光华管理学院
Guanghua School of Management

Chapter 9 & 10

Imperfect Competition

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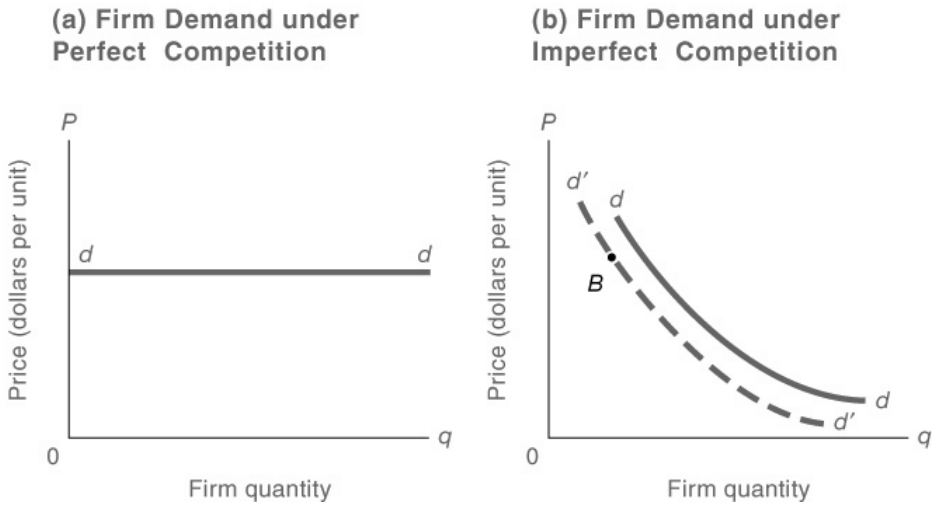
Outline of This Lecture

1. Patterns of Imperfect Competition
   - 1.1 Definition
   - 1.2 Alternative Market Structures
   - 1.3 Sources of Market Power
2. Monopoly Behavior
   - 2.0 Review of Elasticity
   - 2.1 Demand, MR, Elasticity, and TR
   - 2.2 Profit Maximization of Monopoly
   - 2.3 Marginal Principle
3. Public Policies to Combat Market Power
4. Competition among the Few
   - 3.1 Market Power and Its Measure
   - 3.2 Three Cases of Imperfect Competition (Game Theory)
5. Pricing Strategy

1. Patterns of Imperfect Competition

1.1 Definition of Imperfect Competition

- ***Imperfect Competition*** prevails in a industry whenever individual sellers can affect the price of their output.



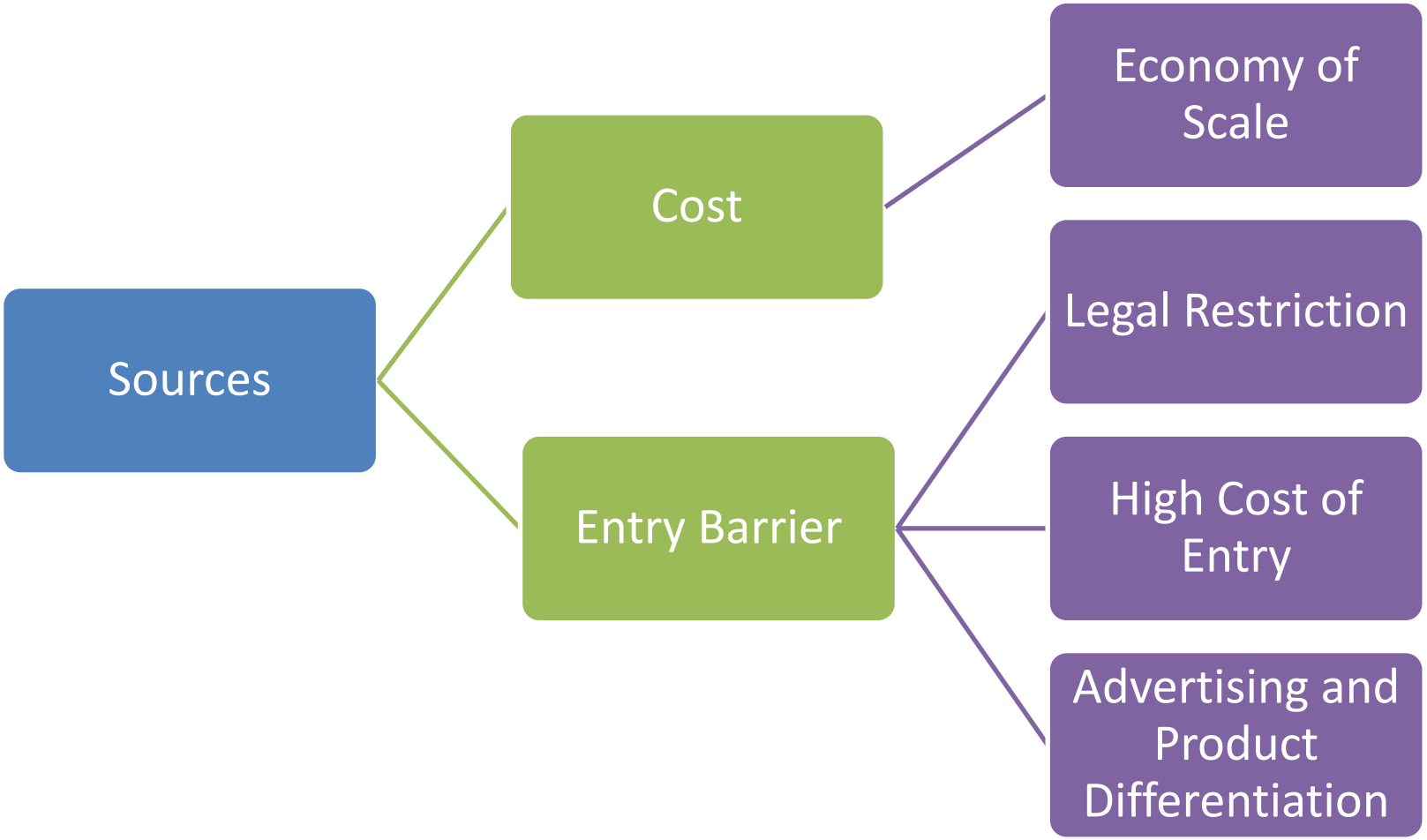
	Perfect Competition	Imperfect Competition
Ability to affect prices	Price-taker	Price-maker
Shape of the demand curve	Horizontal Line	Downward sloping
Price elasticity	Perfectly elastic	Finite elasticity

1.2 Alternative Market Structures

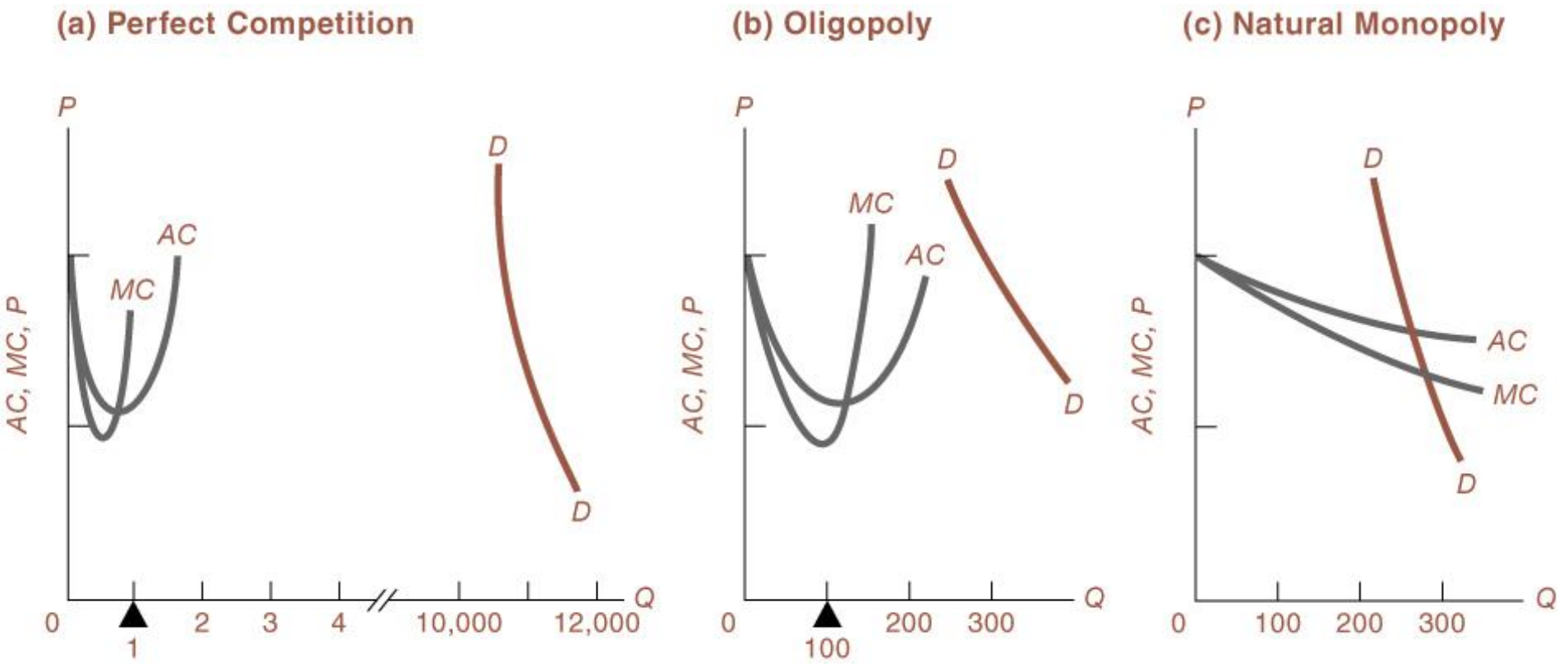
Types of Market Structures				
Structure	**Number of producers and degree of product differentiation**	**Part of economy where prevalent**	**Firm's degree of control over price**	**Methods of marketing**
Perfect competition	Many producers; identical products	Financial markets and agricultural products	None	Market exchange or auction
Imperfect competition				
Monopolistic competition	Many producers; many real or perceived differences in product	Retail trade (pizzas, beer, . . .), personal computers	Some	Advertising and quality rivalry; administered prices
Oligopoly	Few producers; little or no difference in product	Steel, chemicals, . . .		
	Few producers; products are differentiated	Cars, word-processing software, . . .		
Monopoly	Single producer; product without close substitutes	Franchise monopolies (electricity, water); Microsoft Windows; patented drugs	Considerable	Advertising

