# 1. Introduction to Price Fixing: Legal and Economic Foundations

Merger Antitrust Law

Georgetown University Law Center
Dale Collins

December 11, 2020

# Topics

- What is (horizontal) price fixing?
- Basic competition economics
  - Consumer demand and the aggregate consumer demand curve
  - Profit maximization for the individual firm
  - Perfectly competitive markets
  - Perfectly monopoly
- Economics of price-fixing cartels
  - Incentives for price fixing
  - Single-period cartel game and the Prisoner's Dilemma
  - Repeated cartel games and the Folk Theorem
- Initializing a price-fixing cartel

# What Is Price Fixing?

- *Socony-Vacuum* definition
  - Views price fixing broadly as "[a] combination formed for the purpose and with the effect of raising, depressing, fixing, pegging, or stabilizing the price of a commodity."[1]
  - No need for explicit agreement on price level
- Uses
  - Originally defined in the context of seller horizontal price fixing
  - Applied to buyer horizontal price fixing
  - Adopted by courts in vertical price fixing (resale price maintenance)
    - Although later rejected as an appropriate analogy[2]

[1] United States v. Socony-Vacuum Oil Co., 310 U.S. 150, 223 (1940).
[2] State Oil Co. v. Kahn, 522 U.S. 3 (1997) (maximum resale price maintenance); Leegin Creative Leather Prods, Inc. v. PSKS, Inc., 551 U.S. 877 (2007) (minimum resale price maintenance).

# Basic Competition Economics

- Questions
  - How does a firm chose its production levels and prices in order to maximize its profits absent a price-fixing agreement?
  - How can a price-fixing agreement increase a firm's profits?
  - What determines the success or failure of a price fixing agreement?

# Basic Competition Economics

- Two asides
  - A plea

> Do not be put off by the mathematical notation in the slides that follow. All of the notation can be ignored without losing any substance. However, economics is an essential language in modern antitrust law. As you will see, economists love to use mathematical notation to make things look complicated, but with a small investment of effort you will see that all of this is very simple. Learning the basic economics is an investment that will give you a significant comparative advantage against many other antitrust attorneys.

  - An observation by Dave Berry

> Later on, Newton also invented calculus, which is defined as "the branch of mathematics that is so scary it causes everybody to stop studying mathematics." That's the whole point of calculus. At colleges and universities, on the first day of calculus, professors go to the board and write huge, incomprehensible "equations" that they make up right on the spot, knowing that this will cause all the students to drop the course and never return to the mathematics building. This frees the professors to spend the rest of the semester playing cards and regaling one another with stories about the "mathematical symbols" they've invented over the years. ("Remember the time Professor Hinkwattle drew a 'cosine derivative' that was actually a picture of a squid?" "Yes! Students were diving out the windows! From the fourth floor!")[1]

[1] Dave Berry, *Up in the Air on the Question of Gravity*, Baltimore Sun, Mar. 16, 1997, at 3J.

# Price Formation Models

- Standard assumptions
  - Consumers
    - Individually maximize preferences (utility) subject to their individual budget constraints
    - Yields a consumer demand function that gives the quantity demanded $q_i^{demanded}$ by consumer *i* for a given market price *p*
  - Firms
    - Individually maximize profits subject to their available production technology (production possibility sets)
    - Yields a production function that gives the quantity produced $q_j^{produced}$ by firm *j* for a given market price *p*
  - Equilibrium condition
    - No price discrimination (all purchases are made at the single market price)
    - Market clears at the market price (i.e., demand equals supply):

$$\sum_i q_i^{demanded} = \sum_j q_j^{produced}$$

$\Sigma$ simply means to add up the *q*'s

# Consumers

- *Assumption*: Consumers maximize their preference (utility) subject to their individual budget constraints
  - An individual consumer's demand for a product is a function of:
    - The consumer's preferences
    - The price the consumer pays for product
    - Other products and services the consumer may purchase and their respective prices
    - The consumer's budget constraint
  - The relationship between quantity and price is known as the *consumer demand function* or *consumer demand curve*
    - Typically, the consumer will purchase a larger quantity of the product as the price decreases
    - If so, then the consumer demand curve is *downward sloping*
  - The sum of consumer demand functions is known as the industry (aggregate) demand function

Almost all antitrust economic analysis takes this as the point of departure. It is a critical assumption.

# Consumers

- Deriving the consumer demand function
  - Consider a world with two products offered at prices $p_1$ and $p_2$, respectively
  - If the consumer has a budget constraint $B$, then

$$B \geq p_1 q_1 + p_2 q_2$$

This *inequality* simply says that the consumer's expenditure on product 1 ($p_1 q_1$) and product 2 ($p_2 q_2$) cannot exceed her budget

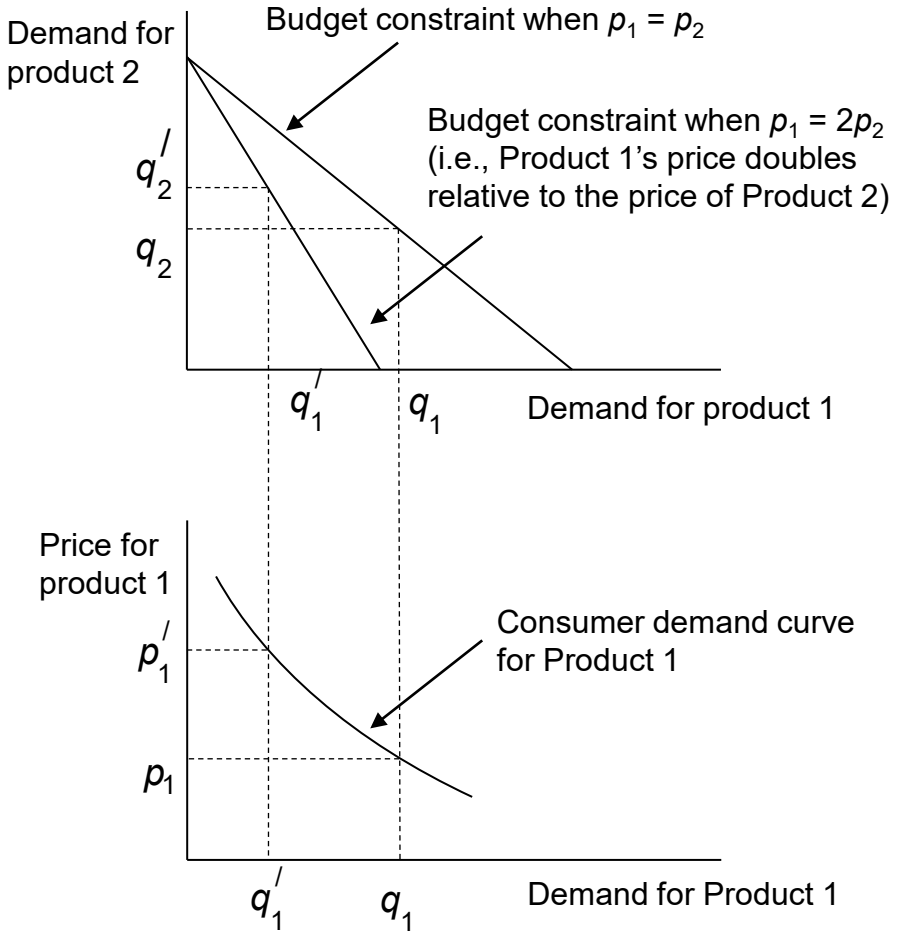
where $q_1$ and $q_2$ are the quantities the consumer purchases of products 1 and 2

  - The inequality requires that the consumer cannot spend more than her budget on the two products
  - If the consumer always prefers more of each product to less, then she will always spend all of her budget (there are no savings in this model):

$$B = p_1 q_1 + p_2 q_2$$

# Consumers

- Deriving the consumer demand function
  - At prices $p_1$ and $p_2$, the consumer purchases quantities $q_1$ and $q_2$
  - When price $p_1$ doubles relative to $p_2$, the consumer decreases its purchases of Product 1 to $q_1'$ and increases its purchases of Product 2 to $q_2'$
  - By holding the budget constant and varying $p_1$ relative to $p_2$ and observing the resulting quantities of Product 1 purchases produces the consumer demand function for that budget constraint
  - In a similar way, the demand function can be made a function of the budget constraint by observing purchases at different prices and different budgets

