


Kosmas Marinakis, Ph.D.

Lecture 11

Collusion & detection



Industrial
Economics

Updates

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Collusion

Incentive for collusion

- * Collusion is **pointless** if the market does not have **monopoly potential**
- * **Factors** that affect the potential:
 1. **Elasticity** of demand
if $|\epsilon_D|$ is high enough the **substitution effect** will be vast
 2. **Portion** of the market that colludes
if collusion is not global the **dominant firm model** should be applied
 3. **Entry status**
if entry is free and open the market will become **contestable**.

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Collusion

Establishing collusion

Collusion can be split into **two problems**

1. **Reach** an agreement
 - ◆ Establish **communication** (*explicit* vs. *tacit*)
 - ◆ Come up with **market shares**
 - ◆ How to **protect** profits from potential **entrants**
2. **Enforce** the agreement
 - ◆ **Penalty** phase
 - ◆ **Renegotiation** issues
 - ◆ **Stability** of the agreement to exogenous shocks.

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Collusion

Facilitation practices

- * Advance **notice** of a price change
- * **Meeting** competition clauses
- * **Most-favored-customer** clauses
- * Exchanging **info** on prices and costs
- * Common **ventures**
- * **Multimarket contact** between firms.

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Collusion

Complications

- * Collusion is neither **simple** not **easy**
- * There are **multiple factors** that can **complicate** collusive agreements
 - ◆ Cost asymmetries
 - ◆ Product heterogeneity
 - ◆ Industry volatility
 - ◆ Industry structure.

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Collusion Complications

Cost asymmetries

- ★ High cost firms will prefer **higher price** and lower quantities
- ★ Low cost firms prefer **lower price** and higher quantities have a **stronger incentive to cheat**
- ★ The cartel may want to **shut down** high cost firms
 - ◆ By buying them off
 - ◆ With side payments (separate production and distribution decisions)

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Collusion Complications

Product heterogeneity

- ★ Product heterogeneity **complicates** the agreement there is a **magnified chance of disagreement** as **multiple prices** have to be agreed upon
- ★ Successful collusion **requires more** than just fixing prices competition can occur **through**: quality • advertisement • brand building • innovation • differentiation • service
- ★ Long term variables are hard to **limit, observe, quantify**
- ★ Firms have an incentive to invest on all those to **be prepared** in case collusion breaks down

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Collusion Complications

Industry volatility

- ★ Innovation
hard to reach agreements in industries where product is under **constant evolution**
- ★ Uncertainty
hard to reach agreements in industries where demand, cost, institutions and regulation change **unpredictably**
- ★ Incomplete information
hard to reach agreement when there is no way to **verify** the parameters of cost, demand and various possible heterogeneity

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Collusion Complications

Industry structure

- ★ Seller concentration
agreement is easier among **fewer parties**
- ★ Attitude of the industry towards competition
some industries are **more competitive** than others
- ★ Asymmetry in objectives
time preference, attitude to **legal risk, non-max-profit** objectives

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Collusion Complications

Miscellaneous complications

- ★ Policing the agreement (Stigler, 1969)
ability to police depends on detection, speed and severity of punishment
- ★ Repetition (Chamberlin, 1957)
how reputation and retaliation function in this market

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Collusion

Collusion & social welfare

- ★ Collusion **reduces** social welfare especially when **entry is restricted** and the only choice variable firms have is **price** or **output**
- ★ There might be exceptions when **entry is free**, and firms make **long-run decisions** such as **product quality** or **variety**
- ★ **Fershtman and Pakes (2000)**: quality and variety can increase under price collusion – those benefits offset reduce in welfare from collusion
- ★ **Symeonidis (2002)**: evidence that cartels do not raise profits but result in high entry into collusive industries

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Usual defense for collusion

- ★ The usual defense is based on **efficiency**
 - ◆ Allow for price **flexibility** to exogenous changes without **renegotiation**
 - ◆ Prevent ex-post **opportunism**
 - ◆ Ensure that prices **along suppliers** are “competitive”
 - ◆ Ensure that prices **along buyers** are similar

Detection

- ★ How can the prosecutor **prove** that an industry is indeed colluding?
- ★ We will analyze the method developed initially by **Porter** to detect **collusive behavior** in an industry **no prior information** about the occurrence of collusion
- ★ The objective is to measure the **degree of market power** of firms in the industry
 - whether prices are closer to the **static NE** or to the **joint monopoly** outcome

