Comments by Rafael Repullo on

Post-Cartel Price Persistence Disentangling Inertia from Expected Legal Costs

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33rd Finance Forum

Universidad de Alicante, 10 July 2026

Research question

- What is the effect on market prices of an antitrust cartel breakdown?
  - → Do post-cartel prices revert to the pre-cartel prices?
  - → What is the effect of the way in which antitrust authorities assess damages?
- Key reference: Harrington (2004): “Post-Cartel Pricing During Litigation”
  - → Use of post-cartel prices in the assessment of damages creates a strategic incentive for firms to keep prices high

Institutional setting

- Spanish automobile cartel during the period 2006-2013

  → 21 manufactures exchanged information that raised car prices

  → Cartel was uncovered by SEAT’s whistleblowing in 2013

  → SEAT avoided the fines imposed on other cartel members in 2015

Empirical strategy

- Build database matching identical automobile models sold in Spain and Germany

  → Sample period 1998-2019 (including pre-cartel, cartel, and post-cartel prices)

  → Net out all taxes, so differences in taxation do not distort the results

- Estimated equations

  → Model 1: DiD of the average Spain-Germany price gap

  → Model 2: DiD of year-by-year price gap

Main results

- Cartel participation significantly increased prices (by about 17%)

  → Post-cartel prices indicate incomplete reversion toward pre-cartel prices

  → How can one explain this result?

- Two hypotheses

  → Shift from explicit to tacit collusion

  → Harrington’s legal cost channel

- Use post-cartel differential pricing of whistleblower and other cartel members

  → Before antitrust decision (2013-2015): price inertia (or tacit collusion?)

  → After antitrust decision (2015-2019): legal cost channel

Some comments (i)

- Paper addresses important issue with a well-designed empirical strategy

  → Construction of database seems major undertaking

- Not clear how to interpret pricing behavior before antitrust decision (2013-2015)

  → Lowering prices could be a ‘smoking gun’ for antitrust authority

  → I would focus on the results after antitrust decision (2015-2019)

  → Provide support for Harrington’s legal cost channel

Some comments (ii)

- References to a ‘competitive benchmark’ are unwarranted

  → Manufacturers sell differentiated products

  → This naturally gives them market power

- One important endogeneity concern in the analysis

  → Why did SEAT act as whistleblower?

  → A decision potentially correlated with pricing behavior in post-cartel period

This discussion

- Illustrate Harrington's legal cost channel with a simple parametric example
    - → Model of Bertrand competition with differentiated products
    - → Two heterogeneous firms
- Compare the following equilibrium outcomes
    - → Pre-cartel Nash equilibrium
    - → Joint profit maximization
    - → Collusive equilibrium
    - → Post-cartel Nash equilibrium
    - → Post-cartel Nash equilibrium with whistleblowing firm

Model setup

- Two firms (1 and 2) with inverse demand functions

$$q_1(p_1, p_2) = \alpha_1 - \beta p_1 + \gamma p_2$$
$$q_2(p_1, p_2) = \alpha_2 - \beta p_2 + \gamma p_1$$

- The corresponding profit functions are

$$\pi_1(p_1, p_2) = (p_1 - c_1)q_1$$
$$\pi_2(p_1, p_2) = (p_2 - c_2)q_2$$

→ c_1 and c_2 are the constant marginal costs of firms 1 and 2

- Parametric assumptions: $\alpha_1 = 1$, $\alpha_2 = 3$, $\beta = 2$, $\gamma = 1$, $c_1 = 1$, and $c_2 = 2$

→ Firm 1 is the low-cost firm

Nash equilibrium

- The Bertrand-Nash equilibrium is obtained by solving

$$\max_{p_1} \pi_1(p_1, p_2)$$
$$\max_{p_2} \pi_2(p_1, p_2)$$

- The corresponding FOCs give a system of two linear equations whose solution is

$$p_1 = 1.26 \qquad q_1 = 0.53 \qquad \pi_1 = 0.14$$
$$p_2 = 2.07 \qquad q_2 = 0.13 \qquad \pi_2 = 0.01$$

