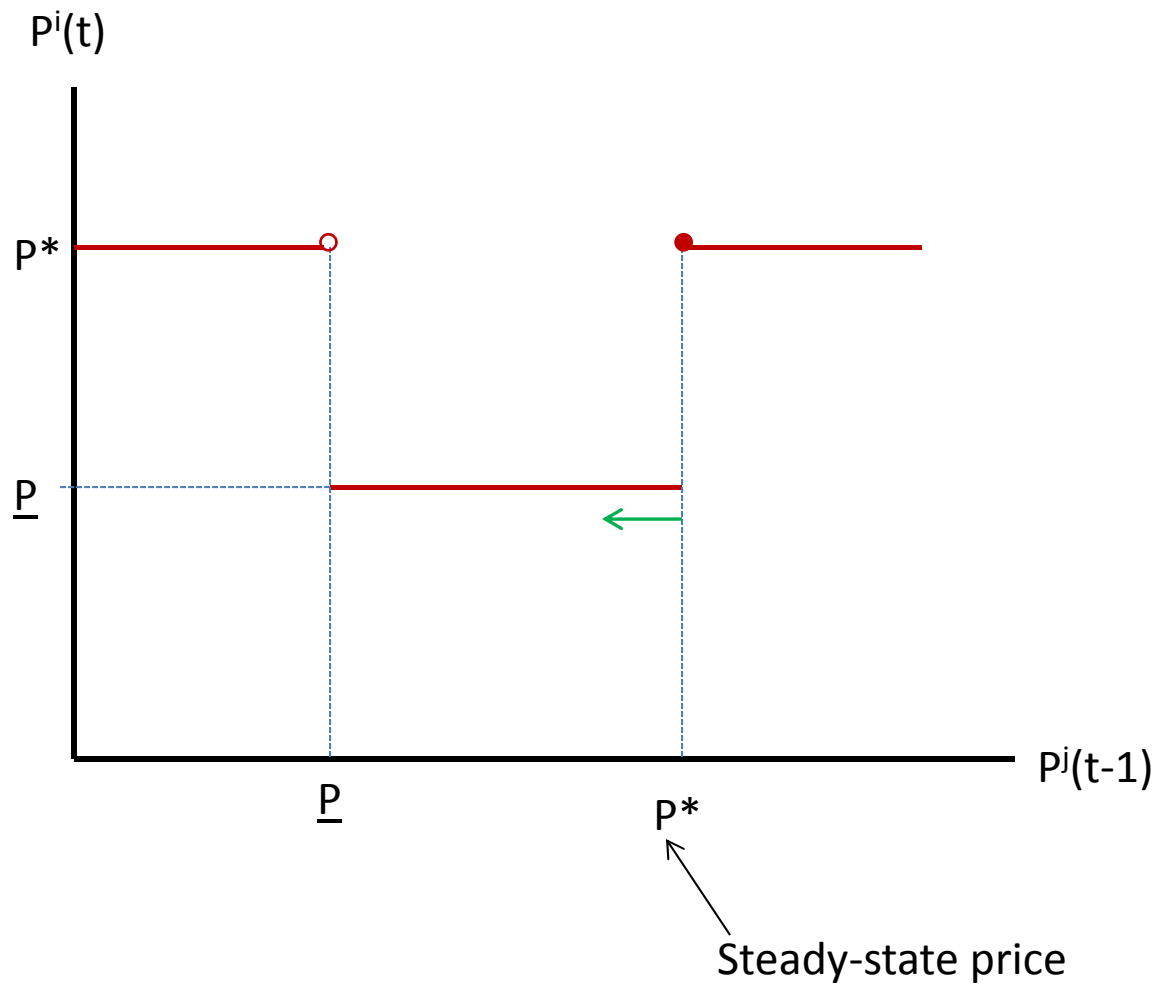
Game-Theoretic Framework

Is it equilibrium-consistent? Is there always an equilibrium for which behavior is lawful?

- Consider a price game with homogeneous goods and a constant marginal cost (MC).
- Assume firms alternate in choosing price (Maskin and Tirole, 1988)
 - For equilibria with stationary outcomes, the only Markov Perfect Equilibrium characterized is of the form:

$$R(p) = \begin{cases} p^* & \text{if } p \leq \underline{p} \text{ and } p \geq p^* \\ \underline{p} & \text{if } p \in (\underline{p}, p^*) \end{cases}$$





Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

Can a movement to a strategy profile (or equilibrium) be unlawful?

- Proposal: It is unlawful for firms to change the strategy profile to one that results in less competitive outcomes.
- Movement between equilibria is well-defined "coordinated behavior."
 - All equilibria involve unilaterally optimal behavior so it is not sensible to say that a dynamic equilibrium is "coordinated" and a static equilibrium is not.
- It seems implementable
 - Firms are consciously engaging in an unlawful act.
 - They know there is another equilibrium with lower prices.
- It is equilibrium-consistent as every equilibrium is lawful.

Defining the Boundaries of Unlawful Collusion

Game-Theoretic Framework

- Logical conundrum: Is it well-defined for a firm to "change its strategy"?
- Having always priced at the competitive level up through period $t-1$, behavior is consistent with
 - a strategy that has its price at the competitive level in period t
 - a strategy that has its price at the monopoly level starting in period t
- Induction argues for the competitive price in period t .
- But why not the monopoly price? (Goodman's Paradox)
- "The procedure of induction consists in accepting as true the simplest law that can be reconciled with our experience." L. Wittgenstein, *Tractatus Logico Philosophicus* (1922)

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- Critical stages of enforcement: 1) Discovery; 2) Prosecution; 3) Penalization; and 4) Evaluation
- There has not been comparable progress in tackling non-explicit forms of collusion
 - Tacit collusion is likely to increase in importance in the EU because of the crackdown on explicit collusion.
 - Need to develop a logically consistent and practical definition of "unlawful collusion"