TABLE 9-1. Alternative Market Structures

1.3 Sources of Market Power



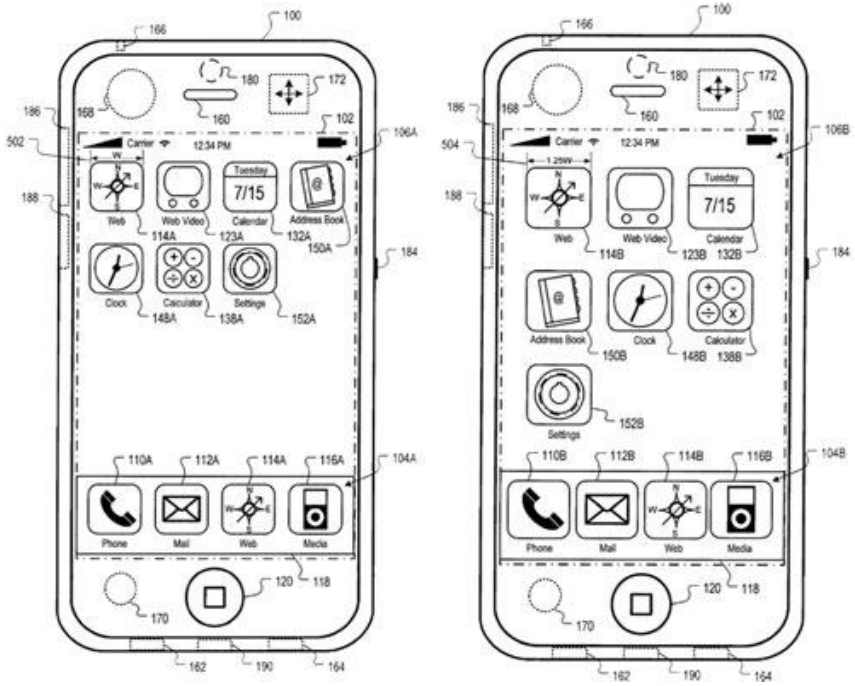
Market Structure Depends on Relative Cost and Demand Factors



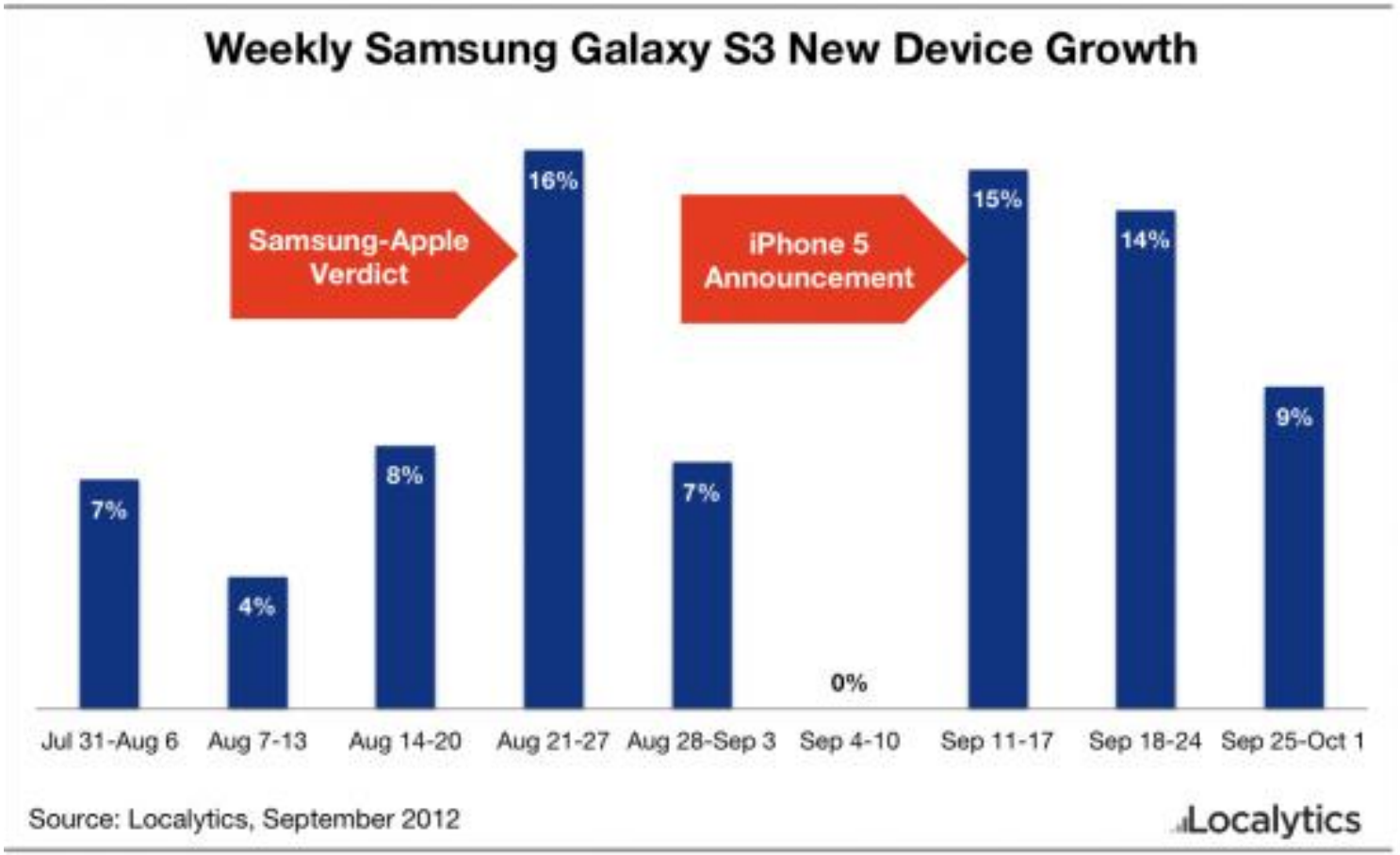
- ***Increasing Return to Scale (IRS):*** Average cost decreases as firm increases output
- ***Natural Monopoly :*** Industry's output can be efficiently produced only by a single firm
  - With perfect IRS, average and marginal cost fall forever.
  - One firm is so efficient than a collection of small firms

Legal Restrictions

- Patent: grant to an inventor to allow temporary exclusive use (or monopoly) of the product or process that is patented
- Purpose
  - Protect incentive for innovation
  - But we have to realize that having patent does not always mean that your product is immune from competition



Does Samsung Really Loss that much?



Outline

1. Patterns of Imperfect Competition
2. Monopoly Behavior
3. Public Policies to Combat Market Power
4. Competition among the Few
5. Pricing Strategy

Outline

1. Patterns of Imperfect Competition
2. **Monopoly Behavior**

Review (Ch. 4)

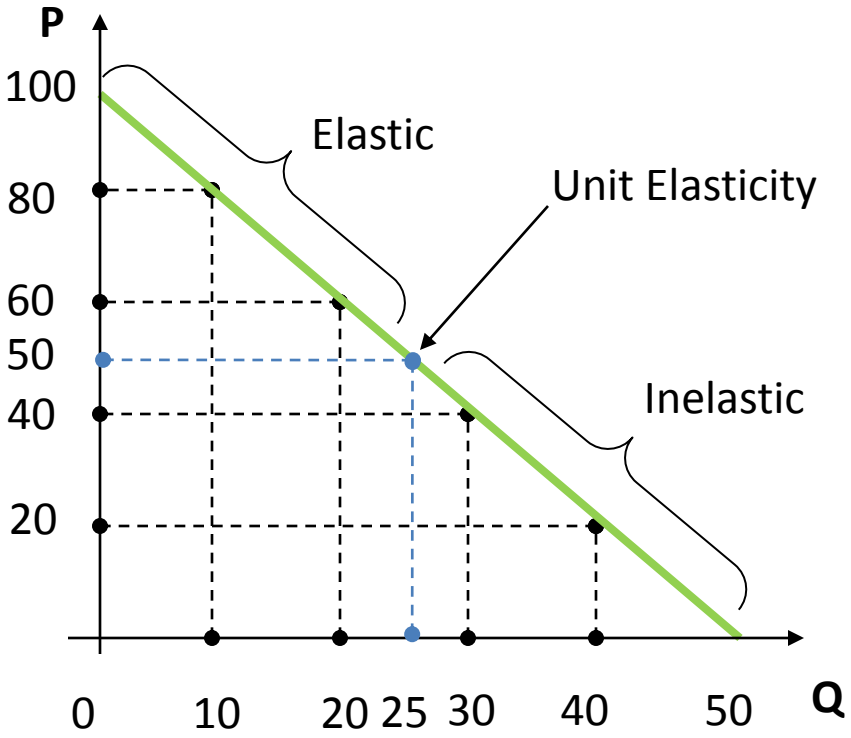
- ***Price Elasticity of Demand***: how much the quantity demanded of a good changes when its price changes.
- Formula:
  - Because of law of demand, demand usually decreases as price increase
  - For convenience, we drop the minus signs so elasticity are all positive

$$E_D = \left|\frac{\%\Delta q}{\%\Delta P}\right| = \left|\frac{\Delta q/q}{\Delta P/P}\right| = \left|\frac{\Delta q}{\Delta P} \cdot \frac{P}{q}\right|$$

$$\begin{cases} E_D > 1 & \text{Price-elastic Demand} \\ E_D = 1 & \text{Unit-elastic Demand} \\ E_D < 1 & \text{Price-inelastic Demand} \end{cases}$$

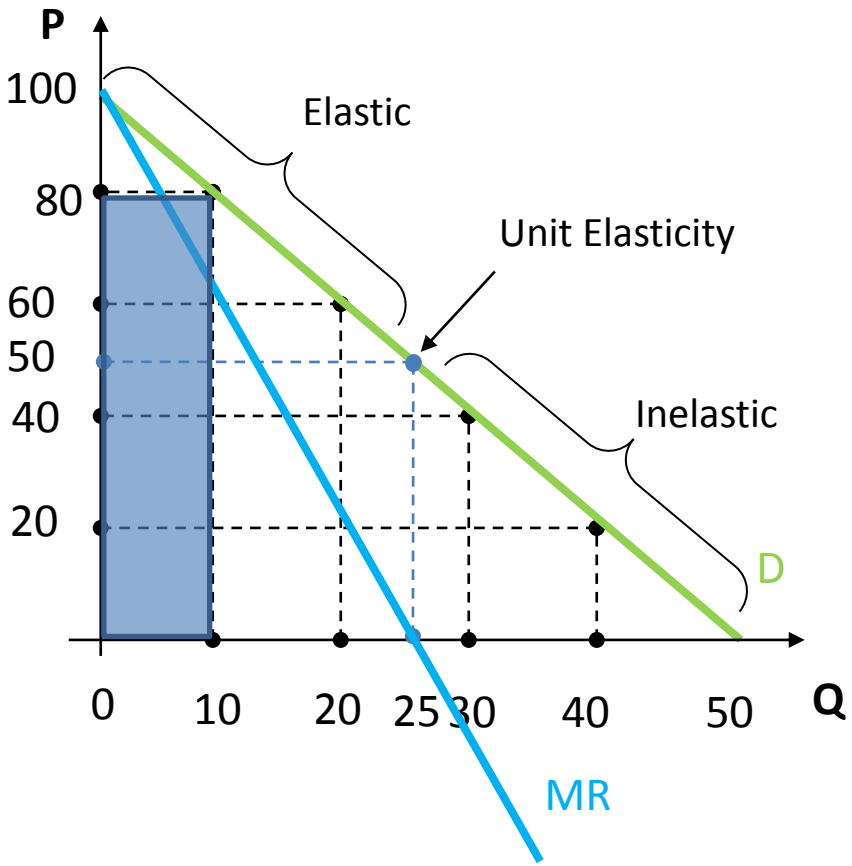
Change in Price Elasticity Along the Demand Curve