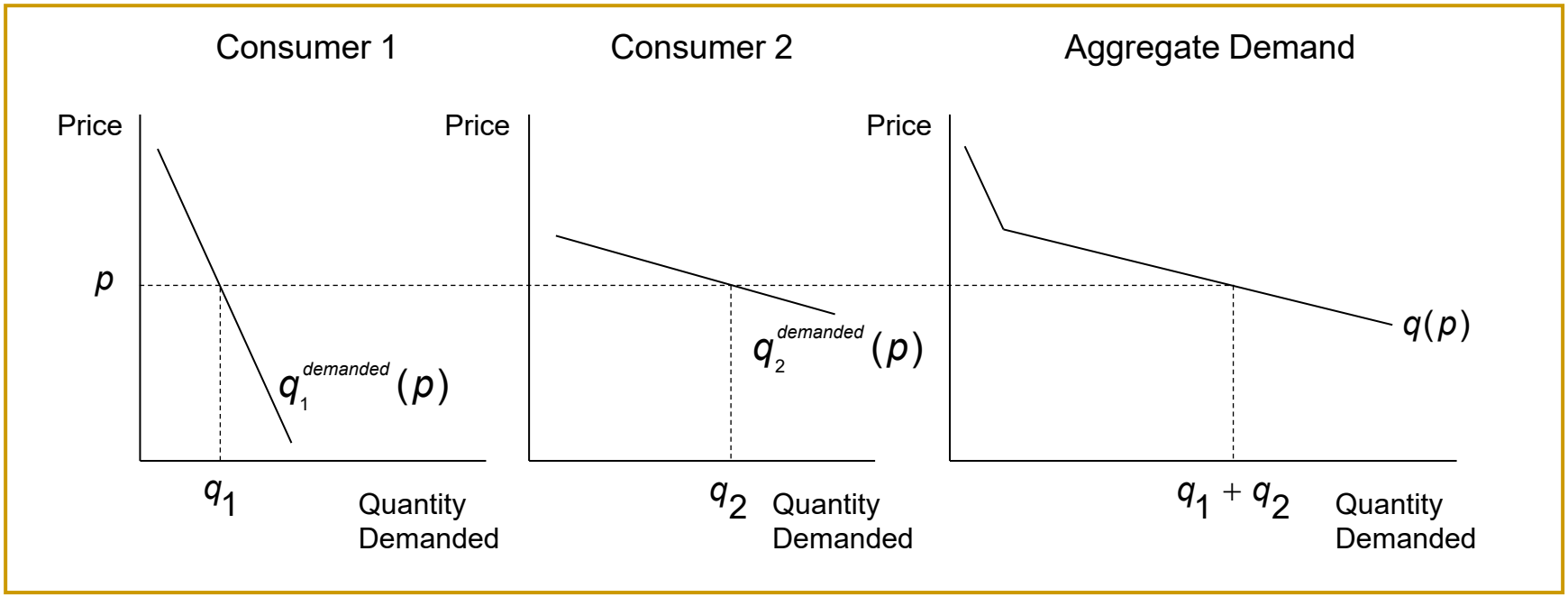


# Consumers

- Aggregate consumer demand
  - Sum of individual consumer demands = Aggregate demand (by definition)

$$\sum_i q_i^{demanded}(p) \equiv q(p)$$

where $q(p)$ is aggregate demand at price $p$



# Firms

- *Assumption*: Firms maximize their profits subject to the technology available to them
  - Profits ($\pi$) = Revenues ($r$) – Costs ($c$)
- To analyze the conditions under which a firm maximizes it profit, need to look at:
  - Costs and cost functions
  - Revenues and revenue functions
  - The relationship between costs and revenues when the firm maximizes its profit

# Firms

- Cost function
  - The cost to produce output *q* depends on the costs of the inputs to produce quantity *q*
  - The *technology* available to the firm provides the relationship between the inputs (including labor and capital) the firm purchases and the output the firm can produce with those inputs
  - The firm's *cost function* $c(q)$ is the minimal cost to the firm of producing quantity *q* given the firm's technology

# Firms

- Cost function—Some useful definitions
  - *Total cost* (TC) is the sum of all costs incurred by the firm to produce output *q*. Total cost is equal to the sum of fixed cost plus variable cost.
  - *Fixed cost* (FC) is that cost incurred by the firm that do not depend on the firm's level of production (e.g., the cost of the factory)
  - *Variable cost* (VC) is the cost incurred by the firm that depends on the firm's level of production
  - *Average total cost* (ATC) is total cost divided by output
  - *Average variable cost* (AVC) is variable cost divided by output
  - *Marginal cost* is the cost to the firm of producing one incremental unit of output

$$TC(q) = FC + VC(q)$$

$$ATC(q) = \frac{TC(q)}{q}$$

$$AVC(q) = \frac{AC(q)}{q}$$

$$MC(q) = C(q) - C(q-1)$$

$$= \frac{\Delta C}{\Delta q} \text{ where } \Delta q = 1$$

$$= \frac{dC}{dq}$$

# Firms

- Revenue function
  - Revenue ($r$) = Price ($p$) × Quantity sold ($q$)
  - The price $p$ is the market price
  - The quantity $q_j$ sold by the firm $j$ at a price $p$ depends on the firm's *residual demand curve*, that is, the demand by consumers for the firm's product when the market price is $p$:

$$q_j(p) = d_j^{residual}(p)$$

    - When there more than one firm servicing the market, firm $j$'s residual demand curve depends on the attractiveness of the firm's product relative to the products offered by competing firm
  - Summing the individual residual demand functions yields the aggregate consumer demand function

Sum of the demands for all firms

$$\sum_j d_j^{residual}(p) \equiv q(p)$$

Aggregate consumer demand function

# Firms

- Profit maximization
  - Firm's objective function in revenues (with quantity $q$ as the control variable):

$$\max_{q} \text{ Profits} = \text{Revenues} - \text{Costs}$$

$$= r(q) - c(q)$$

This equation says pick production level $q$ to maximize profits, that is, the difference between the revenues the firms earns when it sells quantity $q$ and the costs it incurs to produce quantity $q$.

In this maximization problem, the *objective function* is the function that we are trying to maximize, in this case $r(q) - c(q)$.

The *control variable* is the variable the firm gets to pick. In this simple model, the firm can control its production level $q$, but market conditions determine the price at which the sells. Variables that the firm does not control are called as *parameters*.

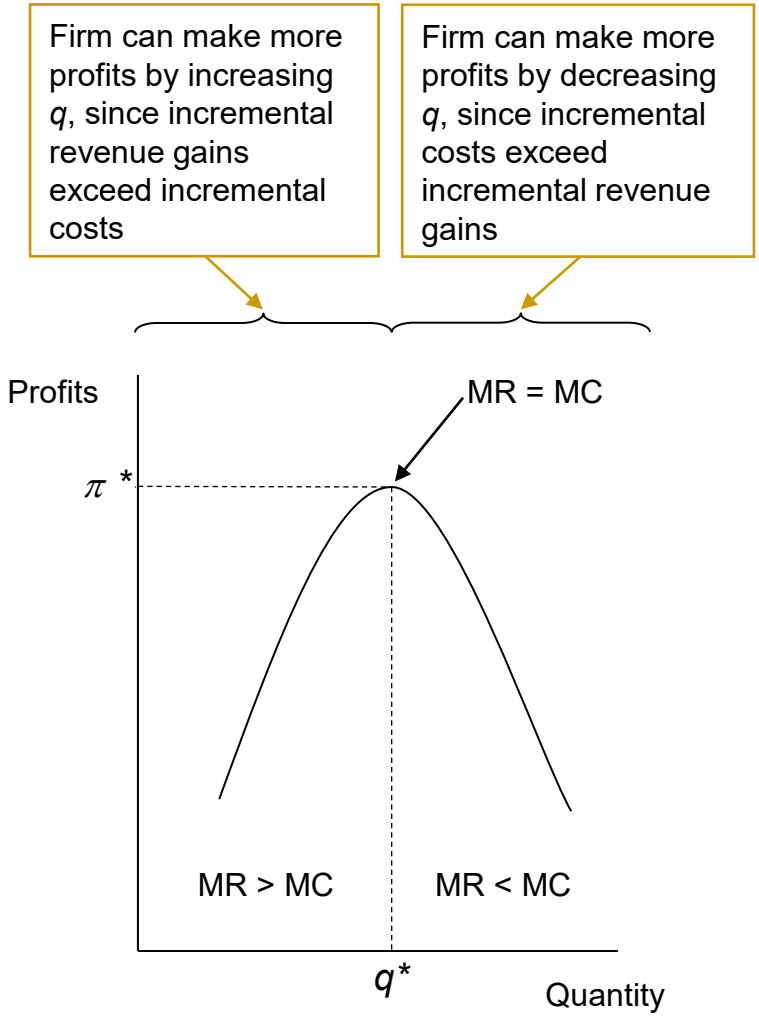
# Firms

- Profit maximization
  - The profit function looks like a hill
  - The profit-maximizing quantity $q^*$ is the quantity at the peak of the profit curve

Economists typically use an asterisk to denote an optimum, so that $q^*$ is the profit-maximizing level of output and $\pi^*$ is the maximum level of profits.

