Industrial Organization

Market Power (Collusion)

Week 9

Collusion

In all oligopoly models studied so far total profits are smaller than in Monopoly

(*due to the externality of competition*)

↓

Firms being aware of this try to establish agreements (either explicitly or tacitly) to increase their market power

↓

These agreements are designated as **collusion***

***Definition**: Collusion between firms refers to a secretive agreement or understanding between two or more independent firms to cooperate with each other in order to increase profits by engaging in anti-competitive practices such as fixing prices or limiting production.*

Collusion

Recall the **symmetric Bertrand duopoly** outcome: $P = MC$.

- The "**standard**" Bertrand model, as previously, is a *one-shot* game.
- The Bertrand equilibrium is the well-known Bertrand Paradox in which $\pi_i = 0$.

Optimal cartel agreement (not a NE)

Firm 1 /Firm 2	$\boldsymbol{P^M}$	$\boldsymbol{P^M - \varepsilon}$	**…**	$\boldsymbol{MC}$
$\boldsymbol{P^M}$	$\left(\frac{\pi^M}{2}, \frac{\pi^M}{2}\right)$	$(0, \boldsymbol{\pi^M})$	…	$(\mathbf{0}, 0)$
$\boldsymbol{P^M - \varepsilon}$	$(\boldsymbol{\pi^M}, 0)$	$\left(\frac{\pi^M}{2}, \frac{\pi^M}{2}\right)$	…	$(\mathbf{0}, 0)$
…	…	…	…	…
$\boldsymbol{MC}$	$(0, \mathbf{0})$	$(0, \mathbf{0})$	…	$(\mathbf{0}, \mathbf{0})$

Bertrand Nash Equilibrium

Collusion

Recall the **symmetric Bertrand duopoly** outcome: $P = MC$.

- The "**standard**" Bertrand model, as previously, is a *one-shot* game.
- The Bertrand equilibrium is the well-known Bertrand Paradox in which $\pi_i = 0$.

Would the expected outcome change if the game was repeated, say...

i. **3** times?

ii. **5** times?

iii. for a ***finite*** number of periods?

"A cartel that succeeds has in it the seeds of its own destruction"

Collusion

Firms communicate

But… can firms actually coordinate in order to charge higher prices? Yes, through explicit collusion…

Supermarkets hit with eighth hub-and-spoke infringement decision in Portugal


Expresso

ANTERIOR SEMANÁRIO 26.07.2024 PRÓXIMO

Exclusive

Covid-19: laboratories created WhatsApp groups and exchanged messages to agree on Covid-19 test prices

AdC sanctions laboratories and business association for involvement in COVID test cartel and other clinical analyses

Collusion

But… can firms actually coordinate in order to charge higher prices? Yes, through explicit collusion…

Examples of real emails obtained by the Portuguese Competition Authority during supermarket investigations

From: Supplier 1
Sent: Friday, 4th of November 2011 10:58
To: Supplier 1 workers
Subject: urgent – prices supermarket 1
Dear colleagues,

As you already know, we are on the verge of raising some prices in supermarket 1:

- TFG 13,49
- TFG Black 15,99
- Grant's 12A 17,99
- Ermelinda Reserva 6,99
- Glenfiddich 12 years 25,99
- Pisang Ambon 11,49
- Bols Blue 11,99
- Bols Advocat 11,99

It is **mandatory** to make sure that the rest of the retailers are not going to deviate from this movement and as such supermarket 2 and supermarket 3 **cannot** put these products at discount.

Any question you may have I am here,

Supplier 1

From: Supplier 2
Sent: 3rd of June 2015 12:51
To: Supplier 2 workers
Subject: Re: Price Increase of Sagres 6x33cl

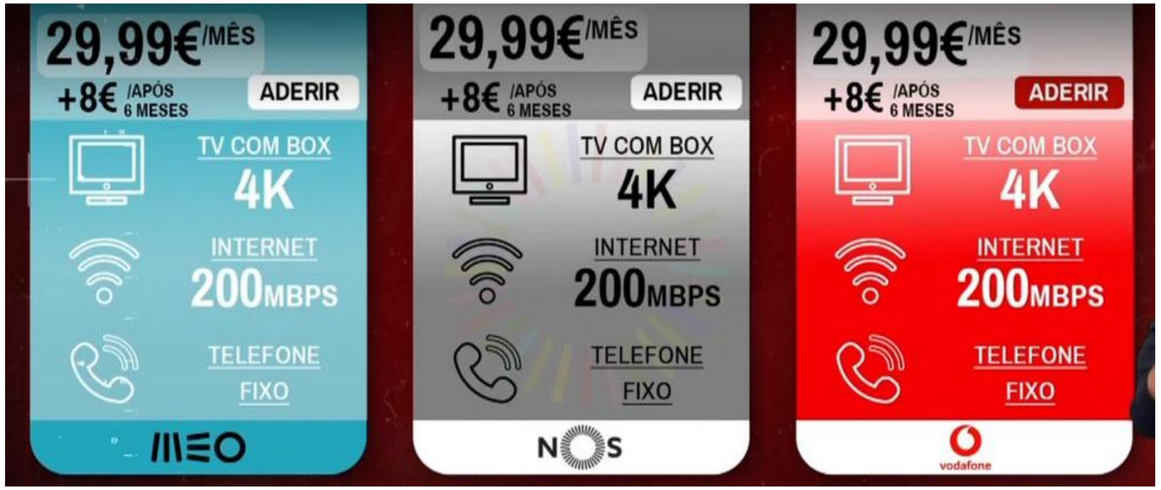
Hi [worker],

That's precisely the goal. Increase prices!! Keep going!!