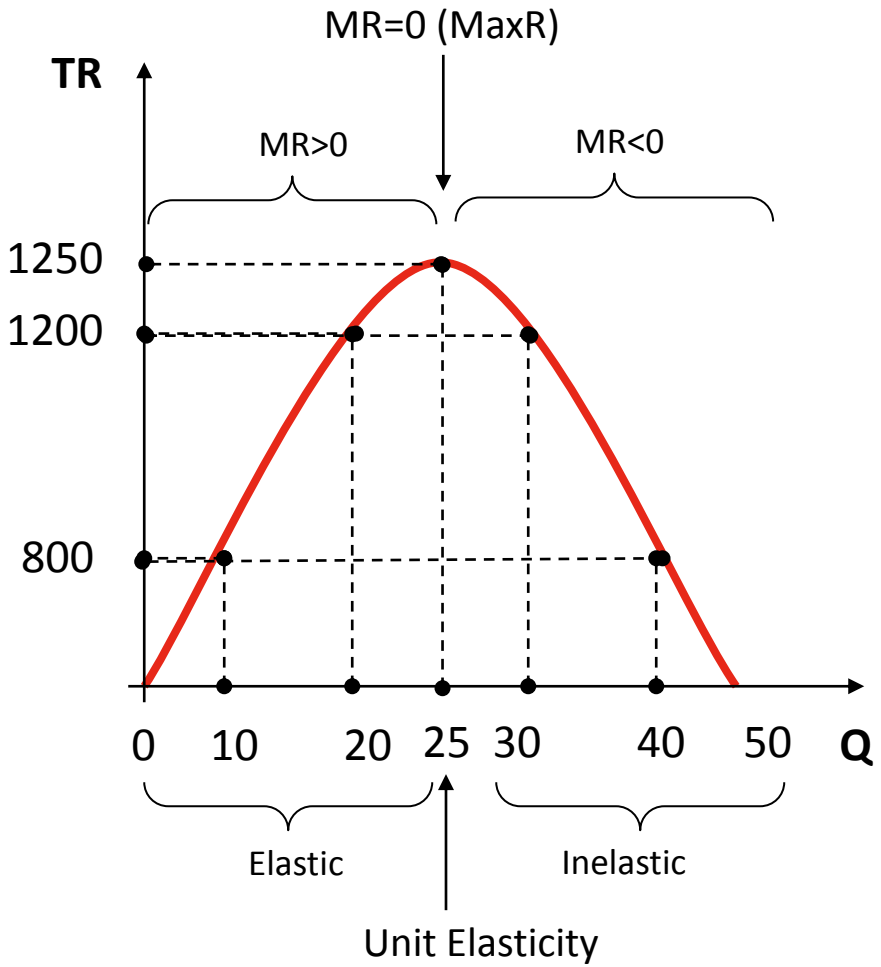
Demand Function：q=50-0.5P



P	q =50−0.5P	E^D =0.5(P/q)
80	10	4.00
60	20	1.50
50	25	1.00
40	30	0.67
20	40	0.25

2.1 Demand, MR, Elasticity, and TR





Own-Price Elasticity and Total Revenue

- Total revenue： R = P x Q

$\Delta R = (P+\Delta P)(Q+\Delta Q) - PQ$

$= \Delta P \times Q + \Delta Q \times P + \Delta P \times \Delta Q$

$\approx \Delta P \times Q + \Delta Q \times P$

$\%\ \Delta R = \Delta R / R = \Delta P/P + \Delta Q/Q$

$= \%\ \Delta P + \%\ \Delta Q$

$= \Delta P/P(1+E)$

- If demand is elastic, i.e., E<-1， $P\downarrow \rightarrow R\uparrow$
- If demand is inelastic, i.e., -1<E<0， $P\downarrow \rightarrow R\downarrow$

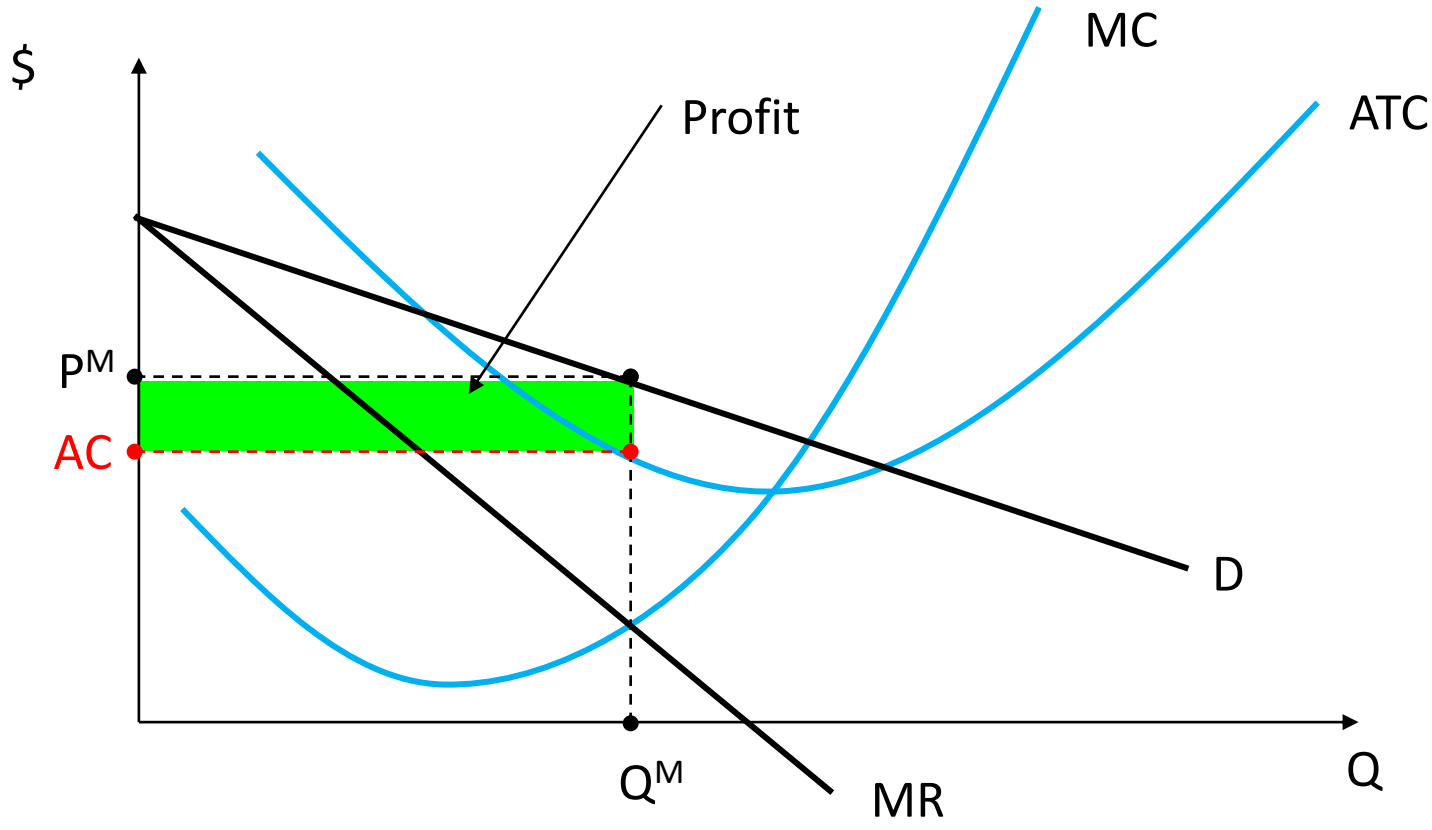
Summary

Table 9-4: Relationship of Demand Elasticity, Output, Price, Revenue, and Marginal Revenue

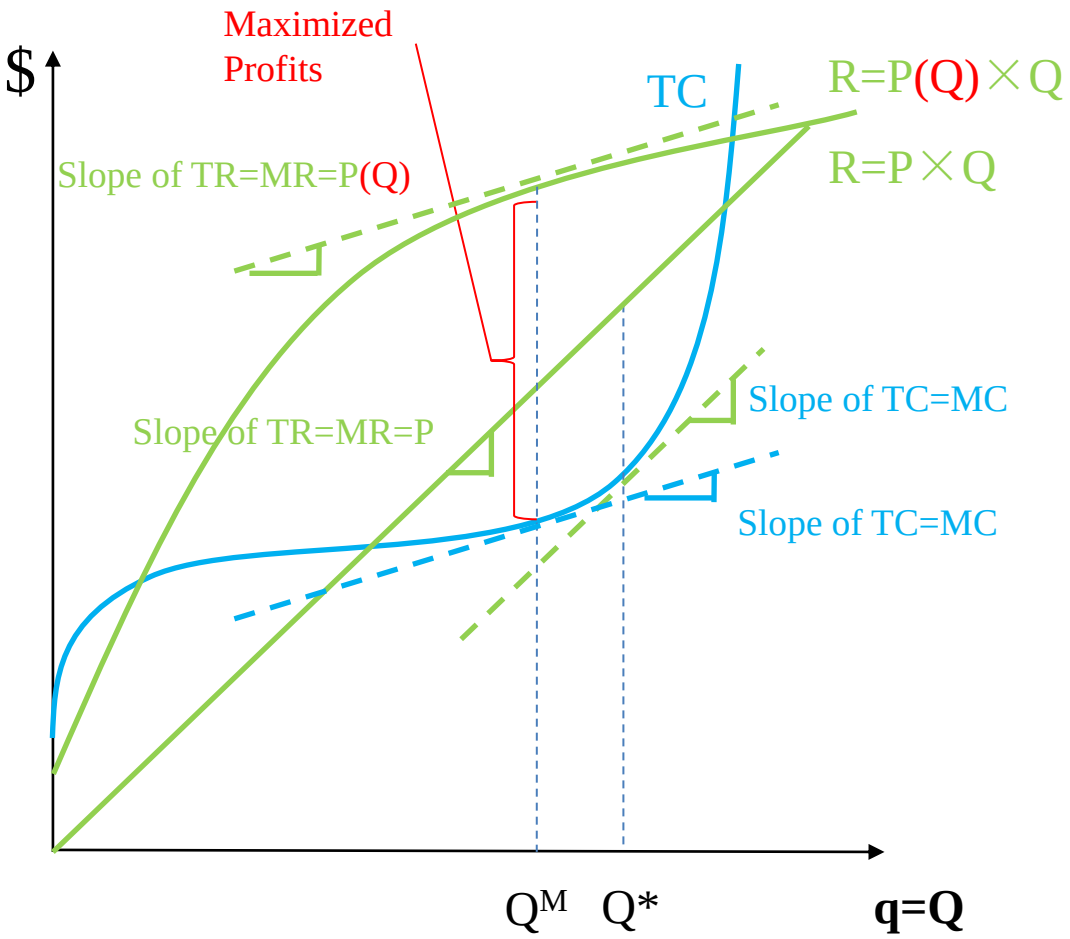
If demand is	Relation of q and P	Effect of q on TR	Value of marginal revenue (MR)
Elastic (E_D>1)	%Δq > %Δp	Higher q raises TR	MR>0
Unit-elastic (E_D=1)	%Δq = %Δp	Higher q leaves TR unchanged	MR=0
Inelastic (E_D<1)	%Δq < %Δp	Higher q lowers TR	MR<0