  - This is where MR = MC

MR = MC is called the *first order condition* for a profit maximum. This attribute of a profit maximum is invoked frequently in antitrust analysis.



# Firms

- Profit maximization
  - At its peak, the slope of the profit curve is zero, that is, where

$$\frac{\Delta \pi}{\Delta q} = 0$$

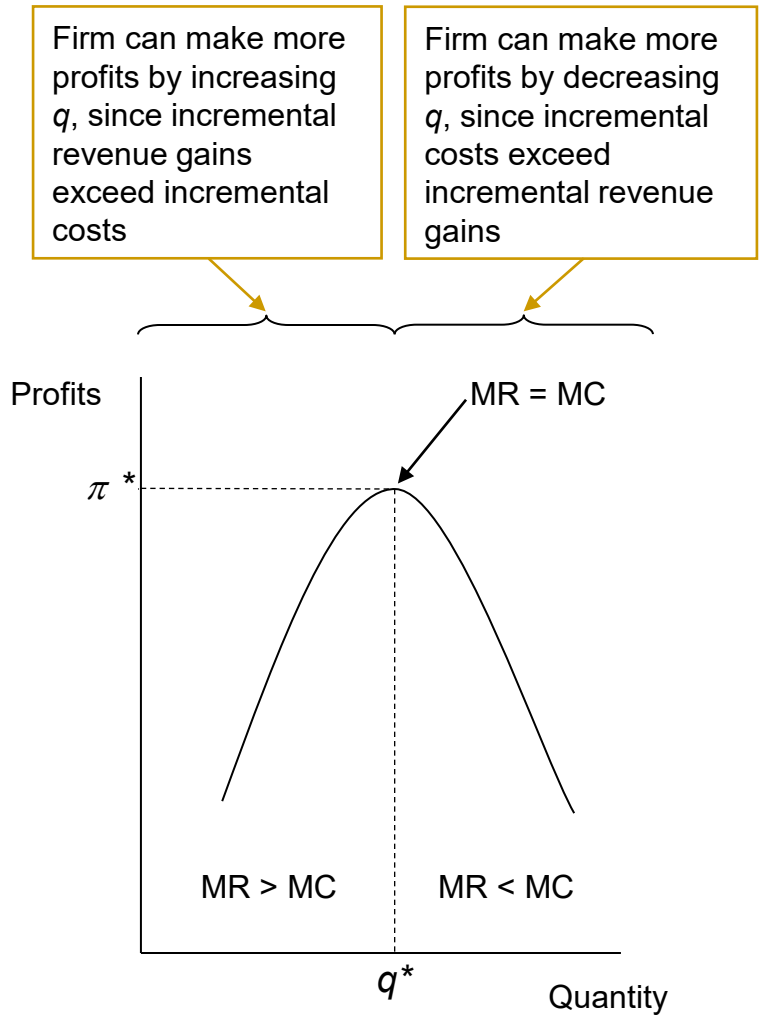
  - We get the same result by setting the derivative of the profit function to zero:

$$\frac{d\pi}{dq} = \frac{dr}{dq} - \frac{dc}{dq} = 0$$

  - Rearranging terms yields:

Marginal revenue → $\frac{dr}{dq} = \frac{dc}{dq}$ ← Marginal cost

which is just another way of saying marginal revenue equal marginal cost



# Firms

- Profit maximization for the individual firm—Example

Assume $q = 10 - p$ (firm residual demand curve)

so $p = 10 - q$ (inverse demand curve)

Revenue $(r) = pq = (10 - q)q = 10q - q^2$

Marginal revenue $(MR) = \frac{dr}{dq} = 10 - 2q$

Constant marginal cost $(MC) = 4$

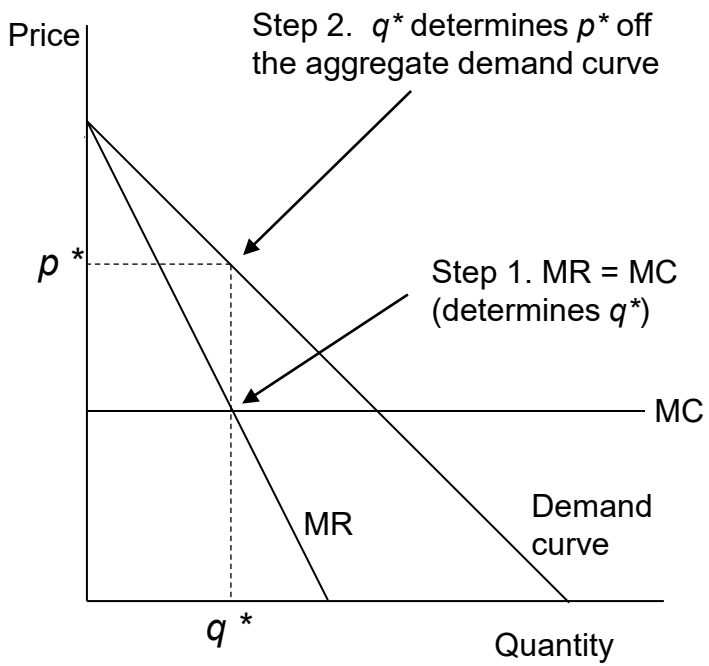
Equating marginal revenue and marginal cost

for a profit maximum: $10 - 2q = 4$

So $q^* = 3$ is the firm's profit-maximizing quantity

Plugging $q^*$ into the inverse demand function to obtain

$p^* = 7$ as the firm's profit-maximizing price



# Firms

- Profit maximization for the individual firm—Example (con't)

Inverse demand curve $p = 10 - q$

Revenue $(r) = pq$

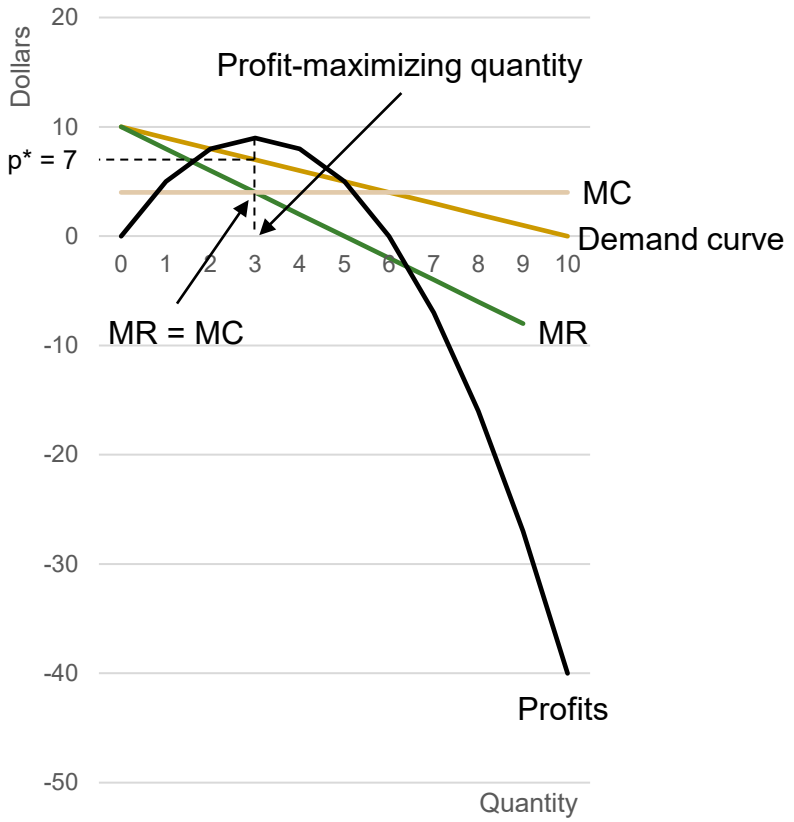
Marginal revenue $(MR_q) = 10 - 2q$

Constant marginal cost $(MC) = 4$

| p | q | Revenue | MR | Costs | MC | Profits |
|---|---|---|---|---|---|---|
| 10 | 0 | 0 | 10 | 0 | 4 | 0 |
| 9 | 1 | 9 | 8 | 4 | 4 | 5 |
| 8 | 2 | 16 | 6 | 8 | 4 | 8 |
| 7 | 3 | 21 | 4 | 12 | 4 | 9 |
| 6 | 4 | 24 | 2 | 16 | 4 | 8 |
| 5 | 5 | 25 | 0 | 20 | 4 | 5 |
| 4 | 6 | 24 | -2 | 24 | 4 | 0 |
| 3 | 7 | 21 | -4 | 28 | 4 | -7 |
| 2 | 8 | 16 | -6 | 32 | 4 | -16 |
| 1 | 9 | 9 | -8 | 36 | 4 | -27 |
| 0 | 10 | 0 | -10 | 40 | 4 | -40 |