Collusion

Firms do not communicate

But… can firms actually coordinate in order to charge higher prices? Yes, through tacit collusion…



Prices in the Portuguese Telecom market

Fuel prices in a highway

Collusion

IF A GAME IS INFINITELY REPEATED, THEN FIRMS WILL COLLUDE AS LONG AS THE PRESENT VALUE OF PROFITS UNDER COLLUSION IS HIGHER THAN THE PRESENT VALUE OF PROFITS UNDER DEVIATION

Consider a **symmetric duopoly** where the two firms are **tacitly colluding**. Firm 1 is considering whether to collude or deviate in period $t = 0$. Assume that Firm 2 will stick to the collusive agreement in that period.

A firm will choose to tacitly collude as long as... *(assuming a market with 2 firms)*

$$\boldsymbol{\pi^{Collusion} > \pi^{Deviation}}$$

$$\leftrightarrow$$

$$\frac{\pi^M}{2} + \delta\frac{\pi^M}{2} + \delta^2\frac{\pi^M}{2} + \cdots > \pi_1^{Deviation} + \delta\pi^{Non-cooperative\ equilibrium} + \delta^2\pi^{Non-cooperative\ equilibrium} + \ldots$$

$$\delta \in [0,1] \rightarrow discount\ factor$$

Collusion

IF A GAME IS INFINITELY REPEATED, THEN FIRMS WILL COLLUDE AS LONG AS THE PRESENT VALUE OF PROFITS UNDER COLLUSION IS HIGHER THAN THE PRESENT VALUE OF PROFITS UNDER DEVIATION

Consider a **symmetric duopoly** where the two firms are **tacitly colluding**. Firm 1 is considering whether to collude or deviate in period $t = 0$. Assume that Firm 2 will stick to the collusive agreement in that period.

- If firms would **compete *à la* Bertrand** after Firm 2 notices that Firm 1 deviated, **Firm 1 will collude if:**

$$\frac{\pi^M}{2} + \delta\frac{\pi^M}{2} + \delta^2\frac{\pi^M}{2} + \cdots > \pi^M + \delta 0 + \delta^2 0 + \cdots$$

- If firms would **compete *à la* Cournot** after Firm 2 notices that Firm 1 deviated, **Firm 1 will collude if:**

$$\frac{\pi^M}{2} + \delta\frac{\pi^M}{2} + \delta^2\frac{\pi^M}{2} + \cdots > \pi_1^{Deviation} + \delta\pi^{Cournot} + \delta^2\pi^{Cournot} + \cdots$$

Collusion in Prices

EXERCISE

1. Consider a market with a single demand where **two firms compete, defining prices simultaneously**. The two firms have been **tacitly colluding**, practicing a monopoly price and sharing the profits generated by their cooperation.

(a) What discount factor must these firms have for cooperation to be maintained in the future?

Collusion in Quantities

EXERCISE

3. Two firms, A and B, supply a market whose yearly demand is given by $\boldsymbol{q = 10 - p}$. They produce the good traded in this market at a **constant marginal and average cost of 4**. Firms **compete in quantities**, which they choose every year, doing so **simultaneously and independently**, and expect to do so **forever**.

Suppose first that **A and B are not colluding**.

(a) How much will each produce per year? What will their yearly profit be?

Suppose now that **A and B are tacitly colluding with the aim of maximizing and equally sharing industry profit**.

(b) How much will each produce per year? What will their yearly profit be?

Collusion in Quantities

EXERCISE

3. Two firms, A and B, supply a market whose yearly demand is given by $\boldsymbol{q = 10 - p}$. They produce the good traded in this market at a **constant marginal and average cost of 4**. Firms **compete in quantities**, which they choose every year, doing so **simultaneously and independently**, and expect to do so **forever**.

Suppose that if either firm deviates from the collusive agreement, the other resorts to playing forever as if they had never colluded.

(c) What is the **condition on the discount factor**, **δ**, that must be obeyed **for the two firms to be able to collude**?

(d) What would this condition be if the two firms **competed in prices instead of competing in quantities**?

(e) In which case is it easier to sustain a tacit collusion agreement? Intuitively explain why.

True or False

EXERCISE

1. **“Prices above marginal costs imply tacit (or even explicit) collusion. No other proof is needed.”**

Recommended readings

CABRAL, LUIS MB. INTRODUCTION TO INDUSTRIAL ORGANIZATION. MIT PRESS, 2017.

- ✓ Chapter 7.1: The Bertrand Model
- ✓ Chapter 8: Collusion