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***To protect in order to Serve, adverse effects of  
leniency programs in view of industry asymmetry***

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# ***Motivation for the paper***

- Definition: "Leniency programs (LP)" grant total or partial immunity from fines to firms that collaborate with the authorities.
- Empirical evidence: LPs improve welfare by increasing the number of detected cartels and by shortening the investigation.
- Question of optimal design of LPs
- How LPs work if there are asymmetries between the firms?
- Is protection of leniency applicants necessary?

# *Outline of the presentation*

- Motivation
- Review of related literature and main innovations
- Structure of the two-stage game
- Solution of the game and derivation of SPNE
- Legal and economic implications of the analysis
- Conclusions and policy implications

# ***Motivation and policy implications***

- Possible **counterproductive effects of LPs**, when LPs are not properly designed

Moderate LPs may greatly facilitate the enforcement of long term cartel agreements (Spagnolo (2004), Ellis and Wilson (2003)).

When procedure of application for leniency is not confidential leniency may increase duration of cartel agreements, when penalties and rate of law enforcement are low (Motchenkova (2004)).

- Problem of **optimal design of LPs**

1. Lenient or strict LPs ?
2. Whether the procedure of application for leniency should be confidential or open?
3. Timing of application for leniency.
4. Different treatment for the first and second reporter.

- Current paper: issue of **protection of leniency applicants**

## ***Real Business Examples of Retaliation and Predatory Pricing***

- ***Health insurance sector in Netherlands*** during the period of privatization of health care insurance market.
- An illustration of coercion through the threat of retaliation can be found in the ***leniency application of British Petrol (BP) in the Bitumen Cartel***. During its existence the colluders managed to increase trust between its members through the design of a collective punishment strategy.
- Recent ***price wars in the Dutch food retailers market***

## ***Review of related literature***

- ***Motta and Polo (2003)***: Investigate the effects of LPs on the incentives of the firms to collude.
- ***Spagnolo (2004)***: Concludes that only courageous LPs may completely and costless deter cartels. Mentions possible counterproductive effects of LPs.
- ***Ellis and Wilson (2001) and Buccorossi and Spagnolo (2001)***: counterproductive effects of leniency programs
- ***Bain (1949), Milgrom and Roberts (1984)***: predatory pricing and limit pricing
- ***Scherer (1980)***: predatory pricing (the “long purse” story)