Note: When demand is linear,

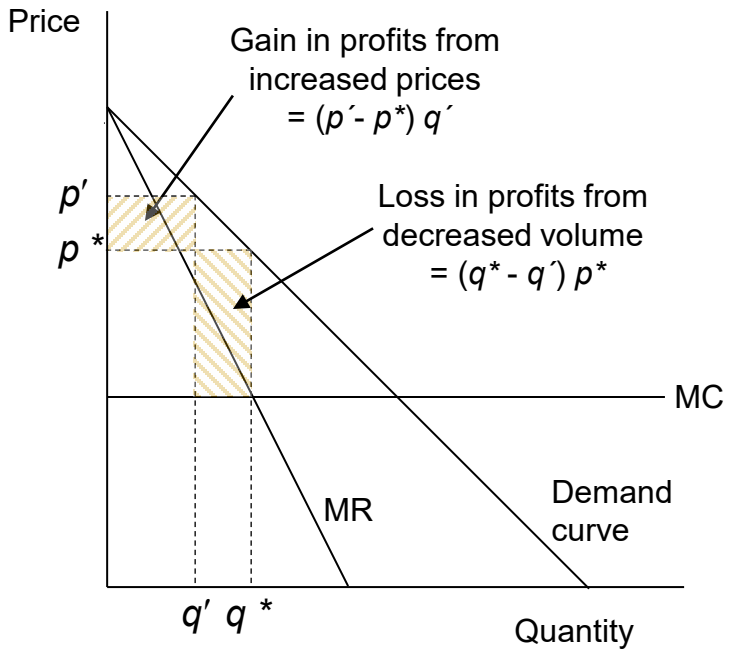
$$MR_q = \frac{(r_{q+1} - r_q) + (r_q - r_{q-1})}{2} = 10 - 2q$$



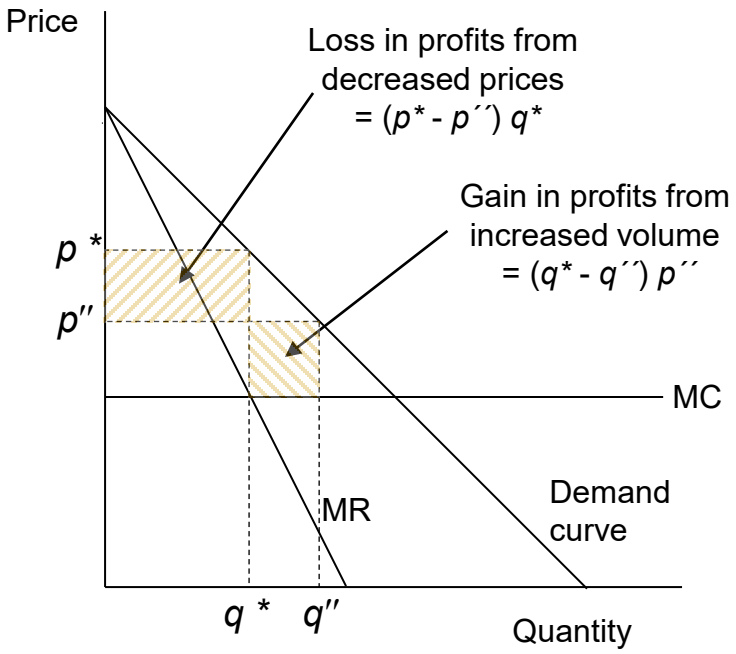
# Firms

- Illustration of profit loss from price changes from $p^*$
  - Assuming no fixed costs

Price increase from p*




Price decrease from p*




In each case, the loss from the price change exceeds the gain, so that profits decrease.

# Firms

- Cournot competition
  - Consider a firm's profit-maximizing function when it competes in quantities:

$$\max_{q} \pi = p(q)q - c(q)$$

Here, the production quantity is the control variable. Economists call this *Cournot competition*.

  - First order conditions for a profit maximum:

$$\frac{d\pi}{dq} = p + q\frac{dp}{dq} - \frac{dc}{dq} = 0$$

Marginal revenue | Marginal cost

So marginal revenue equals marginal cost at a profit maximum

    - *dp*/*dq* is the slope of the firm's (inverse) demand curve. It indicates the degree to which the firm can influence price by changing its level of production. But think about it here as the *decrease* in price that is required to clear the market when an additional unit is added to market supply.
    - So the gross loss in revenues that comes with the introduction of an additional unit of supply is the original quantity q times the reduction in price *dp/dq* necessary to clear the market. Marginal revenue is then *p* (the revenue earned by selling an additional unit minus this loss.

# Firms

- Bertrand competition
  - Consider a firm's profit-maximizing function when it competes in price:

$$\max_{p} \pi = pq(p) - c(q(p))$$

Here, firms compete using firm price as the control variable. Economists call this *Bertrand competition*.

  - First order conditions for a profit maximum:

$$\frac{d\pi}{dp} = q + p\frac{dq}{dp} - \frac{dc}{dq}\frac{dq}{dp} = 0$$

$$= q + \left(p - \frac{dc}{dq}\right)\frac{dq}{dp} = 0$$

Price minus marginal cost = Gross margin

Gross revenue gain from selling $q$ units when the price increases by 1

Gross margin times the loss of sales = gross revenue loss from lost sales

Change in market-clearing quantity with an increase in price (i.e., loss of sales due to a price increase)

  - So at a profit maximum, the gross revenue gain from increased prices on retained sales equals the gross revenue loss from losing the entire gross margin on lost sales

# Perfectly Competitive Markets

- *Definition*: A market in which no single firm can effect price, meaning:
  - The firm's residual demand curve is horizontal
  - The firm can sell any amount of product without affecting the market price
  - $\frac{dp}{dq} = 0$
  - $p = \frac{dc}{dq}$ (i.e., price = marginal cost)

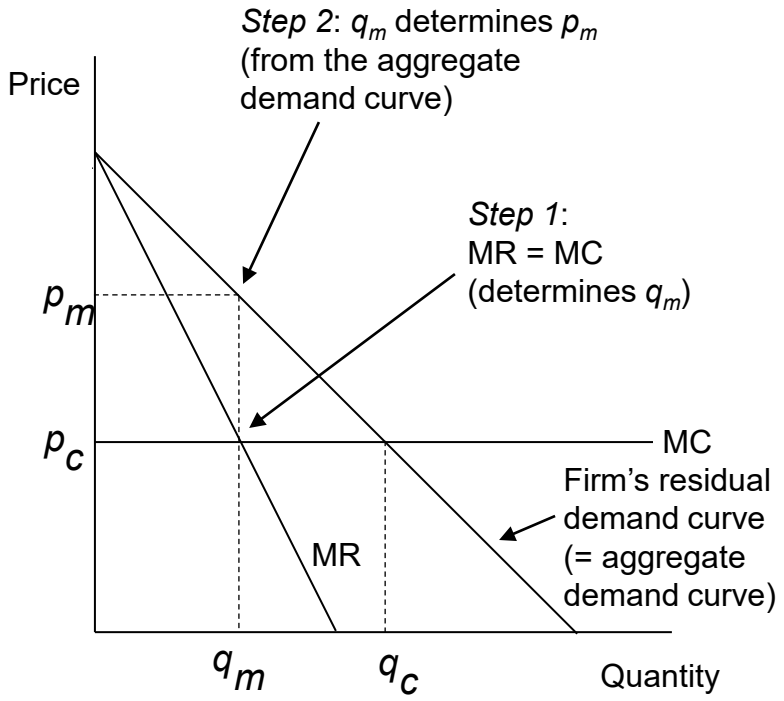
These four bullets are just different ways of saying exactly the same thing.

- What could cause a market to be perfectly competitive?
  - *Traditional theory*: Each individual firm's production is very small compared to aggregate demand at any price, so that individual production changes cannot move significantly along the aggregate demand curve
    - This implies that there are a very large number of firms in the market
  - *Modern theory*: Competitors in the market place react strategically but non-collusively to price or quantity changes by a firm in ways that maintain the competitive equilibrium

# Perfect Monopoly

- *Definition*: A market in which only one firm operates*
  - In this case, the firm's residual demand curve is the same as the aggregate demand curve
  - As always, the firm's chooses production so that its marginal cost is equal to marginal revenue

* Keep in mind that this is the way economists define "perfect monopoly." As we shall see in a later class, the legal definition of "monopoly" is quite different.