→ Firm 1 sells more cars at a lower price with higher profits

Joint profit maximization

- Under joint profit maximization the firms solve

$$\max_{(p_1, p_2)} \left[\pi_1(p_1, p_2) + \pi_2(p_1, p_2) \right]$$

- The corresponding FOCs give a system of two linear equations whose solution is

$$\begin{array}{lll} p_1 = 1.33 & q_1 = 0.50 & \pi_1 = 0.17 \\ p_2 = 2.17 & q_2 = 0 & \pi_2 = 0 \end{array}$$

→ Unless we allow for side payments firm 2 will be worse off (zero profits)

Pareto frontier (i)

- What could firms do (in the absence of side payments)?
  - → Construct the Pareto frontier
  - → Choose Nash bargaining outcome on the frontier

Pareto frontier (ii)

- The Pareto frontier in the (π_1, π_2) space is obtained by solving

$$\max_{(p_1,p_2)} \pi_2(p_1,p_2)$$
$$\text{subject to } \pi_1(p_1,p_2) \geq \bar{\pi}_1$$

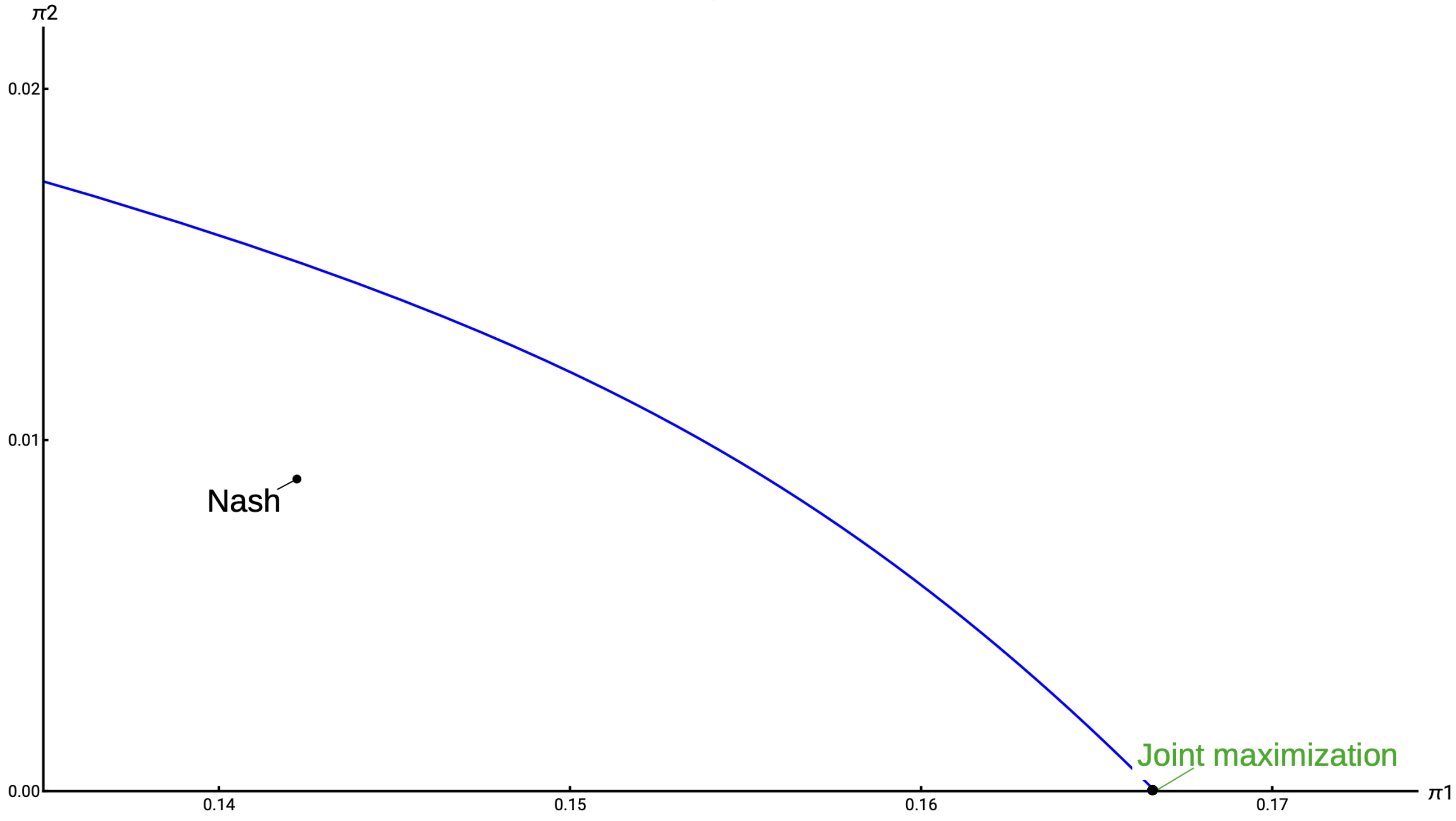
- The corresponding FOCs give a system of two linear equations whose solution is