## ***Main innovations and policy implications***

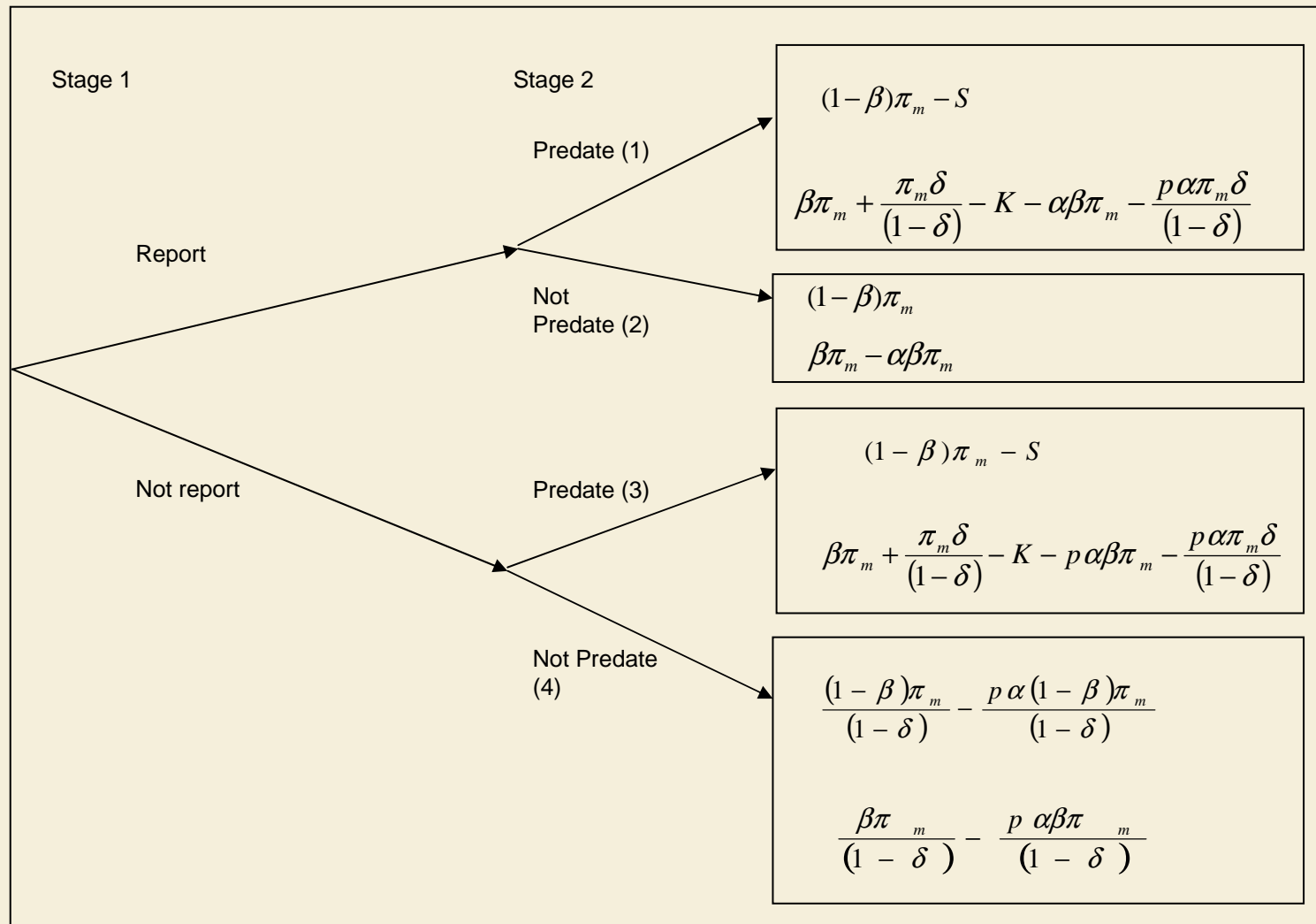
- Ideally, properly designed LPs should induce firms to self-report (see Motta and Polo (2003) or Spagnolo (2004)); however, in this paper we show that, taking into account threat of retaliation (e.g. through predatory pricing), this expected effect of LPs may be reduced.
- That's why the protection of leniency applicants from this kind of abuses by other members of cartel could be a good supplement to current leniency programs. This is the main message of the paper.

# *Timing of the game*

- The game starts with the assumption that collusion can be sustained in equilibrium (i.e. the discount factor is large enough to sustain collusion). Hence, with this model we can only study the impact of LPs on the incentives of the firms to report in the cartels that have already been formed.
- Stage 0: Antitrust authority announces parameters of the penalty scheme,  $p$  and  $F = \alpha\pi$ , and parameters of the leniency program (assume, US system).
- Stage 1: The small firm moves. It can choose between two actions: self-report or keep cartel secret (once and for all decision)
- Stage 2: The big firm responds to the action of the small by choosing whether to punish the small firm (through predatory pricing) for reporting the cartel or to abstain from punishment (once and for all decision)



# Structure of the two-stage game



## ***Solution of the game (Stage 2)***

1. Determination of threshold for collusion to be preferred strategy before leniency program is introduced

→ by comparing outcomes (3) and (4)

If (3) > (4), then predatory pricing is more attractive than collusion for the bigger firm in both situations (with or without the availability of a leniency program). This happens when the discount factor is greater than the following threshold:

$$\delta > \frac{K}{K + \pi_m(1-\beta)(1-p\alpha)} = \delta^{**}(K, p, \alpha).$$

Comparative static of the behavior of  $\delta^{**}(K, p, \alpha)$  with respect to the main parameters of the model shows that

$$\frac{\partial \delta^{**}(K, p, \alpha)}{\partial K} > 0 \text{ if } p\alpha < 1 \text{ or } \frac{\partial \delta^{**}(K, p, \alpha)}{\partial K} < 0 \text{ if } p\alpha > 1, \frac{\partial \delta^{**}(K, p, \alpha)}{\partial p} > 0, \frac{\partial \delta^{**}(K, p, \alpha)}{\partial \alpha} > 0.$$

## ***Solution of the game (Stage 2)***

2. Next, in order to ensure consistent behavior (meaning that collusion is sustainable and there are no incentives to predate in the absence of the possibility of self-reporting) we will consider only interval  $\delta_c < \delta < \delta^{**}$ , so that outcome (3) is ruled out and collusion is sustainable before the revelation game starts.
3. Determination of threshold for competitive pricing to be preferred over predatory pricing for bigger firm after application for leniency ((2)>(1)): 
$$\delta < \frac{K}{K + \pi_m(1 - p\alpha)} = \delta^*(K, p, \alpha).$$

Comparative statics:  $\frac{\partial \delta^*(K, p, \alpha)}{\partial K} > 0$  if  $p\alpha < 1$

This implies that when  $p\alpha < 1$  (i.e. expected penalty is low) the equilibrium (2) is less likely to occur the smaller the size of  $K$  (i.e. the higher the asymmetry).