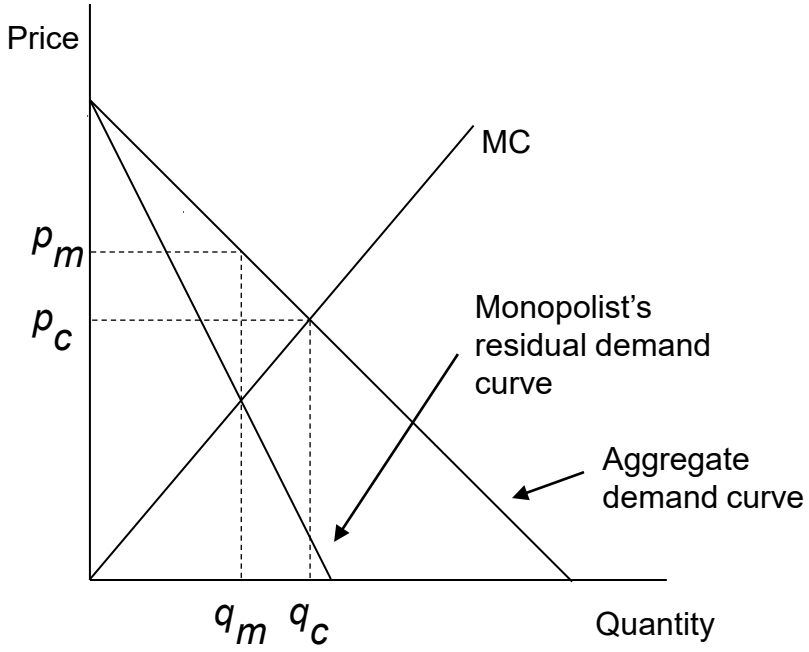


# Summary of Key Results So Far

- Profit-maximizing firms choose production levels so that marginal revenue equals marginal cost (MR = MC) (in Cournot competition)
  - Step 1: MR = MC determines the firm's profit-maximizing production level $q^*$
  - Step 2: The firm's residual demand curve determines the firm's profit-maximizing price $p^*$ given $q^*$
- In a perfectly competitive market, a firm's choice of production level cannot effect market price, so:
  - Marginal revenue is equal to the market unit price (MR = $p_{market}$),
  - MR = MC implies that MC = $p_{market}$, so firm picks $q_{comp}$ to satisfy this condition
    - We have not discussed how the market price is determined in a perfectly competitive market. For our purpose, just take market price as a given.
  - By definition, firm cannot affect market price, so $p_{comp} = p_{market}$
- In a perfectly monopoly market, consumers can only purchase from the monopolist, so
  - The firm's residual demand curve is the same as the aggregate demand curve
  - MR = MC determines the monopolist's profit-maximizing quantity $q_m$
  - The aggregate demand curve determines $p_m$ given $q_m$

# Incentives for Price Fixing

- Consider the difference between a firm's profits under perfect competition and perfect monopoly
  - Example:

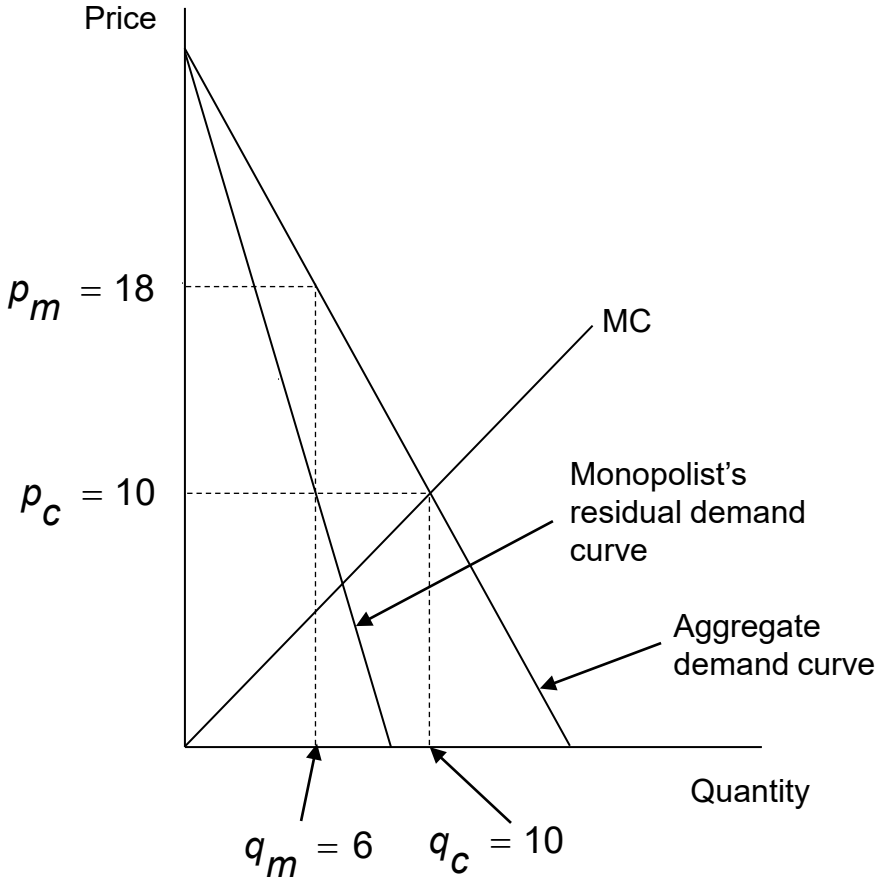



| | |
|---|---|
| Aggregate demand: | $p = 30 - 2q$ |
| Marginal cost: | $MC=q$ |
| Total cost: | $TC=\frac{1}{2}q^2$ |
| Competitive market: | $p = MC$ |
| Competitive quantity: | $q_c$=10 (5 per firm) |
| Competitive price: | $p_c$=10 |
| Competitive profits: | $\pi_c$=50 (25 per firm) |
| Monopoly market: | $MR = MC$ |
| Monopoly quantity: | $q_m$=6 |
| Monopoly price: | $p_m$=18 |
| Monopoly profits: | $\pi_m$=90 |

In this example, the monopoly profits are almost twice the total competitive profits

# Gains from Cartelization

- Example
  - Two symmetric firms in the market
- If the firms coordinate their activities, they can
  - Collectively produce the monopoly output of 6 units
  - Split the monopoly profits of $90, with $45 going to each
  - Each earns $45 instead of the competitive profit of $25, a gain of 80%



# Gains from Cartelization

- Monopoly rents
  - The difference in profits between the monopoly and competitive equilibria is called the *monopoly rent*
    - In economic terms, a *rent* is the return due to some scarcity in supply
  - Monopolies earn profits above the competitive level because:
    - They restrict their output and so create an artificial scarcity in supply,
    - Causing *inframarginal customers*—that is, those who value the product at levels above the competitive price—to bid up the market-clearing price
      - This is sometimes called “riding up the demand curve”

The idea that firms restrict output in order to create an artificial scarcity in supply and thereby increase the market-clearing price is fundamental to many theories of anticompetitive harm in antitrust law.

# How Do Cartels Increase Prices?

- Cartels increase prices by either or both of—
  - Reducing the incentives or ability of customers to shift purchases cartel members, usually by:
    - Reducing or eliminating the price differentials among otherwise competing cartel members
    - Allocating customers to specific cartel members

> Technically, this reduces the elasticity of the residual demand curve for each cartel member, which causes each member's equilibrium price to increase.