2.2 Output and Pricing Decisions of Monopoly

- Output Rule: Produce at Q^m such that $MR(Q^M) = MC(Q^M)$
- Pricing Rule: Find the corresponding price along the demand curve at Q^M $P^M = P(Q^M)$



Profit Maximization of Monopoly

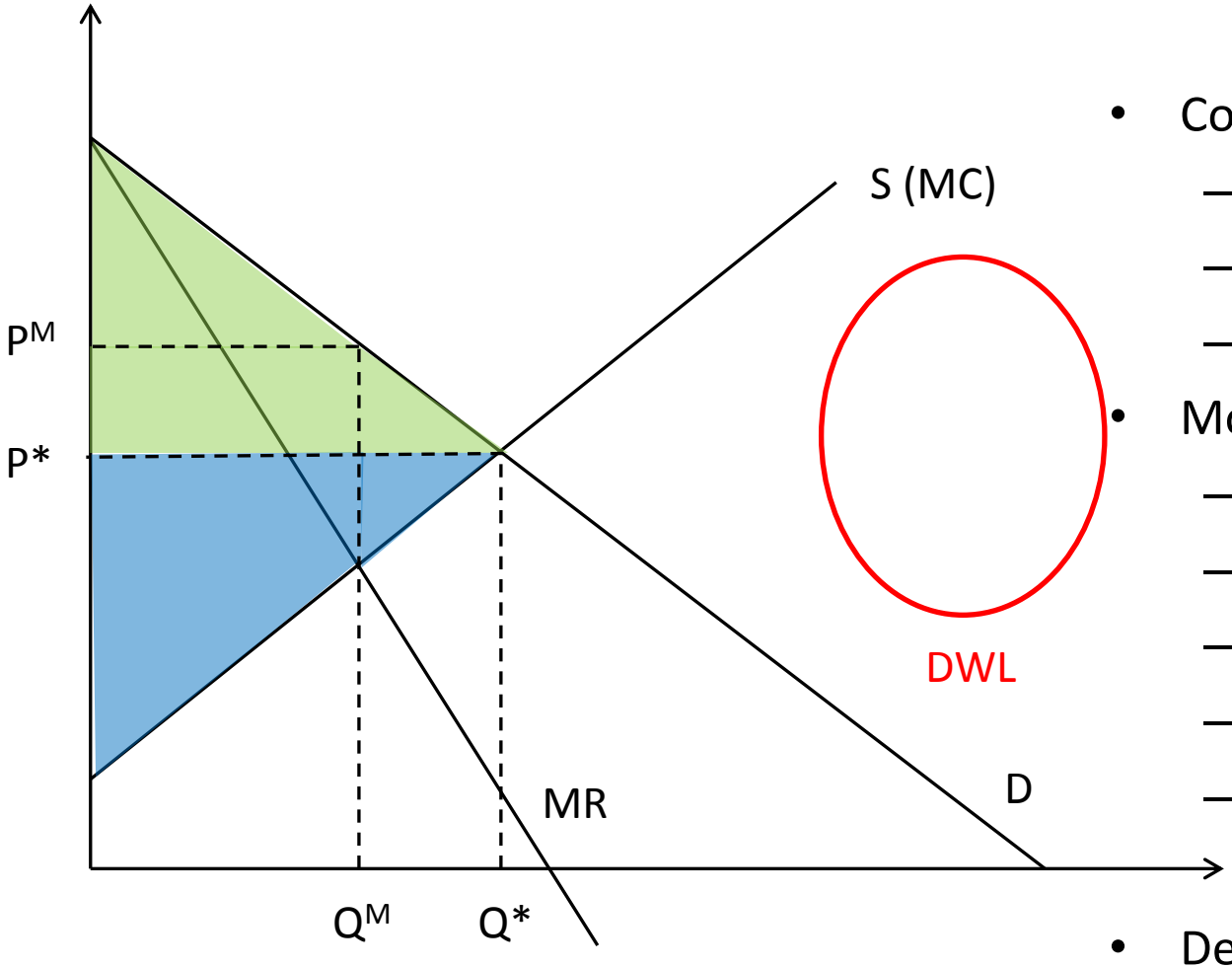


- Since Monopoly is not a price-taker anymore, the slope of the tangent line changes across production levels
- Monopoly profit is maximized when MR=MC at $Q=Q^M$

Outline

1. Patterns of Imperfect Competition
2. Monopoly Behavior
3. **Public Policies to Combat Market Power**

3. Public Policies to Combat Market Power



- Competitive market
  - P*, Q*
  - Consumer Surplus (CS)
  - Producer Surplus (PS)
- Monopoly
  - Marginal Revenue (MR)
  - P^M, Q^M
  - Decrease in CS
  - Decrease in PS
  - Transfer from CS to PS
- Dead Weight Loss (DWL)

Outline

1. Patterns of Imperfect Competition
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4. **Competition among the Few**

4.1 Market Power and Its Measure

- Market power: the degree of control that a single firm or a small number of firms have over the price and production decisions in an industry
- Measures
  1. Concentration ratios
  2. Herfindahl-Hischman Index (HHI)

Four-firm Concentration Ratio

- Sum of the market shares of the four largest firms in the industry: $C_4 = S_1+S_2+S_3+S_4$, where S_i are firm i's market share

- $0 \le C_4 \le 1$
  - $C_4 \rightarrow 0$: Many firms in the market; high degree of competition; Low market power
  - $C_4 \rightarrow 1$: Only a few sellers in the market; low degree of competition; High market power

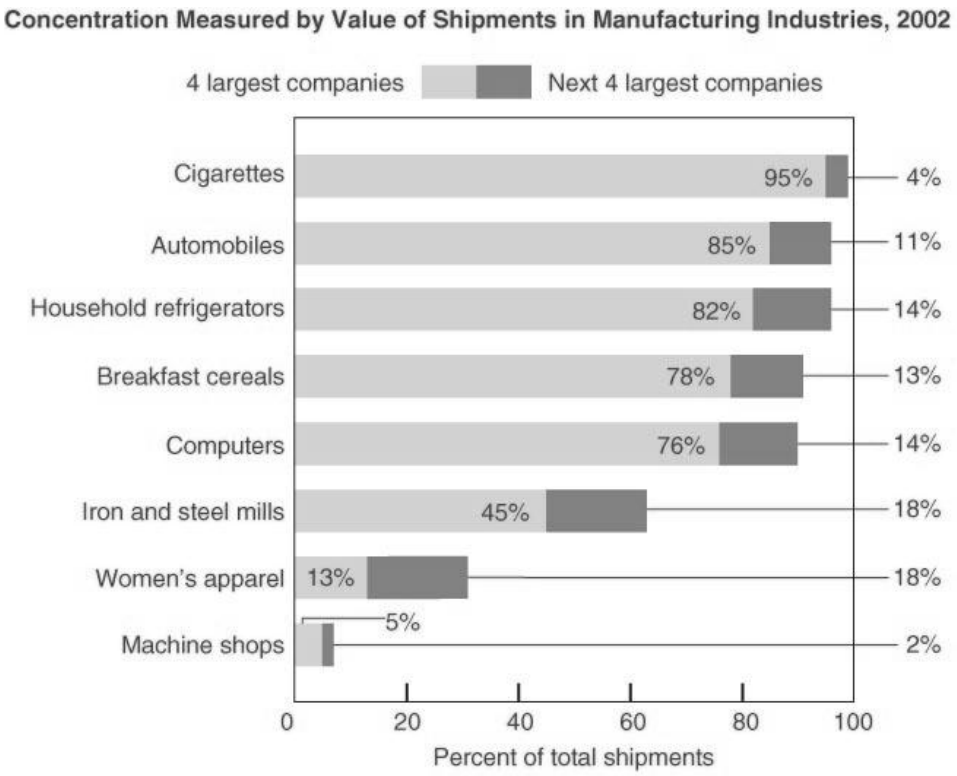


FIGURE 10-1. Concentration Ratios Are Quantitative Measures of Market Power

Herfindahl-Hischman Index

- HHI = sum of the squared market share of all firms in the market ×10000
- HHI = 10000 × ΣS_i^2
- 0≤HHI≤10000。
  - In case of monopoly, HHI=10000
  - In case of infinite number of small firms, HHI=0
- An example:
  - Consider a industry composed by 3 firms. Two of them have annual sales of $10M; the other one has an annual sale of $30M. What is the HHI of this industry?
  - S_1=30/50;S_2=S_3=10/50;
    HHI=10000×[$(30/50)^2$+$(10/50)^2$+$(10/50)^2$]=4400
  - What is the C4 of this industry?