$$\begin{array}{ccc} p_1(\lambda) & q_1(\lambda) & \pi_1(\lambda)=\bar{\pi}_1 \\ p_2(\lambda) & q_2(\lambda) & \pi_2(\lambda) \end{array}$$

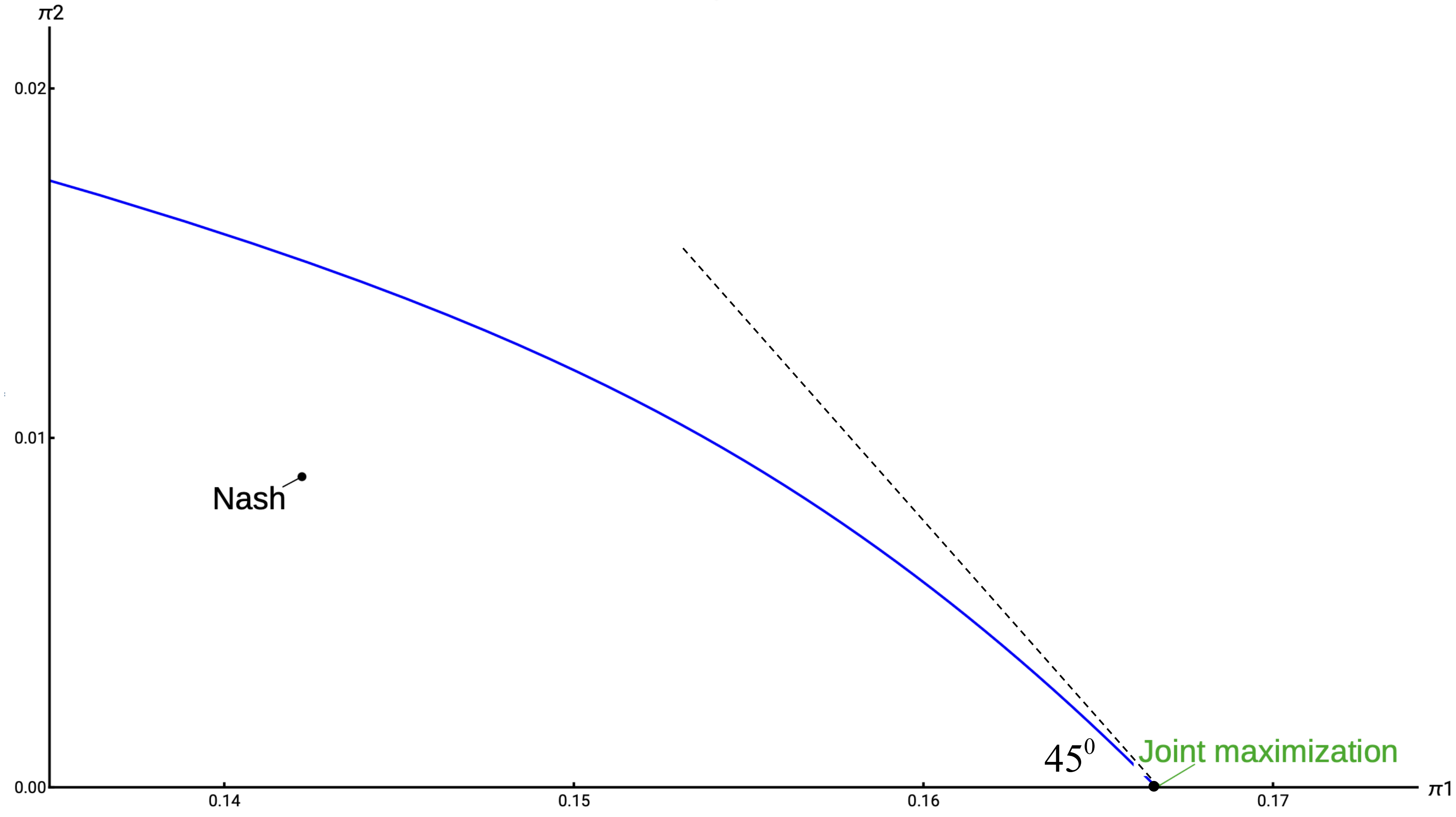
$\rightarrow \lambda$ is the Lagrange multiplier associated with the constraint (a function of $\bar{\pi}_1$)