  - Making "side payments" to members that do not gain (or not gain enough) directly from increases in their own profits from those members that do gain

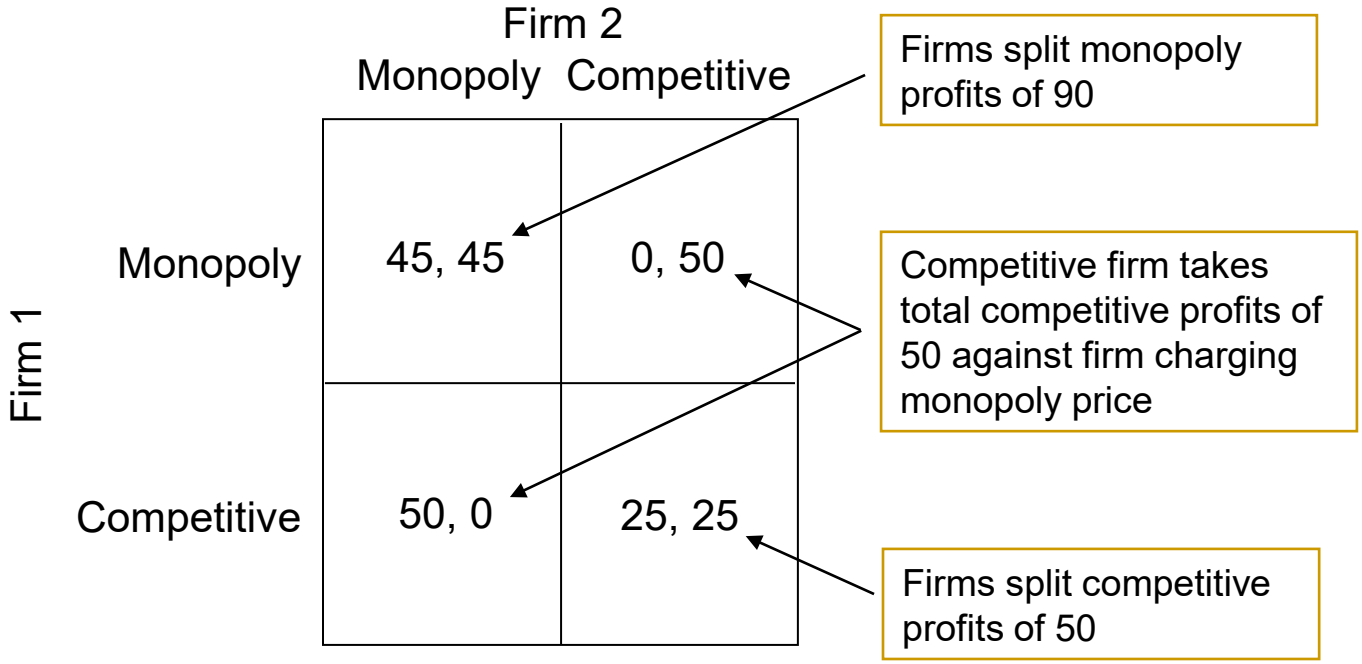
> This is how one-shot bid rigging works. One member is selected to bid on the contract at a supracompetitive price, all of the over members bid at a higher price (or do not bid at all), and the selected member compensates the other members for their cooperation.

# Conditions for Cartel Success

- Necessary conditions for cartel success
  - Cartel members must control the bulk of production in the market
    - Otherwise, non-cartel incumbent firms could expand production levels and return market to the competitive equilibrium
    - For the same reason, there must barriers to entry into the market high enough to prevent new firms from entering and restoring a competitive level of output
  - No countervailing buyer power that could force firms to return to competitive pricing
  - The cartel rents must exceed—
    - The costs of organizing and maintaining the cartel, plus
    - The expected costs from possible government and private enforcement actions
      - Since sanctions are substantial, this condition requires cartel members to believe that there is only a low probability of enforcement action
- Incentive compatibility
  - But even if all of these conditions are satisfied, is cartel coordination compatible with each firm's profit-maximizing incentives if the cartel agreement cannot be legally enforced?

# Single-Period Cartel Game

- Price fixing "prisoner's dilemma" in single period game
  - Two symmetrical firms




*Key result*: Charging the competitive price is the *dominant strategy* for each firms, regardless of what strategy the other firm chooses. But mutual monopoly strategies earn each firm higher profits.

# Multiperiod Cartel Game

- Multiperiod games
  - Firms seek to maximize profits over the course of the entire game, not a single period as in a one-shot Prisoner's Dilemma
  - Assume an infinitely repeated game
    - Payoff matrix is the present discounted values of the profit streams over the life of the game
      - Remember that the present value (*PV*) of a perpetual annuity that pays out an amount *P* every period with a discount rate of *r* is:

$$PV_{\text{perpetual annuity}} = \frac{P}{r}$$

    - Assume $r = 8\%$
  - *Query*: Does Firm 1 cooperate in period 1?
    - Assume firms play "tit-for-tat": Firms cooperate until one deflects, then the other deflects for the remainder of the game
      - So firms cooperate until one deflects, then both deflect for the remainder of the game

# Multiperiod Cartel Game

- "Tit for tat" infinitely repeated game
  - Recall single period game (from earlier slide)

| | | Firm 2: Monopoly | Firm 2: Competitive |
|---|---|---|---|
| Firm 1 | Monopoly | 45, 45 | 0, 50 |
| Firm 1 | Competitive | 50, 0 | 25, 25 |

  - Infinitely repeated game (given strategy played in period 1)

PV of a perpetual stream of individual monopoly profits of 45

PV of a perpetual stream of individual competitive profits of 25

| | | Firm 2: Monopoly | Firm 2: Competitive |
|---|---|---|---|
| Firm 1 | Monopoly | 563, 563 | 288, 338 |
| Firm 1 | Competitive | 338, 288 | 313, 313 |

Monopoly firm takes 0 profits in Period 1 and PV of competitive profits for the remainder of the game

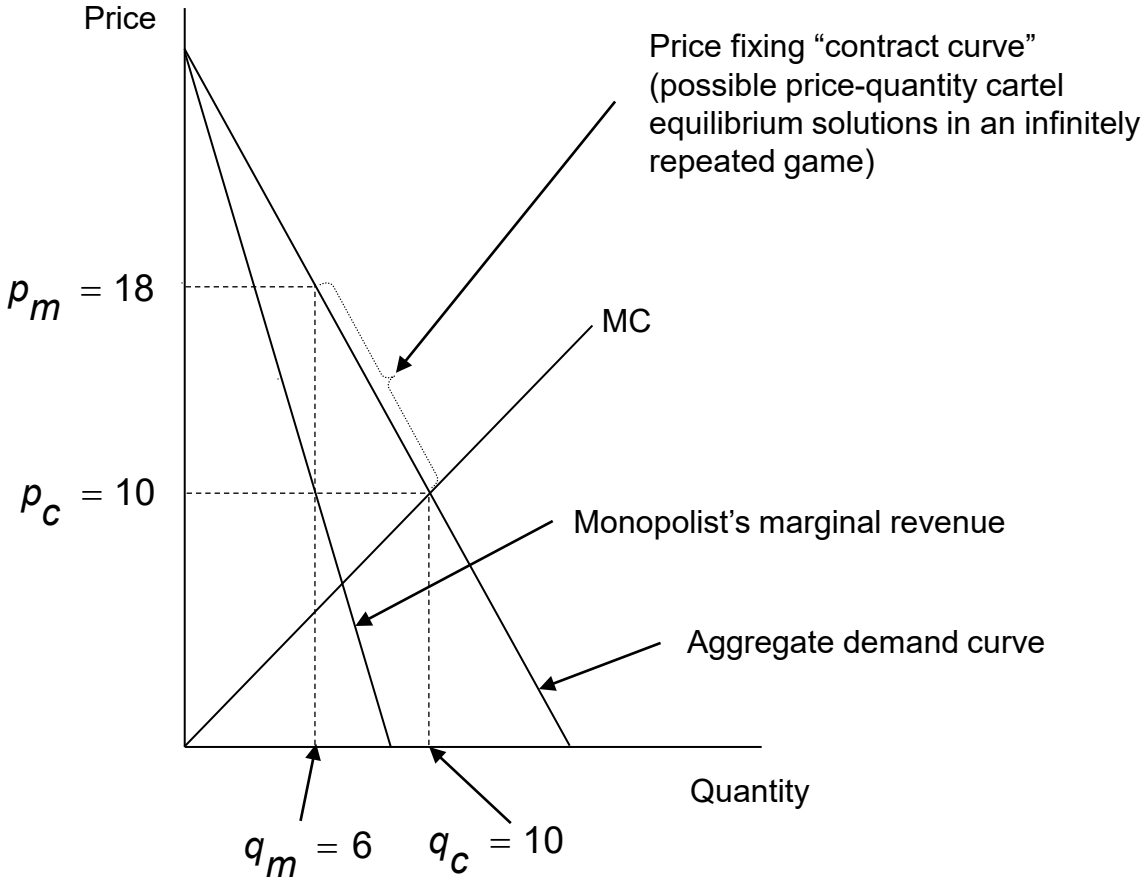
Competitive firm takes total monopoly profits of 50 in Period 1 and PV of competitive profits for the remainder of the game

