

# Collusion and horizontal agreements

# Main ingredients of collusion

- Situation where firms set prices above the competitive level, which can be obtained either by explicit or by tacit collusion.
- But not so easy :
  - temptation to deviate (price just under the collusive price, take all the demand and make more profit);
  - need to detect deviation from the collusive price and identify it as a deviation;
  - Need to punish deviation.
- Each of these items raises difficult problems.

# No need to talk !

- In many market circumstances, there is no need to communicate between firms to reach a collusive price.
- Tacit collusion : each firm understands that it is better to price high if the other firm prices high too.
- Problems of coordination may arise : on which price to focus? With explicit collusion contacts, coordination on a specified level of prices, quantities...
- Detection and punishment remain the same /explicit collusion.

# Factors that facilitate collusion

- Analysis of the incentives to collude received by each firm : comparison of the profits under collusion/competitive behavior.
- Incentives depend on various factors that reinforce or lessen the propensity to collude.
- Structural factors, factors related to information, pricing rules and properties of contracts.

# Incentives to collude (1)

$$\Pi_i^c + \delta V_i^c \geq \Pi_i^d + \delta V_i^p$$

Where :  $\delta$  = discount factor, c = collusive,  
d= deviation, p = punishment,  $\Pi$  = profit,

V = future value of profits.

$$\Pi_i^d - \Pi_i^c \leq \delta(V_i^c - V_i^p)$$

$$\delta \geq (\Pi_i^d - \Pi_i^c) / (V_i^c - V_i^p) = \delta^*$$

In order to have sustainable collusion,  $\delta$  has  
to be large enough : future has to matter

# Incentive to collude (2)

- $n$  identical firms, same discount factor  $\delta$ , same unit cost  $c$ .
- At each period of time  $t$ , firms play non cooperatively.
- If they all charge the same price  $p$ , they all share the demand at that price, i.e., each obtains  $D(p)/n$  and  $\pi_i = \pi(p)/n$
- If firm  $i$  charges  $p_i < p_j$  for all  $j$ , it takes all the demand and all the profit :  $D_i(p_i)=D(p_i)$  and  $\pi_i = \pi(p_i)$
- If firm  $i$  charges  $p_i > p_j$  for all  $j$ , then  $D(p_i)=0$  and  $\pi_i=0$

# Incentives to collude (3)

- Trigger strategies : at  $t = 0$ , all the firms charge the same collusive price (monopoly price)  $p_m$
- At time  $t$ , each firm sets  $p_m$  if all the others have set  $p_m$  at the previous period
- If one firm has set another price (deviation from the tacit or explicit price level), each firm sets  $p = \text{marginal cost } c$  (and makes 0 profit) forever (Bertrand competition).
- Collusion arises if no firm has an incentive to deviate, that is, if (symmetry) :

$$(1 + \delta + \delta^2 + \delta^3 + \dots) \pi(p_m)/n \geq \pi(p_m) + 0$$

$$[\pi(p_m)/n] \cdot [1/(1-\delta)] \geq \pi(p_m)$$

$$\text{Condition 1 : } \delta \geq 1 - 1/n$$

When  $n$  is small,  $1/n$  is high and the condition is more easy to satisfy.

# Structural factors (1)

- Collusion more likely, the smaller the number of firms :
  - Collusive profit : small share of the cake if many firms
  - Incentives to deviate ++ if many firms.
  - Cartels appear more easily in concentrated industries.
- Symmetry between firms favors collusion : more easy to coordinate.
- Entry : if entry easier, collusion more difficult to sustain.
  - If the entrant doesn't pursue a collusive strategy : its prices are lower, it takes market share to the collusive firms who must reduce their prices.
  - If it does, since a higher number of firms makes collusion less likely, entry reduces the incentives to collude.

# Structural factors (2)

- Cross ownership : makes objectives of the firms less conflicting.
- Regularity and frequency of orders :
  - in public market, an unusually large order gives a strong temptation to deviate to obtain the market;
  - High frequency of orders : allows a timely punishment in case of deviation.
- Buyer power : a strong buyer
  - can stimulate competition between sellers,
  - can break collusion,
  - can design procurement auctions so as to minimize the risk of collusive behaviour among suppliers.

# Structural factors (3)

- Demand elasticity :
  - if demand very elastic, a price cut increases demand ++.
  - Both true :
    - for deviations (deviation is more likely to occur, so that a high elasticity discourages collusion)
    - And for punishment (that becomes less costly for the non deviating firms, which favors collusion)
  - Affects both sides of the incentive constraint
  - Overall effect : ?

# Structural factors (4)

- Dynamics of demand : demand shocks upward or downward may affect collusion.
  - Upward shock : may give an incentive to deviate to benefit from an increased transitory demand
  - If permanent shock : then better wait in order to enjoy a large collusive profit
- Product homogeneity : affects both sides.
  - Products more homogenous : deviation allows to capture a more important share
  - But punishment is more efficient.
- Symmetry : facilitates collusion (easier to find an arrangement)

# Structural factors (5)

- Multi-market contacts : more costly to deviate on one market, because punishment on many markets.
- Inventories and excess capacities : if no excess capacity, then deviation unprofitable (impossible to answer additional demand) :
  - In an industry where capacity are fully employed, collusion more probable.
  - If no inventories, collusion more probable.