$\rightarrow \lambda = 1$ corresponds to the joint profit maximization outcome

Pareto frontier



Pareto frontier



Nash bargaining outcome

- The bargaining outcome (with equal bargaining weights) is obtained by solving

$$\max_{\lambda}\left[\pi_1(\lambda)-\pi_1^B\right]\left[\pi_2(\lambda)-\pi_2^B\right]$$

→ π_1^B and π_2^B are the firms' profits in the initial Bertrand-Nash equilibrium

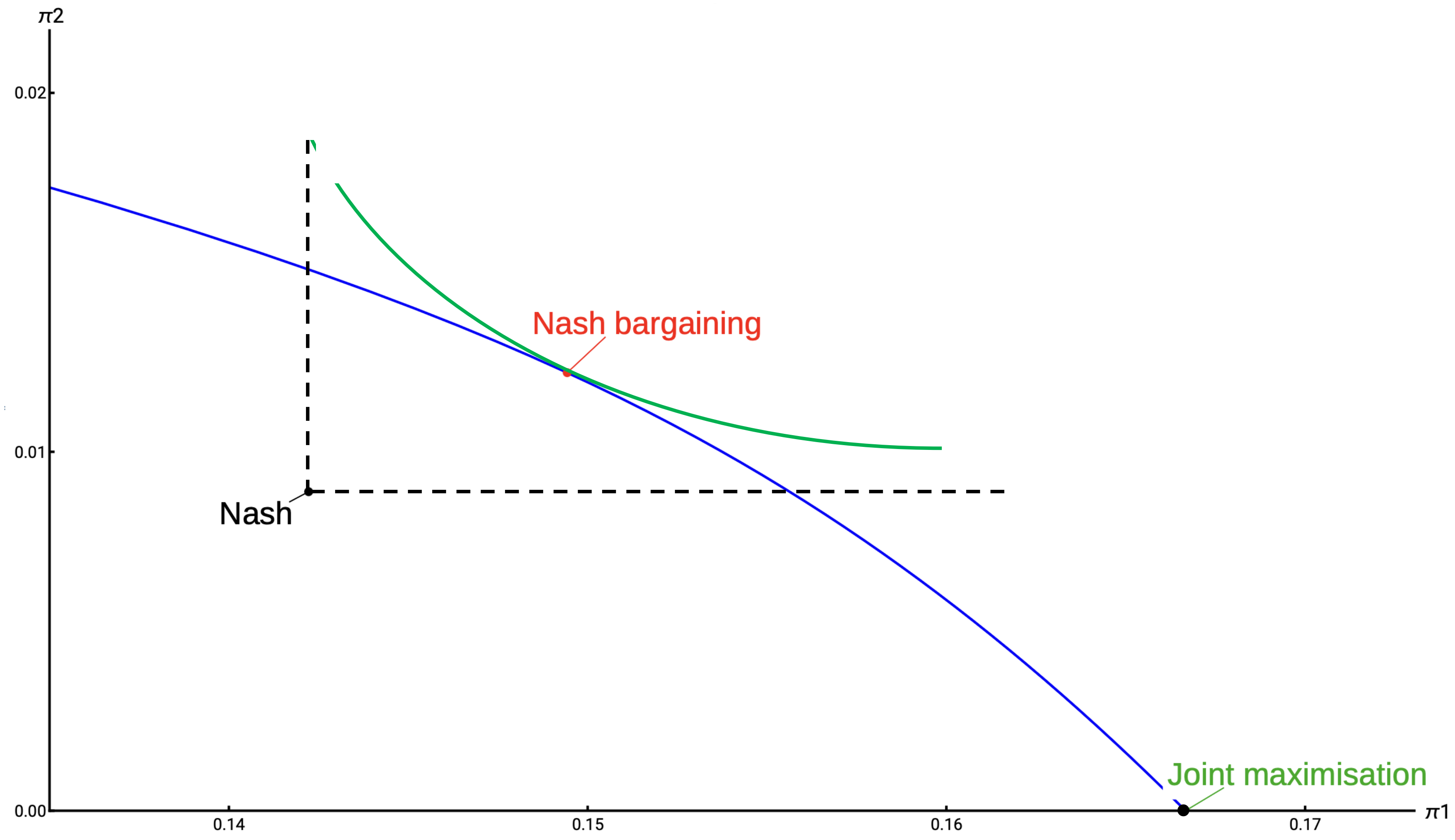
→ In case of disagreement firms revert to the original noncooperative outcome