# Repeated Cartel Games

- Repeated games
  - Firms seek to maximize profits over the course of the entire game, not a single period as in a one-shot Prisoner's Dilemma
- Infinitely repeated games
  - *Folk Theorem:* In an infinitely repeated game with homogenous products, any common pricing strategy ($p_1 = p_2$) between the competitive price and the monopoly price can be supported in equilibrium
  - *Key result*: The single-period Prisoner's Dilemma problem disappears
- Repeated games with uncertain end points
  - Approximate infinitely repeated games where
    - The probability mass of ending is sufficiently far out, and
    - Players have sufficiently low discount rates, so that distant profits have significant present discounted value

There are many variants of the Folk Theorem. In this version, the game does not permit price discrimination, so that all firms have to choose the same price

# Economics of Price Fixing



# Economics of Price Fixing

- Take-aways
  - Cartel strategies can be equilibrium strategies for firms
    - Indeed, there are an infinite number of such strategies on the cartel "contract curve" between the competitive price and the monopoly price
    - BUT not all price pairs are equilibrium solutions
      - For example, in a symmetric game between two firms selling nondifferentiated products, the firms have to choose the same price
  - Cartel can still suffer from Prisoner Dilemma problems when:
    - A firm believes that the game might end in the "near" future, or
    - A firm believes that some other firm believes that the game might end in the "near" future and therefore will defect
- Resulting questions
  - How does a cartel "pick" an initial cartel strategy from the infinite number of cartel equilibria?
  - How do cartel members minimize the Prisoner's Dilemma problem?

# Initializing a Cartel

- Cartel members must "pick" a common cartel strategy
  - In a simple model, must specify p and qi for each firm i in the cartel
  - More realistically, the cartel strategy may be a simple behavioral rule:
    - Raise price by 10%
    - Reduce production levels by 10%
    - Limits on discounting off of list price
    - Do not "poach" each other's customers or territories (i.e., market allocations)

# Initializing a Cartel

- The cartel solution must allocate the resulting cartel profits in a mutually satisfactory way among cartel members
  - *Key constraint*: A firm will participate in a cartel if and only to the extent the firm believes that participation is in the firm's individual self-interest
  - Firms not satisfied with their cartel profit allocation are likely to either:
    - Not agree to the cartel solution in the first place, or
    - Join the cartel but cheat on the cartel price
  - Simple behavioral rules can be attractive
    - Easily understood and followed
    - Tend to preserve pre-existing market shares (and allocate cartel profits accordingly, which the cartel members are likely to see as "fair")
    - But are unlikely to capture full monopoly rents
- This bargaining problem ultimately may not yield a cartel agreement

# "Enforcing" a Cartel

- A cartel agreement will not be effective unless the members stick to it
  - "No honor among thieves"
- Cheating on the cartel rule
  - A firm cheats if it charges lower prices or produces higher output than it is allowed under the rules of the cartel
  - Cheating is destabilizing to the cartel
    - Cheating drives up aggregate production, and so depresses the market-clearing price to the detriment of other cartel members who comply with the cartel rule
    - If a firm believes that another cartel member is cheating (or will cheat), then that firm has an increased incentive to cheat rather than get burned

# "Enforcing" a Cartel

- If cartel is to succeed, important to deter cheating
  - Even in an infinitely repeated game, each cartel member has an incentive to cheat if:
    - Cheating cannot be detected, or
    - No adverse consequences to the firm from cheating on the cartel rule
  - Deterrence requires
    - A means of monitoring compliance with the cartel rule
    - A means of punishing those firms that cheat

# "Enforcing" a Cartel

- To deter cheating, cartel members must be able to detect cheating
  - Observable prices, production levels, or market shares can make detection easy
    - Readily observable variables are likely to inform the selection of the cartel rule (i.e., pick cartel strategies where compliance can be monitored)
    - This is true even if the resulting cartel rule does not achieve the maximum cartel profits (that is, the monopoly profit)
  - When variables are not easily observable, cartel rule may require members to report on operations.
    - But are the reports reliable?

# "Enforcing" a Cartel

- Punishment
  - Moral suasion
    - Tends to be ineffective[1]
  - Targeting defector with price war
    - Effective because narrowly focused at the cheating firm and so preserves much of the cartel rents for the other members
    - But requires
      - Ability to identify the cheating firm
      - Ability to target the cheating firm's customers
      - No arbitrage between the cheating firm's low-paying customers and the other firms' high-paying customers
  - "Grim trigger" strategy
    - Whenever cheating is first detected, all cartel members return to the competitive price and stay there
    - This is a severe but often effective strategy, since it promises a complete end to cooperation

[1] For a good example, see United States v. Beaver, 515 F.3d 730 (7th Cir. 2008).

# Price-Fixing Mechanisms

- United States v. Trans-Missouri Freight Ass'n[1]
  - Formed to establish "reasonable rates" on members' competitive freight traffic between the Missouri River and the West Coast
  - Association to set rates for all competitive traffic in region
  - Regular monthly meetings in which each member must be represented
  - Members must give 5 days' notice before meeting on any proposed rate reduction
  - All rate changes to be voted on by membership at regular meeting; members bound by vote
  - Exceptions
    - For meeting outside competition (subject to review for good faith)
    - On notice given at a regular meeting, a member could change in 10 days to a different rate specified in the notice
  - Association chairman to publish rates
  - Members may withdraw on 30 days notice

[1] 166 U.S. 290 (1897).

# Price-Fixing Mechanisms

- United States v. Addyston Pipe & Steel Co.[1]
  - Six cast-iron pipe manufacturers—accounting for a majority of U.S. cast iron pipe sales—formed the Southern Associated Pipe Works covering 36 states and territories
  - Originally divided market and paid association 10% "bonus" on work
    - Job rates set by 5-member supramajority vote
    - Bonus dividends paid pro rata by capacity
    - Arrangement in effect only for a few months before it failed
  - When bonus system failed to raise prices, formed "auction pool“
  - In both cases association orchestrated fraudulent "competing bids"

[1] 85 F. 271 (6th Cir. 1898), *mod. and aff'd*, 175 U.S. 211 (1899).

# Price-Fixing Mechanisms

- American Column & Lumber Co. v. United States[1]
  - Information exchange through trade association of detailed individual member statistics on sales made (including price and identity of purchaser), price lists, production, and inventories
  - Trade association meetings served as a forum for discussions of prices, production, trade statistics, and trade practices
  - In particular, used as forum to discuss restrictions in production in order to maintain prices at war levels

[1] 257 U.S. 377 (1921).

# Price-Fixing Mechanisms

- Sugar Institute v. United States[1]
  - Agreement to adhere to previously announced prices and terms of sale, even though advance price announcements are perfectly lawful and even though the particular prices and terms were not themselves fixed by private agreement.

[1] 297 U.S. 553 (1936).

# Price-Fixing Mechanisms

- United States v. Socony-Vacuum Oil Co.[1]
  - Agreement among competitors to engage in a program of buying surplus gasoline on the spot market in order to prevent prices from falling sharply constitutes price fixing, even though there was no direct agreement on the actual prices to be maintained.

[1] 310 U.S. 150, 223 (1940).

# Price-Fixing Mechanisms

- FTC v. Cement Institute[1]
  - Agreement among competitors to use a specific method of quoting prices
    - In this case, multiple basing point pricing

[1] 333 U.S. 683 (1948).

# Price-Fixing Mechanisms

- Plymouth Dealers' Ass'n of No. Cal. v. United States[1]
  - Agreement among competitors to use common fixed list price constituted per se illegal horizontal price-fixing despite independently negotiated departures from the list prices

[1] , 279 F.2d 128, 132 (9th Cir.1960).

# Price-Fixing Mechanisms

- National Society of Professional Engineers v. United States[1]
  - Agreement among competing firms of professional engineers to refuse to discuss prices with potential customers until after negotiations have resulted in the initial selection of an engineer

[1] 435 U.S. 679 (1978).

# Price-Fixing Mechanisms

- Catalano, Inc. v. Target Sales, Inc.[1]
  - Agreement among competitor-beer wholesalers to refuse to sell unless the retailer makes payment in cash either in advance or on delivery—effectively eliminating short-term credit—constitutes price fixing, even if wholesalers are free to set other attributes of price.
  - Widely read to make agreements regarding any attribute of price a form of price fixing

[1] 446 U.S. 643 (1980) (per curiam).