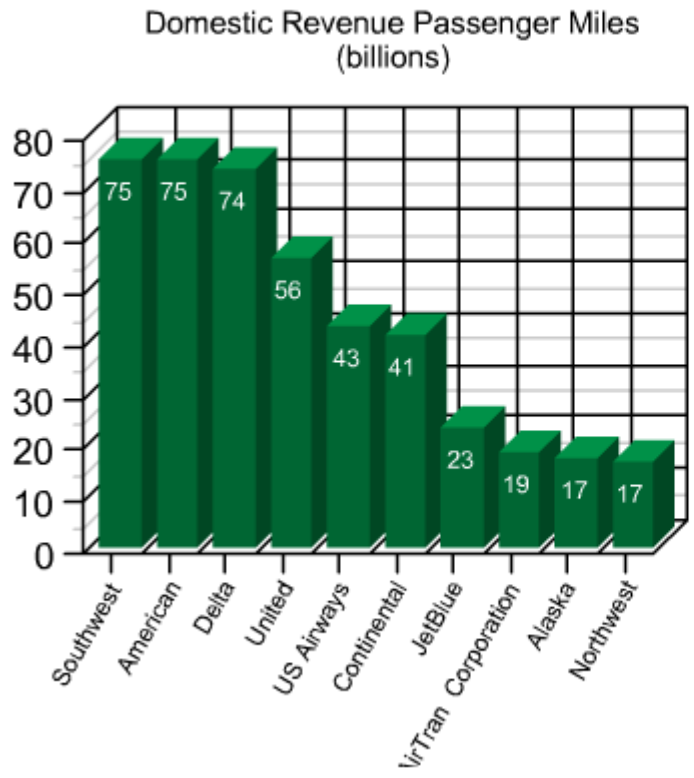
Horizontal Merger Guidelines of the US

- Block a horizontal merger if it will increase the Herfindahl-Hirschman index (HHI) by more than 100
- HHI>1,800 => "highly concentrated"
- HHI<1,000 after a merger => "unconcentrated"
  - horizontal mergers usually are allowed
- 1000<HHI<1800, depend on other factors in determining whether to block a horizontal merger
  - such as economies of scale
  - ease of entry into an industry

Merger Case: UNITED & Continental Airlines

- Passed in August, 2010

Airline Domestic Market Share July 2009 - June 2010



Airlines	Share
Southwest	13.9%
American	13.8%
Delta	13.5%
United	10.4%
US Airways	7.9%
Continental	7.6%
JetBlue	4.3%
AirTran Corporation	3.4%
Alaska	3.2%
Northwest	3.1%
Other	18.9%

To Address Anti-trust Concerns

- Cost Saving
  - Economy of Scales
- Special Arrangement to Limit Market Power
  - Southwest Airlines, one of Continental Airlines' major competitors, will be able to enter Newark airport in New Jersey
- Geography and Market Definition
  - Global v.s. Domestic market
  - Service scope of United Airline: 73 US cities, 41 international destinations in 25 countries, 4 continents
  - International flights accounts for 30% of revenue

Markets at Different Geographical Level

- Illustrative case: U.S. retail banking industry

- US banking industry has been much more fragmented than elsewhere, composed of many small, locally concentrated banks
  - Due to a long tradition against a nationwide banking system (Ever since President Thomas Jefferson)
  - In 1994, the US banking industry has about 10,000 commercial banks, 93% of which have less than $500m in assets
  - The top ten largest banks have only 36.6% of total assets, compared to Canada or UK where 4 or 5 banks hold about 80-90% of the total assets

Deregulation in the US Banking Industry

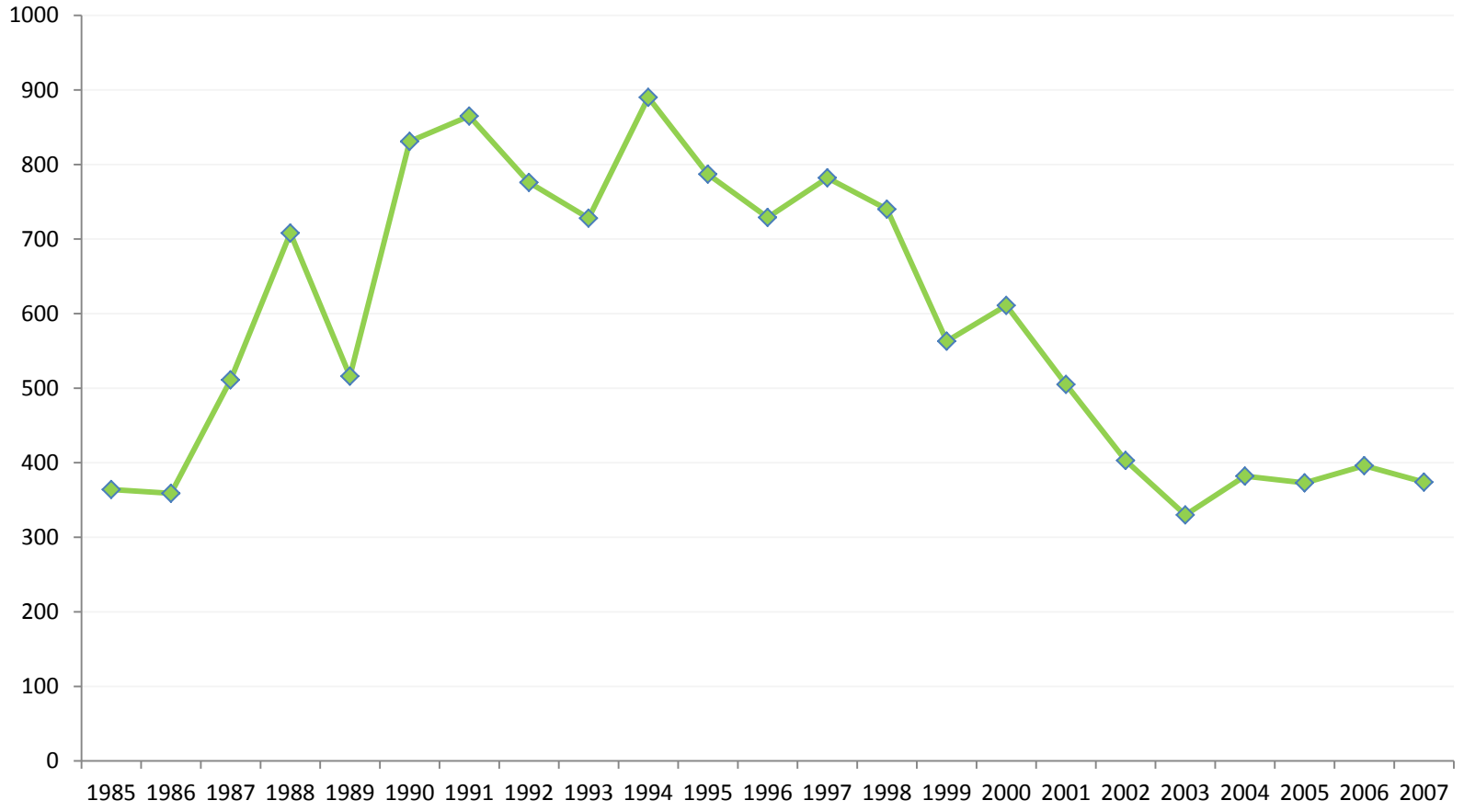
- Disadvantage of less diversified bank-branch network
  - High risk of bankruptcy
  - large number of failures of small community banks and thrifts during the 1970s and 1980s

- Deregulation: a move towards the elimination of restrictions on geographic expansion for banks

- Riegle Neal Interstate Banking and Branching Efficiency Act (RN) in 1994 laid the foundation for the removal of restrictions on interstate banking and branching

- The result has been a substantial consolidation of the US banking industry

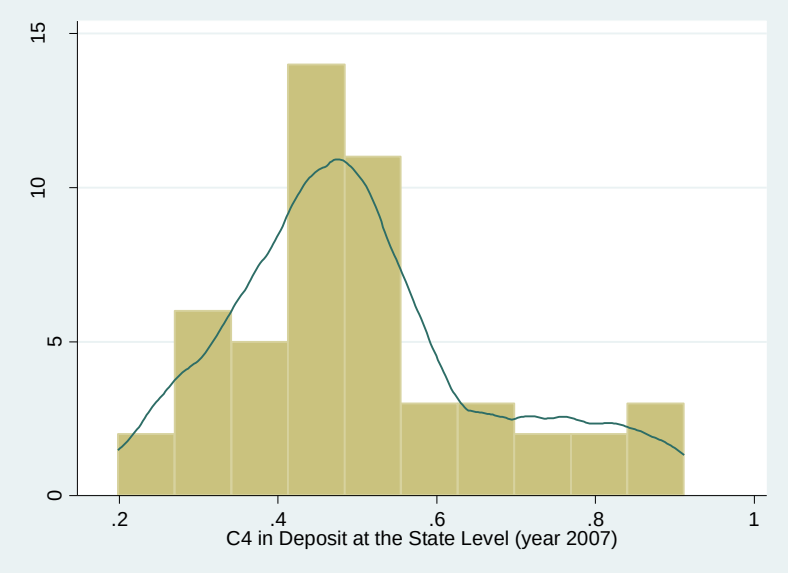
Number of Bank Mergers by Year



Country, State, and County Level Concentration Ratio

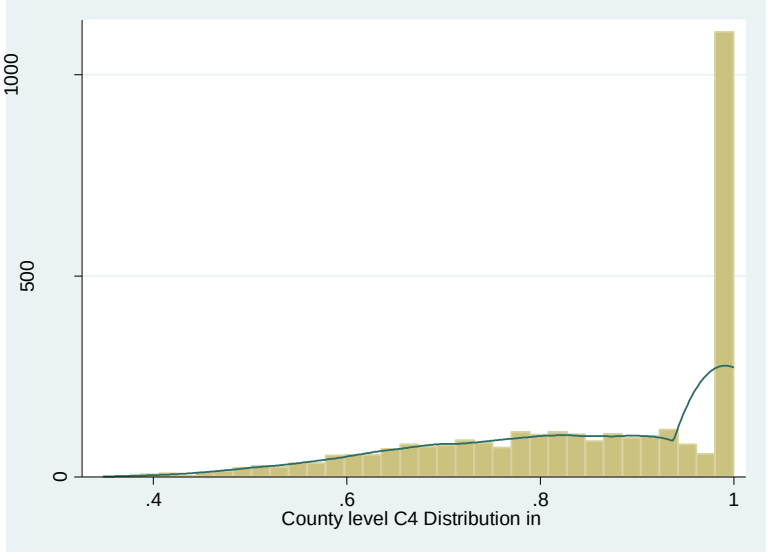
- From now on, we shall concentrate on the retail banking services and look at the deposit market.
- In year 2007, the C4 for the *whole US* is 0.243

Distribution of C4 at the *State Level*



Mean = 0.50 Median = 0.48

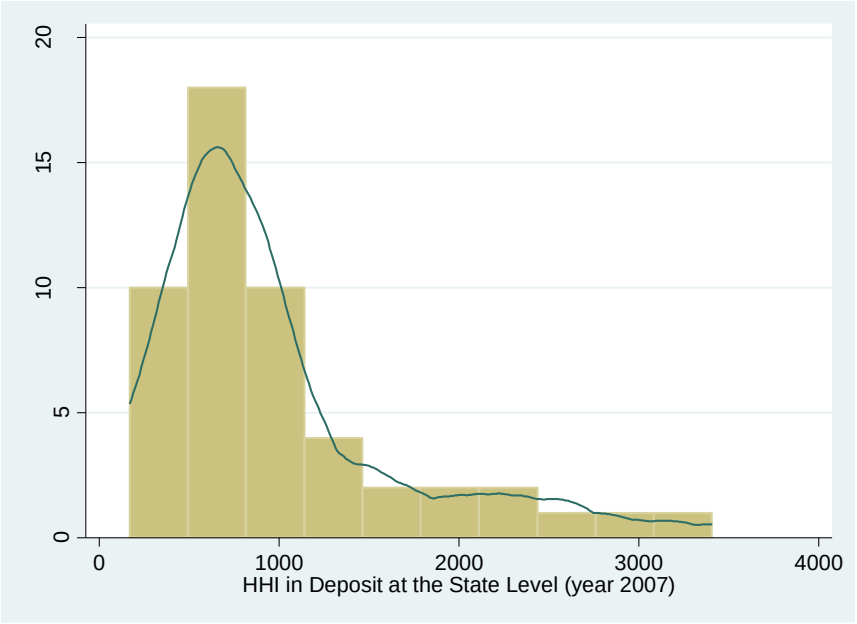
Distribution of C4 at the *County Level*