# Information

- Observability of firms' behavior affects collusion.
  - Risks of secret prices cuts : how then to detect collusion?
- Major problem : when a firm observes that its demand shrinks, is it due to a deviation by another firm or to a general decrease in demand?
- Depends on the characteristics of the demand

# Collusion, observability and demand shocks (1)

- Haltiwanger and Harrington (1991)
- « Collusion is more likely to fail during demand falls ».
- If a firm observe a fall in the demand addressed to it, and if it is unable to observe if this is due to a deviation or to a general fall in demand, then it should return to the competitive equilibrium (i.e. punish a possible deviation).
- Then collusion is more likely to disappear during periods where there are negative shocks on demand.

# Collusion, observability and demand shocks (2)

## Rotemberg and Saloner (1986)

- Demand may be low or high,
- More incentive to deviate when demand is high : then more profit to gain.
- Collusion is less likely to hold during high demand periods.
- In practice, it is often observed that collusion begins during period where there is a decrease in demand (defensive cartels).

# Practical problems

- It seems indeed to be not so easy to sustain collusion for a long period of time.
  - Incentives to deviate are strong (and often unobservable).
  - Incentives to retaliation are often weak (because it is costly for the firm who punish).
- Firms often build sophisticated mechanisms in order to detect and punish deviations from the collusive equilibrium.

# Practical problems

- These difficulties make it often difficult for competition authorities to prove that there is a risk of tacit collusion, because it requires to prove 1) that detection and identification of deviations are possible; 2) that retaliation is possible and will be implemented.
- 2) may be difficult for example if long term contracts.

# What should be considered legal/illegal?

## 1. **Standards of proof : market data/hard evidence of collusion?**

- Collusion results in high prices.
- Analysis of the price level in an industry and if they are high, consider them as collusive?
- No !
  - price data may not be available;
  - Could be disagreement on the monopoly price : sellers may have different views.
  - If there is an agreement on this monopoly price, how close the observed price should be in order to be considered collusive?
  - Dangerous principle : high prices can result from market power, which is not by itself illegal!

# What should be considered legal/illegal?

- Rather than the level, the evolution of prices?
- « Parallelism of behavior » : sellers charge similar prices over time.
- But this may result from a common factor, like the increase of the price of an input.
- If a seller increases its price of 10% one day, it may be individually rational to do the same.
- A tacitly collusive behavior may consist in staying on its own market to avoid an aggressive behavior from the other firm.

# What should be considered legal/illegal?

- « Parallelism + » : parallelism of prices plus other facilitating factors (RPM, best price clauses, exchange of information...)
- Existence of periods of price war : reveals collusion?
- Price wars are usually part of the functioning of a cartel, but can also be due to other causes.
- Inferring illegal price collusion from market data is not desirable.
- Hard evidence should be required : dawn raids to obtain documents....

# Ex ante measures against collusion (1)

- Fines : should be computed in order to discourage collusive behavior, that is,

$$\pi^{\text{coll}} - pS \leq \pi^{\text{conc}} \quad \text{and} \quad S \geq [\pi^{\text{coll}} - \pi^{\text{conc}}] / p$$

- S should not only deprive the firm from its anticompetitive profit, but also take into account the probability of detection p.
- The higher p, the lower S needs to be.
- A policy against collusion is defined by (S, p) that are substitutes.

# Ex ante measures against collusion (2)

## Black list of facilitating practices

- Business practices that should be forbidden
  - Exchange of disaggregate information about prices and quantities;
  - Co-ordination among firms aimed at harmonising business practices that increase observability of actions among sellers but not for buyers : best price clause, ..
  - Minority shareholding?
  - RPM (debate)

# Ex ante measures against collusion (3)

- Auction design : players can use their bids to signal their collusive intention in simultaneous ascending auctions;
- An appropriate auction design can prevent this problem : anonymous bidding
- Merger analysis and control (see further)

# Ex post measures against collusion

- Dawn raids (surprise inspections)
- Leniency programs : since competition authorities hardly observe the collusive behavior, they can « buy » information by granting immunity to firms that give information on cartels they are involved in.
- Many cases for leniency.

# Ex post measures against collusion (2)

- Automatic and total immunity for firms that report evidence of a cartel before any investigation has begun, provided that the firms terminates its participation to the collusive behavior;
- Partial immunity for firms that come after an investigation has started if they bring evidence that allow to characterise the practices.
- Allows the competition authorities to save resources and discourages collusion.

# Effects of leniency policy

- Potential effects are twofold :
  - 1) Ex ante : before entering a cartel, a firm should take into account the fact that another firm can reveal the existence of the cartel. This increases the probability of the cartel and reduces the incentives to collude.
  - 2) Ex post : once a firm has entered a cartel, it can always avoid fines by coming forward. Makes collusive behavior more profitable.
- The first effect dominates : leniency programs have allowed a better detection of collusive practices since they are implemented.
- First leniency program : US (1978), revised (1983); EU first program (1996), revised (2002); France (2001).