Recall that  $K$  is the size of the buffer of Small, since it equals the cost of e.g. driving the smaller firm out of the market.

## *Intuition*

This implies that when  $\rho\alpha < 1$  (i.e. expected penalty is low) the equilibrium (2) is less likely to occur the smaller the size of  $K$ . Recall that  $K$  is the size of the buffer of Small, since it equals the cost of e.g. driving the smaller firm out of the market. After Small loses its buffer it can't sustain the losses associated with the predatory price setting. Intuitively this means that the greater the size difference (asymmetry), the lower  $K$  and therefore threshold  $\delta\{*\}$  will be lower when asymmetry is greater. It also implies that raising the risk of being fined will increase  $\delta\{*\}$ . Intuitively it means that the smaller the asymmetry and the higher the chance of a capture and substantial fine, the more likely the perceived discount rate is below the threshold  $\delta\{*\}$ .

## ***Solution of the game (Stage 1)***

4. Next, we consider the decision of the smaller firm in the first stage given no predatory pricing is chosen by Big in the second stage of the game. (2) is preferred over (4) by Small (i.e. self-reporting is more attractive for Small) when the discount factor is lower than the following threshold:

$$\delta < p\alpha = \delta^{***}(K, p, \alpha).$$

This is a clear indication that raising the rate of capture and the proportional fine will make the smaller firm to choose equilibrium (2) over (4), and small will therefore decide to self-report instead of continuing to collude.

## Solution of the game (Stage 1)

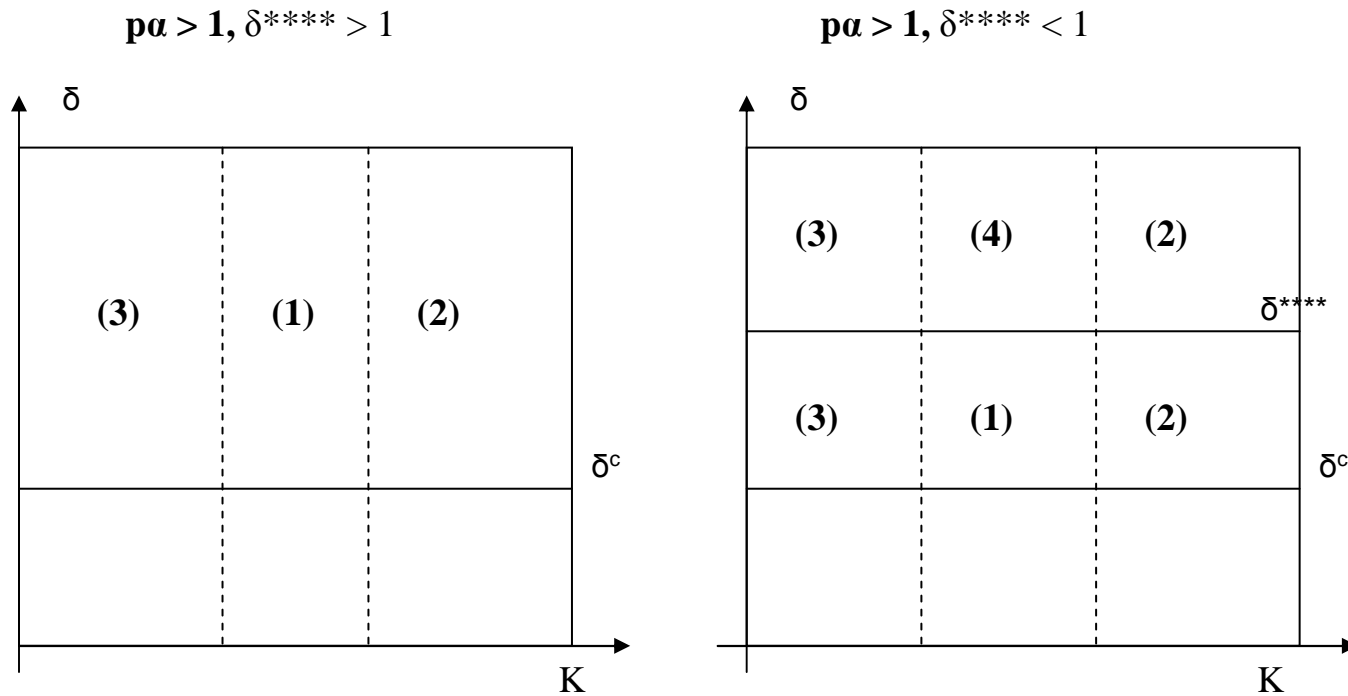
- Finally, we also have to compare the payoffs for Small in case outcome (1) arises and in case outcome (4) arises. Equilibrium (1) in the model is the situation in which strategies (report, predate) are employed by the smaller firm and the bigger firm respectively. Equilibrium (4) is collusive equilibrium. The payoff of equilibrium (4) is higher than the payoff in equilibrium (1) for Small (i.e. collusion is more attractive for the small firm) if discount factor is higher than the following threshold:

$$\delta > \frac{(1-\beta)\pi_m p \alpha - S}{(1-\beta)\pi_m - S} = \delta^{****}(K, S, p, \alpha).$$

$$\begin{aligned} \delta^{****} > \delta^{***} & \text{ when } \begin{cases} \frac{p\alpha > 1}{(1-\beta)\pi_m > S} \\ \text{or when } \begin{cases} \frac{p\alpha < 1}{(1-\beta)\pi_m < S} \end{cases} \end{cases} \text{ . In this case we have also that } \delta^{****} > 1. \\ \delta^{****} < \delta^{***} & \text{ when } \begin{cases} \frac{p\alpha > 1}{(1-\beta)\pi_m < S} \\ \text{or when } \begin{cases} \frac{p\alpha < 1}{(1-\beta)\pi_m > S} \end{cases} \end{cases} \text{ . In this case we have also that } \delta^{****} < 1. \end{aligned}$$

# Graphical illustration

(Incentive compatibility constraints and equilibrium outcomes when  $p\alpha > 1$ )



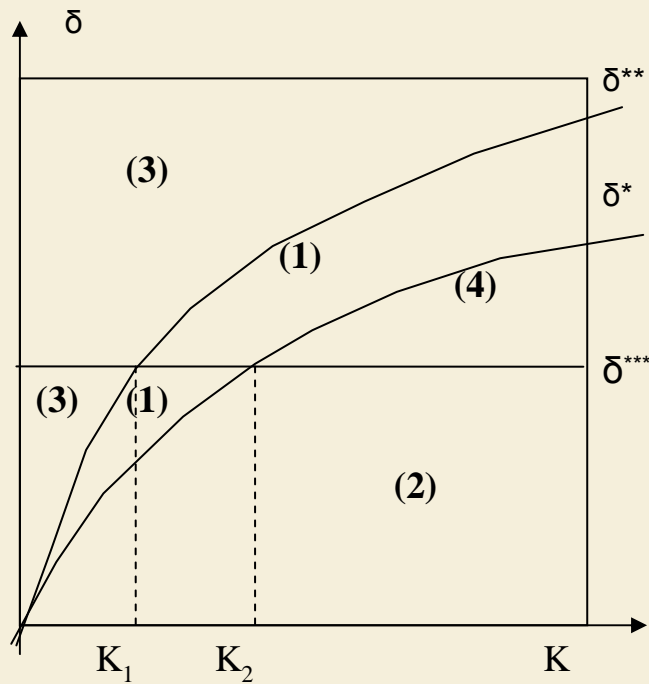
## Equilibrium outcomes when $p\alpha > 1$

Even when penalties are high enough to block the cartel formation, (i.e.  $p\alpha > 1$ ) there could be adverse effects of leniency programs on the incentives to the firms to break the cartel. There could be a threat of retaliation and of even stronger collusion in the industries with an intermediate level of asymmetry. This implies that, in this kind of industries, a strong