Mean = 0.85 Median = 0.88
n(C4=1)=454 (out of 3114)

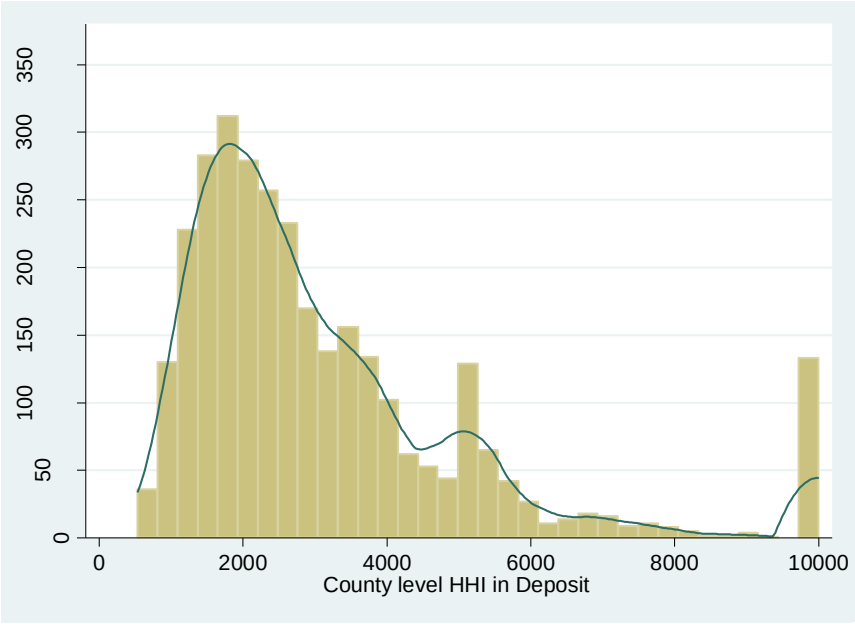
- In year 2007, the HHI for the whole US is 207

Distribution of HHI at the State Level



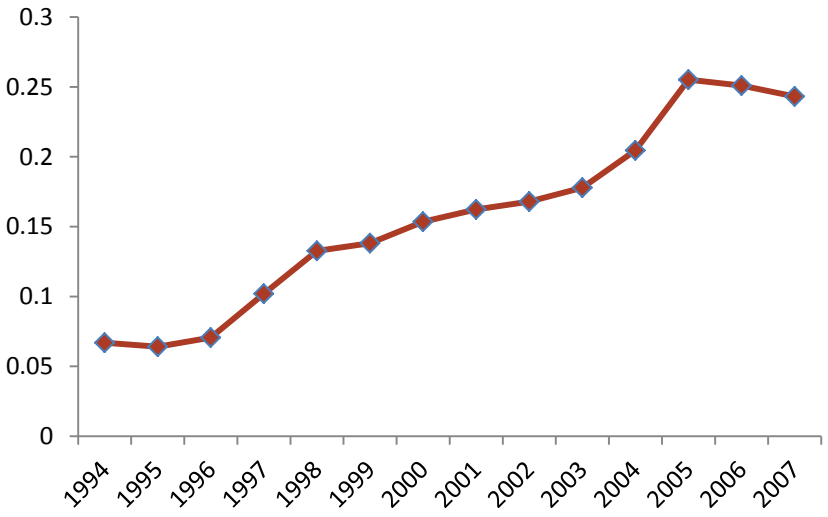
Mean = 728 Median = 747

Distribution of HHI at the County Level



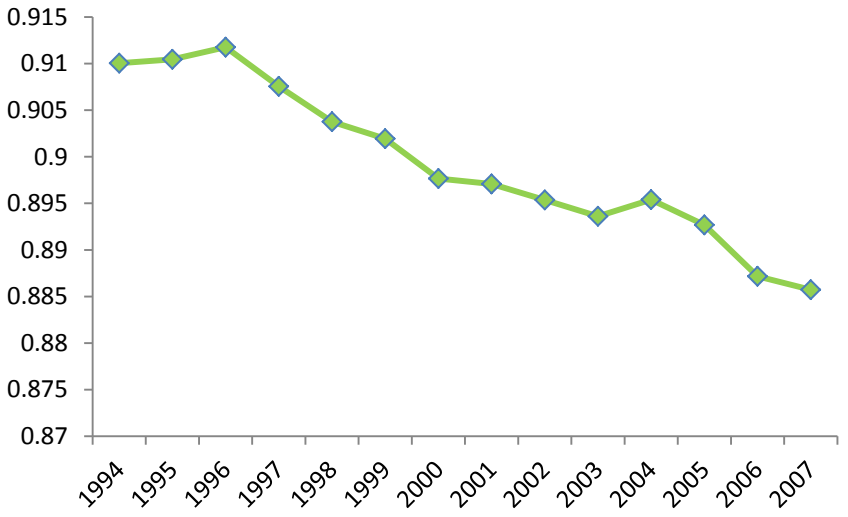
Mean = 3138 Median = 2520
n(HHI=10000)=133 (out of 3114)

Changes in C4 at the National Level



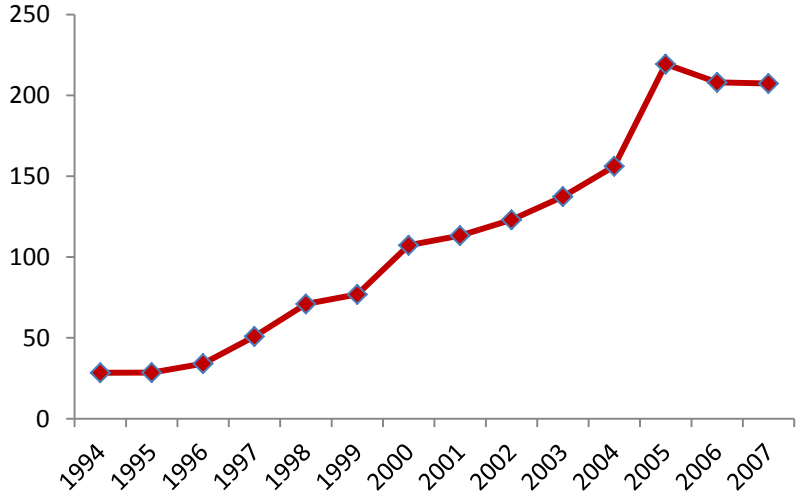
Increase by 263%!

Changes in C4 at the County Level



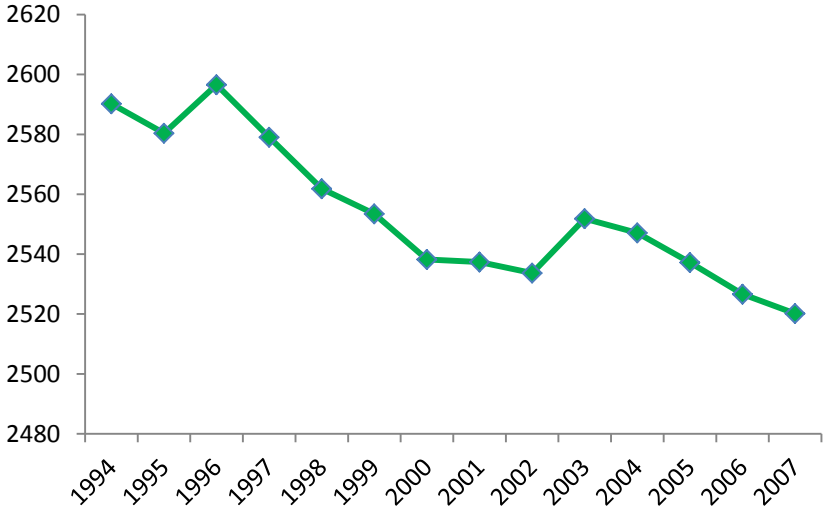
Decrease by 2.7%

Changes in HHI at the National Level



Increase by 630%!

Changes in HHI at the County Level



Decrease by 2.7%

Takeaway

- When the relevant market is “local”, using national level concentration measures will ___ estimate the market powers that matter to the consumers

- In case of US banking industry, using the national level concentration will lead to a complete different conclusion in evaluating the effect of RN act in 1994
  - National level: market power increase significantly
  - County level: little changes in the local market structure

Outline

1. Patterns of Imperfect Competition
2. Monopoly Behavior
3. Public Policies to Combat Market Power
4. Competition among the Few
   - 4.1 Market Power and Its Measure
   - **4.2 Three Cases of the Imperfect Competition**