Setup

- ★ We consider a **homogeneous** product with **demand**

$$\ln Q_t = \alpha_0 + \alpha_1 \ln p_t + \alpha_2 L_t + u_{1t} \quad (1)$$
- ★ The **cost** for the firm is

$$C_i(q_{it}) = F_i + A_i q_{it}^\lambda$$
- ★ Profit maximization implies setting **MC = MR**, that is

$$\lambda A_i q_{it}^{\lambda-1} = p_t \cdot \left(1 + \frac{\vartheta_{it}}{\alpha_1}\right)$$
- ★ The parameter ϑ_{it} indicates the **degree of collusion**
 - ϑ is our **target** in this model

Degree of collusion

- ★ Recall that for the **generalized Cournot** we have previously shown (L8-S12) that

$$\frac{p_t - c'}{p_t} = \frac{s_i}{|\varepsilon_d|} \Rightarrow c' = p_t \left(1 - \frac{s_i}{|\alpha_1|}\right)$$

- ◆ If competition is Bertrand, $\vartheta_{it} \rightarrow 0$
- ◆ If competition is Cournot, $\vartheta_{it} \rightarrow s_i$
- ◆ If there is collusion, $\vartheta_{it} \rightarrow 1$
- ★ For estimated values of ϑ **significantly above** s_i we can justify collusion

Aggregation

- ★ If we have no data at the firm level we can **aggregate**
- ★ MR side

$$p_t \left(1 + \frac{\sum_i s_{it} \vartheta_{it}}{\alpha_1}\right) = p_t \left(1 + \frac{\theta_t}{\alpha_1}\right)$$
- ★ MC side

$$\sum_i (s_{it} \cdot \lambda A_i q_{it}^{\lambda-1}) = D \cdot Q_t^{\lambda-1}$$
 where $Q_t = \sum_i q_{it}$ and $D = \lambda \cdot \sum_i (A_i^{1/(1-\lambda)})^{1-\lambda}$
- ★ Supply becomes

$$p_t \left(1 + \frac{\theta_t}{\alpha_1}\right) = D \cdot Q_t^{\lambda-1}$$

Estimation

- ★ Suppose that I_t is an **indicator dummy**
 - equals 1 when the industry is in a cooperative regime
- ★ Suppose that S_t is a **structural dummy**
 - equals 1 to reflect a period of entry and acquisition
- ★ **Supply** can be estimated as

$$\log p_t = \beta_0 + \beta_1 \log Q_t + \beta_2 S_t + \beta_3 I_t + u_{2t} \quad (2)$$

$$\beta_0 = \log D, \quad \beta_1 = \lambda - 1, \quad \beta_3 = -\log \left(1 + \frac{\theta_t}{\alpha_1}\right)$$
- ★ We can **estimate** θ_t if we estimate β_3 from (2) and α_1 from (1)

Detection

Key points

- ★ There is a **direct link** between theory and econometric specification
 - demand – supply – FOCs – dummies
- ★ All we need to estimate the model is **prices, quantities** and information on the **dummy variables**
 - demand** and **cost** parameters can be estimated in the process
- ★ Porter's methodology is **instructional**
 - ◆ There are **more sophisticated methods** for econometric identification of collusion
 - ◆ Several **variants** of the basic model exist: Leadership models or different sizes of firms

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Detection Case study

The JEC cartel

- ★ In 1983 Porter tried to estimate θ for an infamous case the US railroad cartel established by the Joint Executive Committee a century ago (1880 – 1886)
- ★ Estimation of the model using **2SLS** yielded $\hat{\theta} = 0.34$
- ★ Estimation of the model using **ML** yielded $\hat{\theta} = 0.58$ there is indication of collusive behavior
- ★ In 1994, Ellison re-estimated the model assuming that the error term of the demand equation is **serially correlated** he obtained $\hat{\theta} = 0.85$

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Detection

Limitations of the econometric approach

1. The **elasticity of demand** is assumed constant
2. The **quantity** is the same for all firms within a group and over time
3. More restrictions need to be imposed for **differentiated good** industries
4. The **functional form** of the demand and cost are arbitrary
5. The results depend heavily on the **method** of the econometric estimation

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Thank you!



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