- The corresponding FOCs give a system of two linear equations whose solution is

$$\begin{array}{lll} p_1 = 1.35 & q_1 = 0.42 & \pi_1 = 0.15 \\ p_2 = 2.13 & q_2 = 0.10 & \pi_2 = 0.01 \end{array}$$

→ Both firms are better off than in the original noncooperative outcome

Nash bargaining outcome



Post-cartel fines

- The profit functions now include fines set by antitrust authority

$$\pi_1(p_1, p_2) = (p_1 - c_1)q_1 - \tau(p_1^C - p_1)q_1^C$$
$$\pi_2(p_1, p_2) = (p_2 - c_2)q_2 - \tau(p_2^C - p_2)q_2^C$$

→ Super-index *C* denotes prices and quantities in collusive outcome

→ New term is assessment of damages associated with firms' collusion

→ New term is increasing in the post-cartel price

→ Incentive for firms to keep prices high

Post-cartel Nash equilibrium

- The Bertrand-Nash equilibrium is obtained by solving

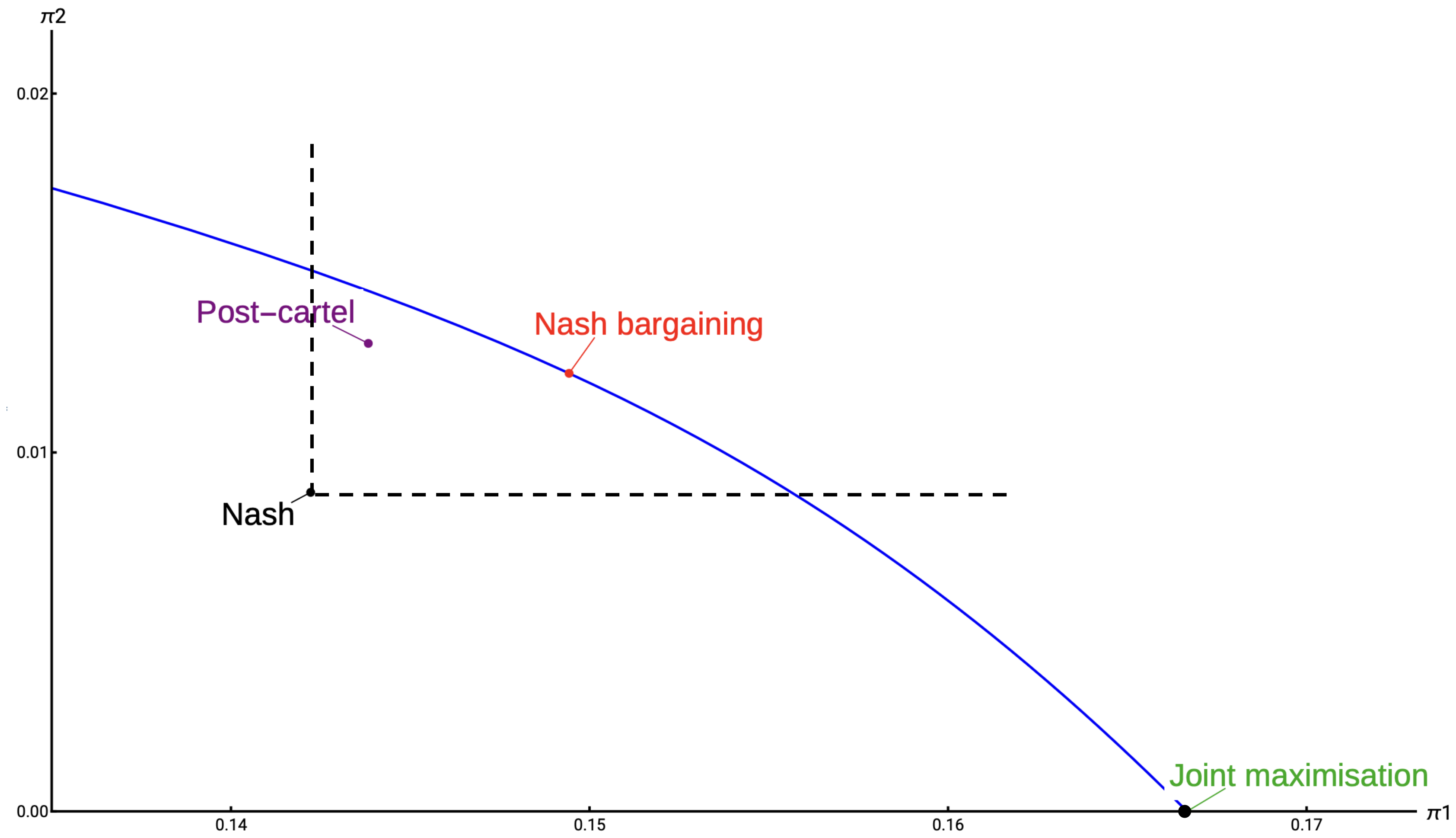
$$\max_{p_1} \pi_1(p_1, p_2)$$
$$\max_{p_2} \pi_2(p_1, p_2)$$

- The corresponding FOCs give a system of two linear equations whose solution is

$$p_1 = 1.33 \qquad q_1 = 0.44 \qquad \pi_1 = 0.14$$
$$p_2 = 2.09 \qquad q_2 = 0.14 \qquad \pi_2 = 0.01$$

→ Prices are higher than in the initial Nash equilibrium

Post-cartel Nash equilibrium



Post-cartel Nash equilibrium with leniency for firm 1

- The profit functions only include a fine for firm 2

$$\pi_1(p_1, p_2) = (p_1 - c_1)q_1$$
$$\pi_2(p_1, p_2) = (p_2 - c_2)q_2 - \tau(p_2^C - p_2)q_2^C$$