Case 1: Monopolistic Competition

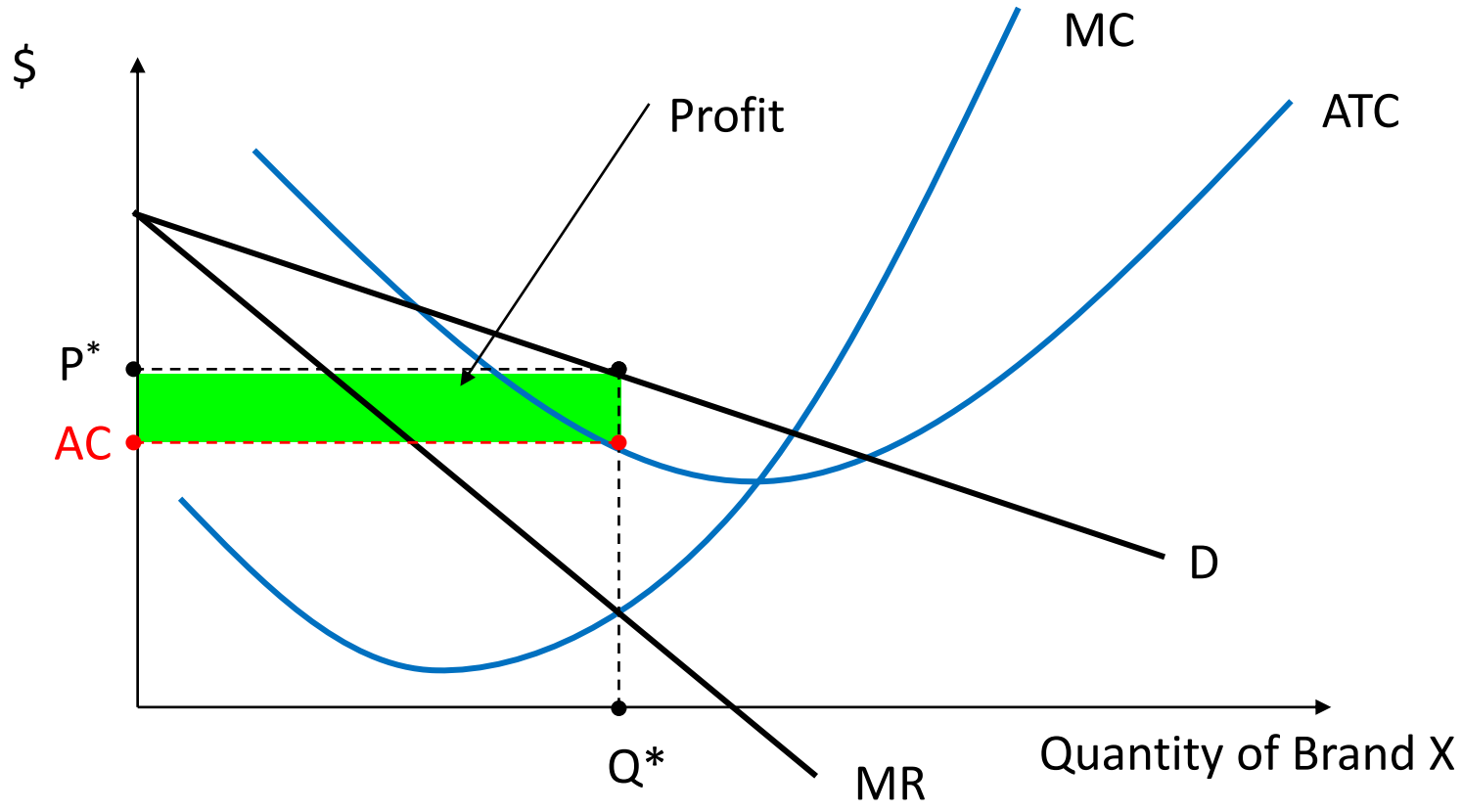
- Conditions for monopolistic competition:
  1. There are many buyers and sellers;
  2. There is free entry into and exit from the industry;
  3. Firms take other firms' prices as given;
  4. Each firm in the industry produces a differentiate product
     - Each firm faces a downward sloping demand curve
     - Consumers view differentiated products as close substitutes: there exists *some* willingness to substitute

V.S.

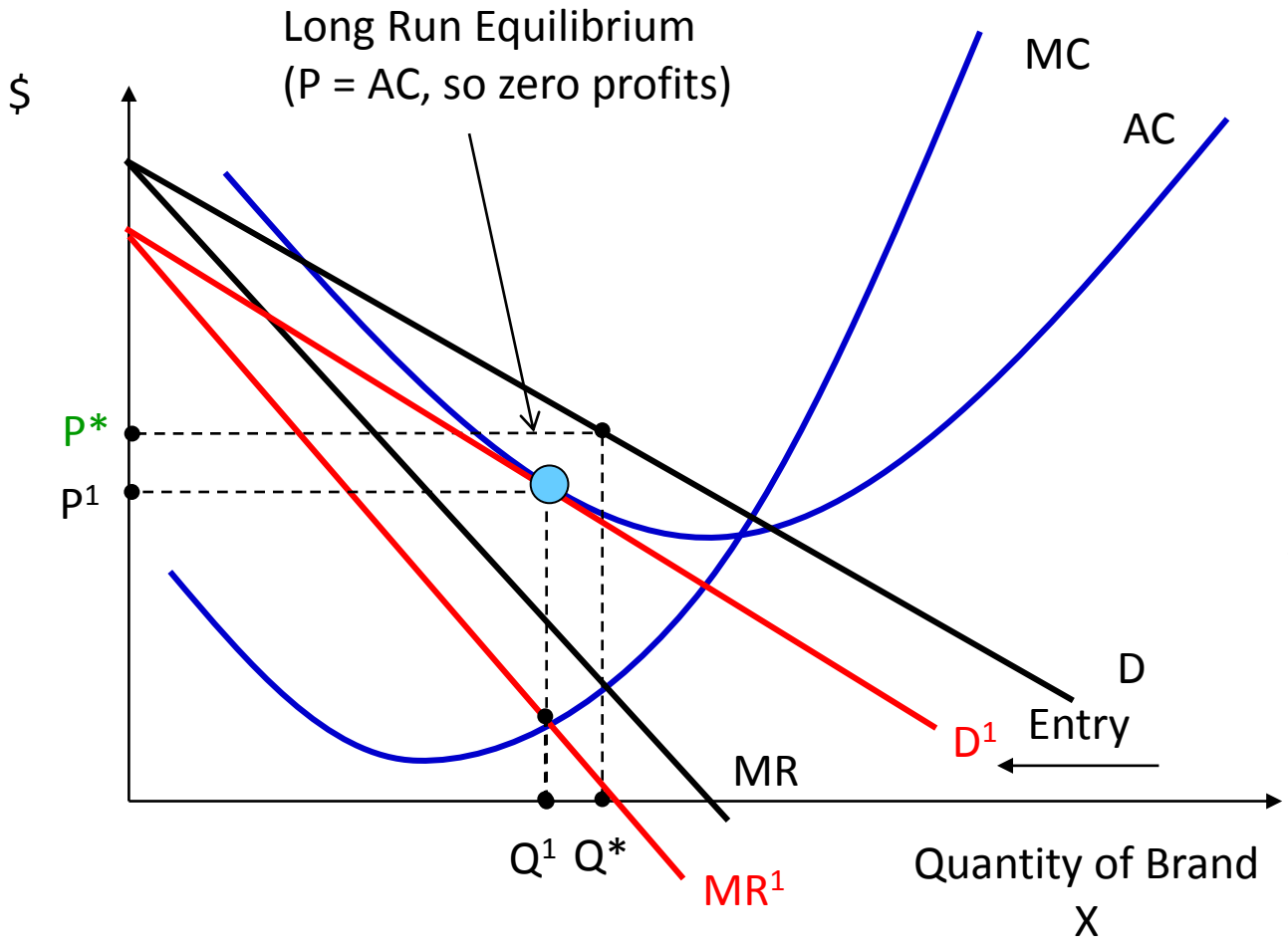
Managing a Monopolistically Competitive Firm

- Like a monopoly, monopolistically competitive firms
  - have market power that permits pricing above marginal cost
  - level of sales depends on the price it sets
- But …
  - The presence of other brands in the market makes the demand for your brand more elastic than if you were a monopolist
  - Free entry and exit impacts profitability
- Therefore, monopolistically competitive firms have limited market power.

Short-Run Monopolistic Competition



Long-Run Monopolistic Competition



With free entry, in the long-run:

Other "greedy capitalists" enter, and their new brands steal market share.

This reduces the demand for your product until **profits are ultimately zero (price is above the marginal cost)**

Why

- Like a monopoly, monopolistically competitive firms
  - have market power that permits pricing above marginal cost
  - level of sales depends on the price it sets
- But …
  - The presence of other brands in the market makes the demand for your brand more elastic than if you were a monopolist
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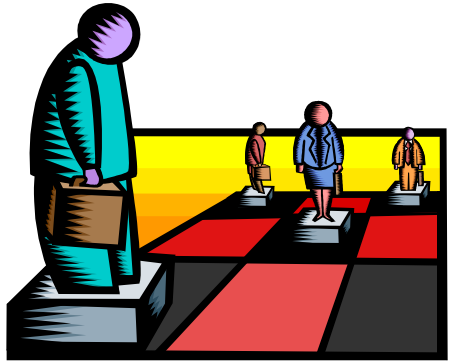
Case 2. Rivalry among the Few



- Entry barriers exist, at least in the short-run. Thereby only a few firms compete with each other (e.g., ***Duopoly*** - 2 firms compete)
- Firms are interdependent.
- ***Strategic interaction***: occurs when each firm's business depends upon the behavior of its rivals
- Analytical tool of the strategic interactions among firms: Game Theory

Case 3. Collusive Oligopoly

- Collusion: A situation in which two or more firms jointly set their prices or outputs, divide the market among themselves, or make other business decisions jointly

- Cartel: An organization of independent firms, producing similar products, that work together to raise prices and restrict output

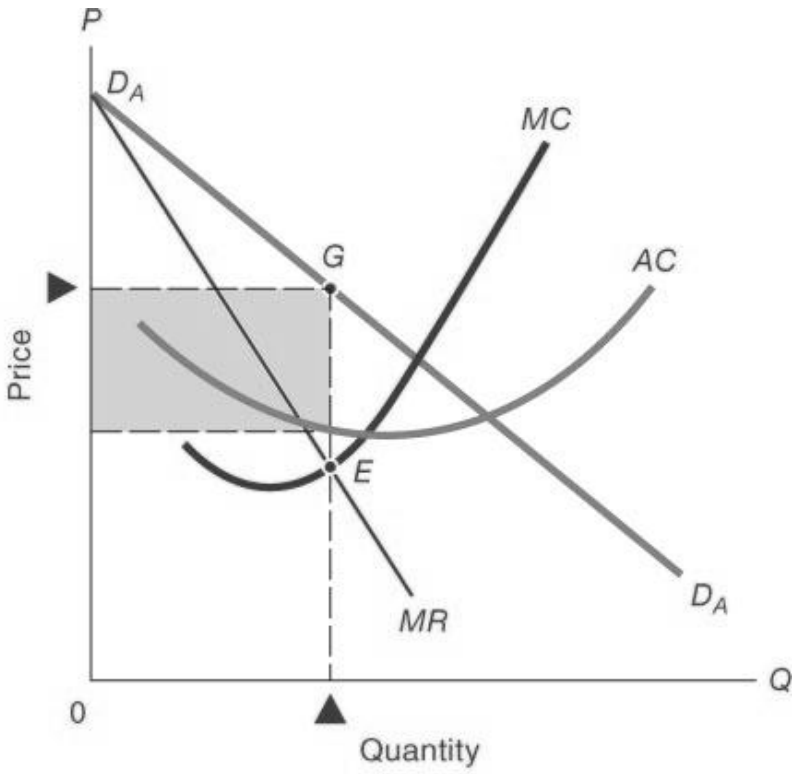


FIGURE 10-2. Collusive Oligopoly Looks Much Like Monopoly

Obstacles to Effective Collusio

1. Legal concerns
2. Instability of cartel: firms have incentive to "cheat" on the agreement by
   - Cutting their prices
   - Increase their production
     - With price being set at a monopoly level, more output means more profits
     - However, as output increases, price will go down because of the downward sloping demand curve)
3. Role of international trade

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5. **Pricing Strategy**

5. Pricing Strategy

- When firms have market power, they are price-maker. With more information on the willingness to pay of consumers, they can extract more profits through various forms of price discrimination
- ***Price discrimination***: same product is sold to different consumers for different prices

A Simple Formula

- Suppose that a product's demand elasticity is E_F.
- Since $MR = P[1 + E_F]/ E_F$. (Refer to earlier lecture)
- Optimality requires MR = MC. Hence

$$P = [E_F/(1+ E_F)] \times MC.$$

- Optimal price is marginal cost multiplied by a constant.
- This constant $K= E_F/(1+ E_F)$ is called markup factor
  - More elastic demand -> ____ markup factor
  - More inelastic demand -> ____ markup factor
  - Higher marginal cost -> ____ markup factor

Example

- Price elasticity for Kodak's film is -2.