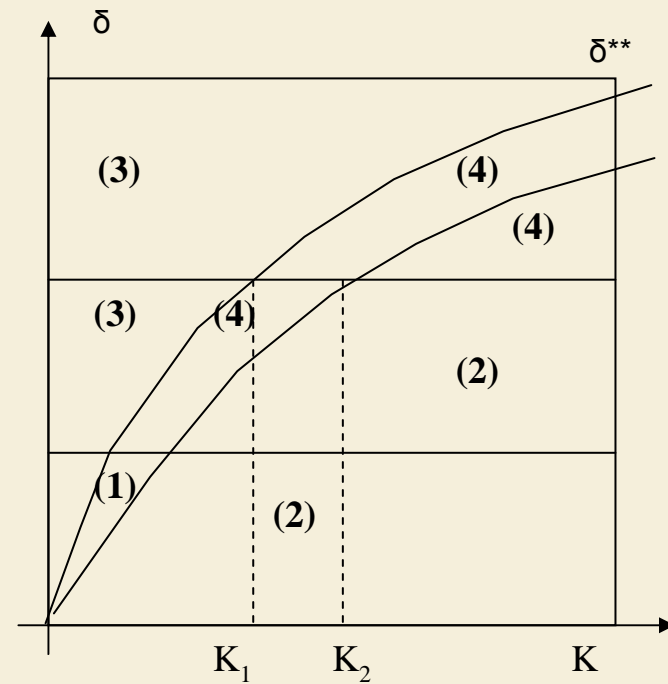
# Graphical illustration

(Incentive compatibility constraints and equilibrium outcomes when  $p\alpha < 1$ )

$p\alpha < 1, \delta^{****} > 1$



$p\alpha < 1, \delta^{****} < 1$



Equilibrium outcomes when  $p\alpha < 1$



## ***Proposition 1 (derived from above figure)***

- When traditional antitrust enforcement is weak. ( $p\alpha < 1$ ):
  - ◆ (1) In industries with little asymmetry ( $K$  is high) and low discount rate the ***first best outcome with self-reporting and competitive pricing*** afterwards (***equilibrium (2)***) can be achieved.
  - ◆ (2) In industries characterized by a high discount rate ( $\delta > \delta^{**}$ ) ***predatory pricing is always the most attractive strategy*** for any type of firm (regardless of asymmetry). ***Outcome (3)*** arises in equilibrium.
  - ◆ (3) In industries with low sunk costs, high asymmetry, and a low discount rate there is a ***threat of retaliation*** on the self-reporting firm. ***Outcome (1)*** with self-reporting and predatory pricing arises in equilibrium. In industries with high sunk costs the threat of retaliation is much stronger than in industries with low sunk costs. Outcome (1) can arise for a wider range of combinations of  $K$  and  $\delta$ .
  - ◆ (4). In industries with low sunk costs, little asymmetry ( $K$  is high), and a high discount rate ***collusion (equilibrium (4)) is sustainable even after leniency programs are introduced.***

# *Optimal enforcement*

- **$p\alpha > 1$**

- ◆ Even when penalties are high enough to block the cartel formation (i.e.  $p\alpha > 1$ ), there could be adverse effects of leniency programs on the incentives to the firms to break the cartel. There exists a threat of retaliation and of even stronger collusion in the industries with an intermediate level of asymmetry. This implies that, in this kind of industries, a strong emphasis on the protection of leniency applicants needs to be put and particular attention should be paid to industries where sunk costs are high.

- **$p\alpha < 1$**  (currently generally the case for European Countries)

- ◆ The outcome depend on the environment in terms of industry characteristics (degree of asymmetry, sunk costs, discount factors).

# ***Conclusions and policy implications***

## **Main innovations:**

- a) Consider ***asymmetries*** between firms.  
Modeling asymmetries
- b) Take into account ***possibility of retaliation*** on leniency applicants by former partners in crime (through e.g. predatory pricing)
- c) Paper points out necessity of
  - a) ***protection of leniency applicants*** and
  - b) possible ***customization of leniency programs*** depending on industry characteristics.

# ***Conclusions and policy implications***

- Main implications of the analysis:
  - ◆ When the antitrust authority is unable to remove the credibility of retaliation, the bigger firm has the option to employ a punishment strategy on the self-reporting party.
  - ◆ In industries characterized by barriers to entry (such as sunk cost) and a certain degree of asymmetry the program is ineffective and may give rise to increased cartel strength or cause exit of weaker rivals due to retaliation by stronger firms (especially when traditional antitrust enforcement is weak).

# ***Policy Implications***

- What can and should be improved:
  - ◆ Set ***higher fines*** in order to remove a bigger part of the illegal gains.
  - ◆ Putting ***more emphasis on aggravating circumstances***, such as coercion, in the fining guidelines can also be an effective approach.
  - ◆ Another regulatory measure is to ***introduce the promise to "protect" the reporting party*** after reporting in the leniency application.
  - ◆ All these measures should be implemented ***in combination with traditional*** means of antitrust enforcement.