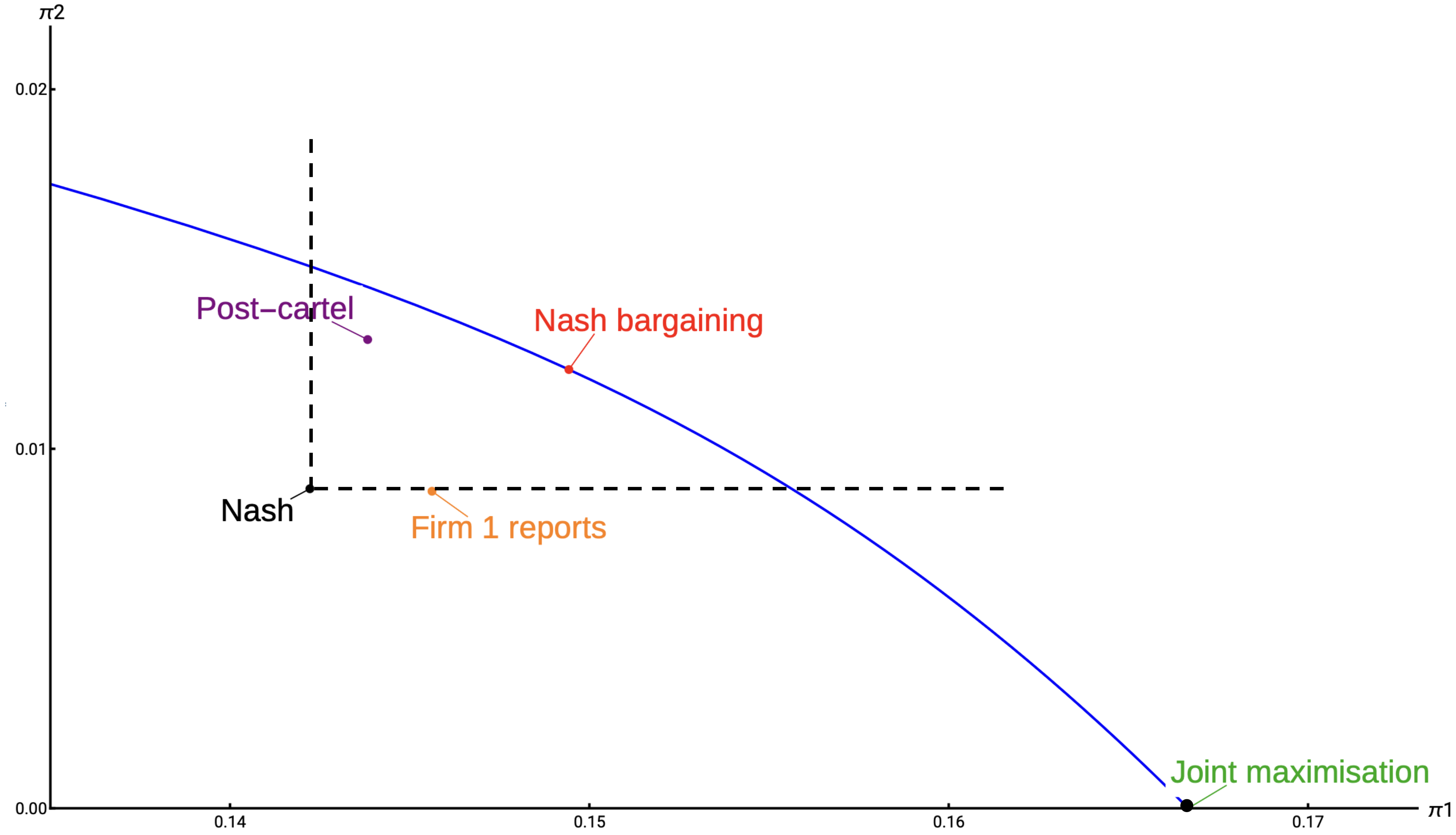
→ Leniency means that the whistleblower is pardoned the fine

- Corresponding Bertrand-Nash equilibrium implies

$$p_1 = 1.27 \qquad q_1 = 0.54 \qquad \pi_1 = 0.15$$
$$p_2 = 2.08 \qquad q_2 = 0.11 \qquad \pi_2 = 0.01$$

→ Firm 1 is better off than in the post-cartel equilibrium (without leniency)

Post-cartel Nash equilibrium with leniency for firm 1



Summary of numerical results

Percentage changes with respect to pre-cartel Nash equilibrium

	$p_1 - c_1$	$p_2 - c_2$	q_1	q_2	π_1	π_2
Collusion	32%	93%	−20%	−29%	5%	37%
Post-cartel	22%	40%	−17%	5%	1%	46%
Post-cartel with 1's w.	1%	19%	1%	-17%	2%	-1%

Concluding remarks

- Paper would profit from adding theoretical framework

- Numerical example used arbitrary parameter values

  → Could be improved by matching data from the empirical analysis

  → Model has eight parameters: $\alpha_1, \alpha_2, \beta_1, \beta_2, \gamma_1, \gamma_2, c_1, c_2$

  → Plus firms' bargaining power parameter

  → Could do much better on the numerical front