# Price-Fixing Mechanisms

- Gelboim v. Bank of American Corp.[1]
  - *Held*, the complaint stated a claim of per se illegal horizontal price fixing under *Catalano* where the complaint alleged—
    - The defendant-banks competed with one another in the sale of financial instruments
    - The price of many financial instruments were indexed by various formulae to the U.S. Dollar LIBOR (the London Interbank Offered Rate)
    - The U.S. Dollar LIBOR was set daily based on the responses of a panel of the 16 defendant banks as to rate each bank said it could borrow overnight from another bank in a reasonable market size just prior to 11 a.m.
      - Each bank submitted a rate, the highest four and lowest four rates were discarded, and the LIBOR was set equal to the average of the remaining eight banks
    - The defendant banks conspired to depress the LIBOR rate by coordinating their responses in order to—
      - increase profits in the sale of LIBOR-based financial instruments, and
      - project financial health (in the wake of the 2007 financial crisis)[2]

[1] 823 F.3d 759 (2016).
[2] *Id*. at 770 ("LIBOR forms a component of the return from various LIBOR-denominated financial instruments, and the fixing of a component of price violates the antitrust laws.").

# Price-Fixing Mechanisms

- Extends to horizontal division of markets
  - United States v. Topco Associates, Inc.[1]
    - Agreements among actual or potential competitors to allocate territories is tantamount to price fixing
    - NB: The defendants had never competed in the same market, but had simply agreed to allocate markets
  - Palmer v. BRG of Georgia, Inc.[2]
    - BRG and HBJ, the only two firms offering bar review courses in Georgia, agreed that
      - BRG would become a licensee of HBJ in Georgia, offer its courses under the HBJ trade name, and pay royalties to HBJ
      - HBJ would withdraw and not offer courses in Georgia as long as BRG remained its licensee
      - BRG agreed that it would not offer courses outside of Georgia

[1] 405 U.S. 596 (1972).
[2] 498 U.S. 46 (1990) (per curiam).

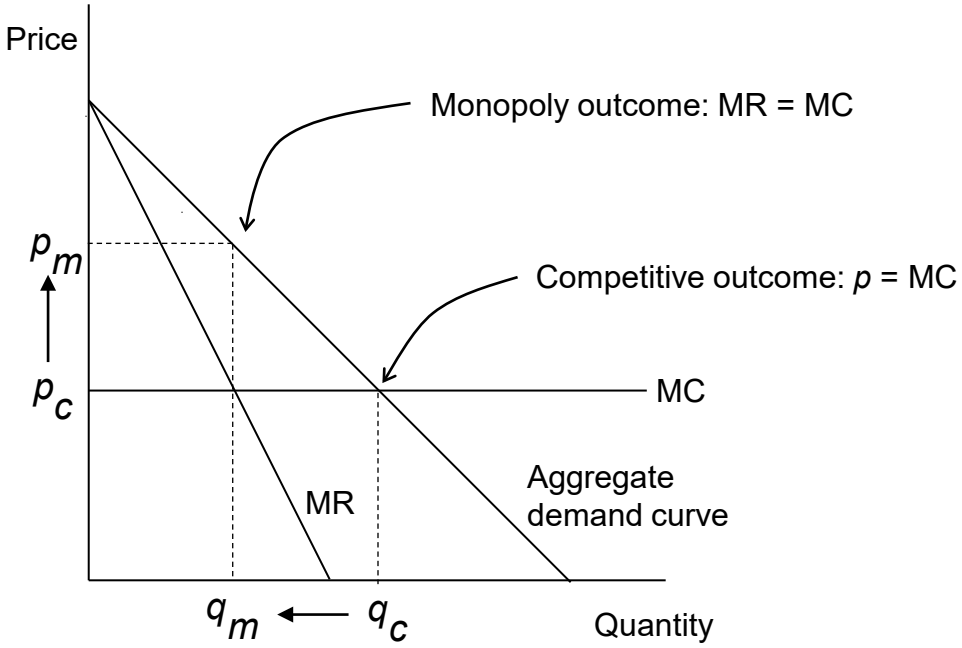
# Public Policy of Price Fixing

- Modern view on why monopolies are bad:
  - Increase price and decrease output
  - Shift wealth from consumers to producers
  - Create economic inefficiency ("deadweight loss")

  - May (or may not) have other socially adverse effects
    - Decrease product or service quality
    - Decrease the rate of technological innovation or product improvement
    - Decrease product choice

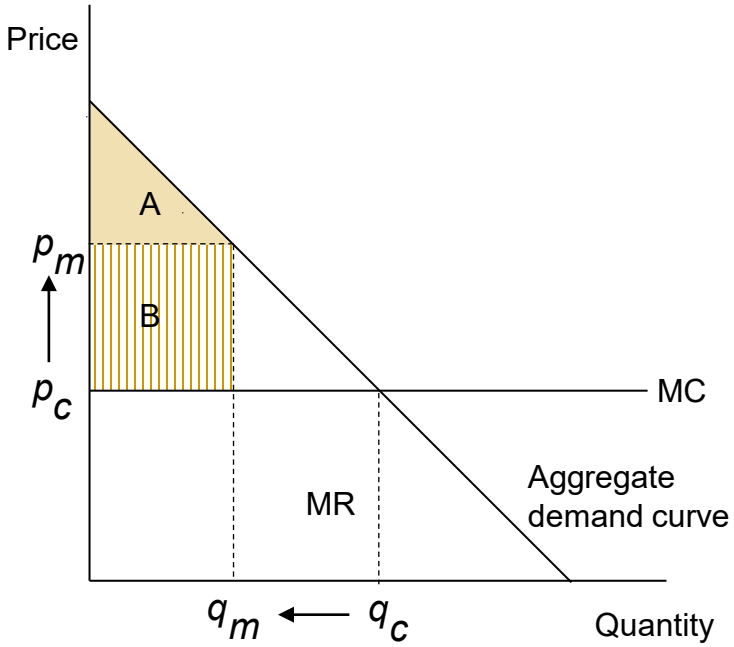
# Public Policy of Price Fixing

- Output decreases: $q_c \searrow q_m$
- Prices increase: $p_c \nearrow p_m$



# Public Policy of Price Fixing

- Shift in wealth from inframarginal consumers to producers*
  - Total wealth created ("surplus"): A + B
  - Sometimes called a "rent redistribution"

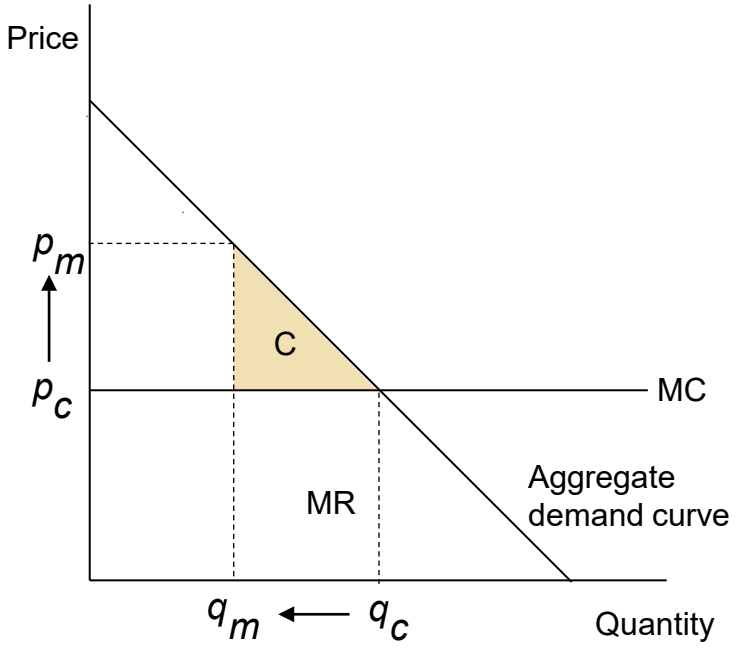



| | Competitive | Monopoly |
|---|---|---|
| Consumers | A + B | A |
| Producers | 0 | B |

* Inframarginal customers here means customers that would purchase at both the competitive price and the monopoly price

# Public Policy of Price Fixing

- "Deadweight loss" of surplus of marginal customers*
  - Surplus C just disappears from the economy
  - Creates "allocative inefficiency" because it does not exhaust all gains from trade




* Marginal customers here means customers that would purchase at the competitive price but not at the monopoly price

# Public Policy of Price Fixing

- Challenge for public policy
  - Create an environment that maximizes the probability that each firm will choose the competitive strategy
    - Make collusive agreements unenforceable as a matter of contract law
    - Make collusive agreements illegal as a matter of antitrust law
    - Find ways to increase the probability of detecting cartels in order to challenge them
      - "Reward" coconspirators that report violations to the enforcement agencies
    - Impose stiff punishments for price-fixing antitrust violations
      - Increase the level of sanctions to compensate for a low probability of detection, so as to keep the expected level of punishment high