- $P = [E_F/(1+ E_F)] \times MC$
- $P = [-2/(1 - 2)] \times MC$
- $P = 2 \times MC$

- Price is determined by doubling the marginal cost (markup factor is 2)

- Half of Kodak's film price is due to the markup rather than marginal cost

Apple's Markup?

Figure 1. Distribution of value for iPhone, 2010

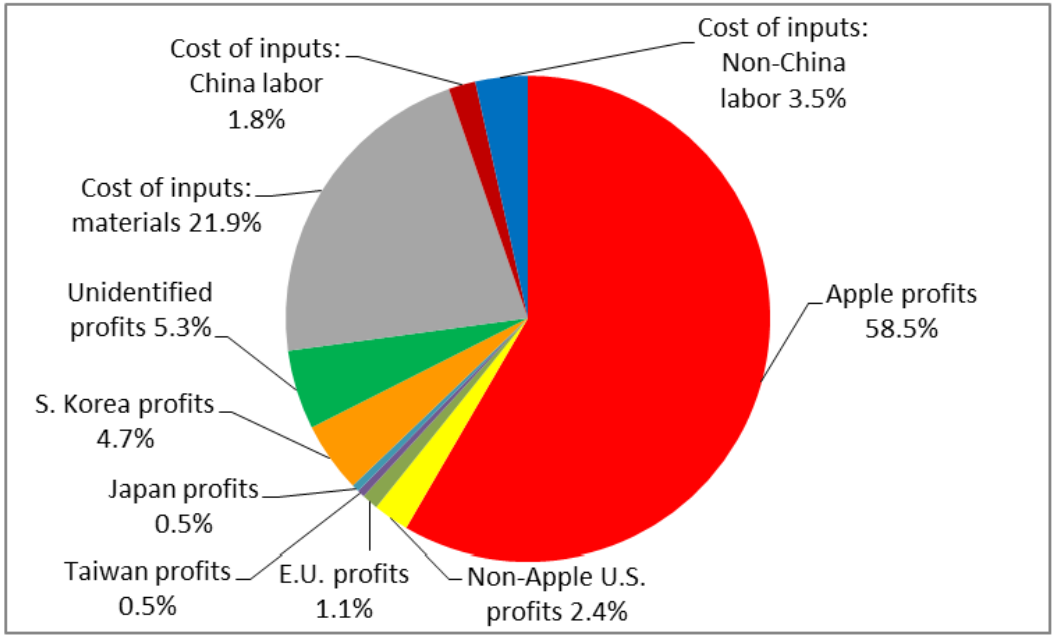
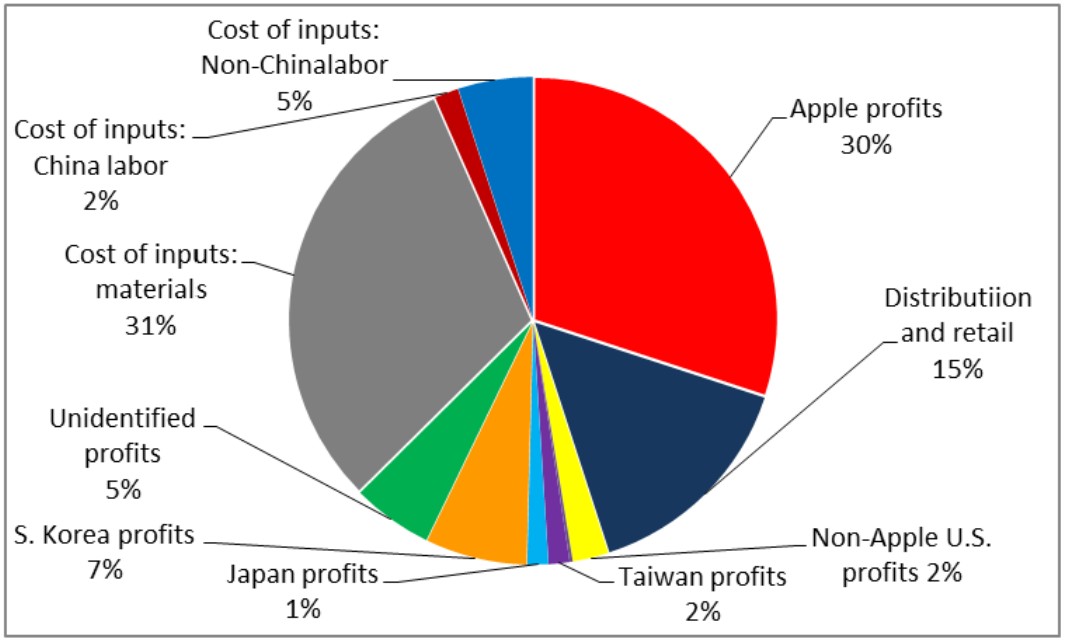
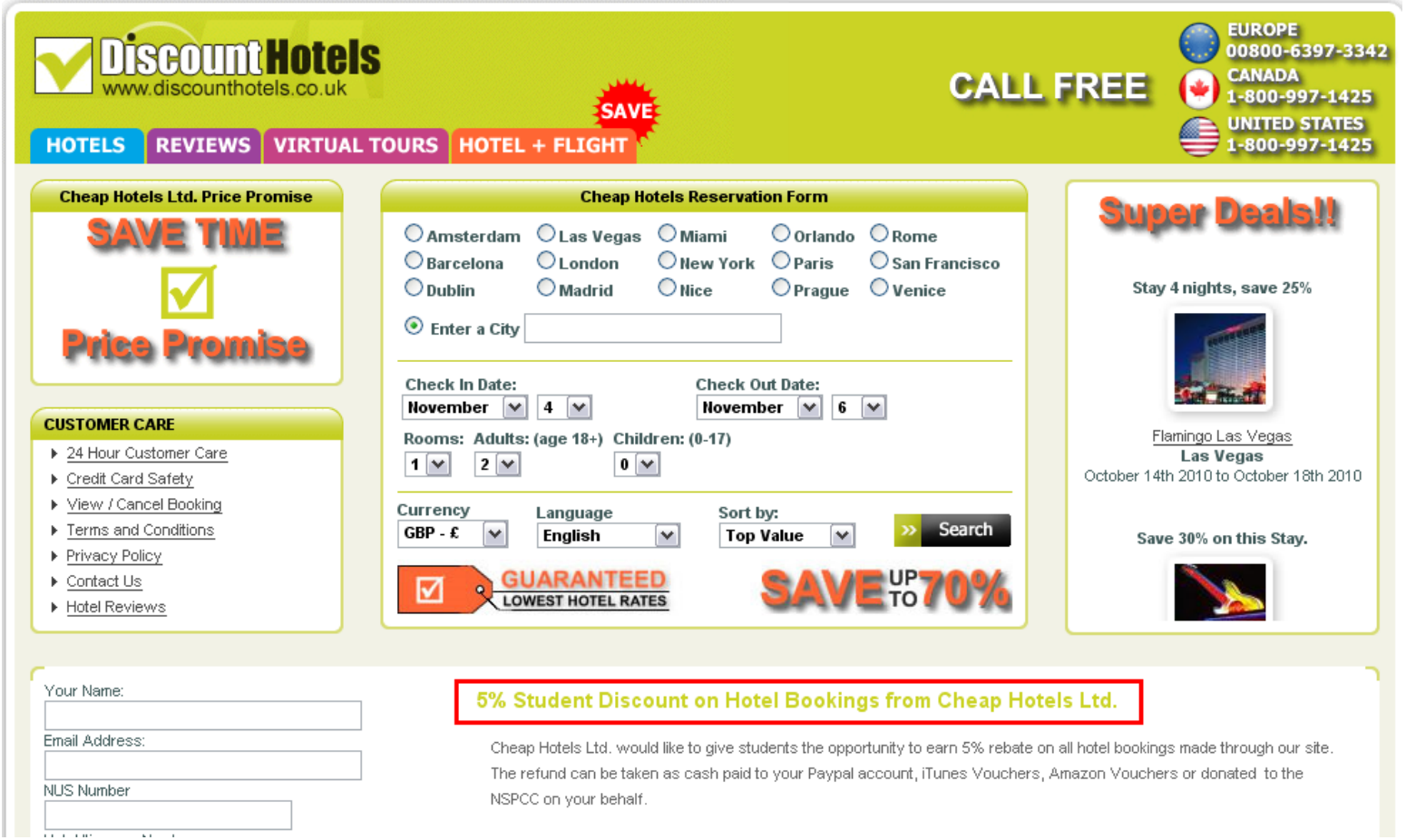


Figure 2. Distribution of value for iPad



Example 1: Discounting



- Similar examples: discount to senior people, family buyers (relative to enterprise buyers)
- People might think such a pricing strategy is designed for the benefits of these groups; however, it is actually for the purpose of profit maximization
- Students, seniors, family buyers are more sensitive to prices (elastic demand), therefore lowering price will increase firm's revenue

Example 2: Different price by locations

Version	Home Premium	Professional	Ultimate
United States	USD$199 ≈￥1400	USD$299 ≈￥2100	USD$319 ≈￥2240
Hong Kong	HKD$1,699	HKD$2,599	HKD$2,699
Taiwan	NT$6990 ≈￥1400	NT$9890 ≈￥1980	NT$10590 ≈￥2010
China	￥399（￥699）	￥1,399	￥2,460

Source：http://www.pconline.com.cn/pcedu/softnews/yejie/0910/1860654.html

Caveat: if the price difference is due to the difference in production or transportation costs, then it is not evidence of price discrimination

Price of iPad Air 2

	16GB	64GB	128GB
U.S.	￥3055	￥3677	￥4279
Japan	￥3098	￥3731	￥4364
Hong Kong	￥3067	￥3700	￥4331
China	￥3588	￥4288	￥4988

Example 3: Different prices by amount of purchase

12-pack sold at
$5.99

24-pack sold at
$9.99

Intel 486SX and 486DX

- In 1991, the most advanced CPU produced by Intel is i486CPU (25 MHz). (Compared to the mainstream now: 2GHz)
- There are two types of i486: i486DX sold at $588; i486SX sold at $333.
- i486SX is produced in a curious way: start with a fully functioning i486DX and then disable its math processor.
- Question: why i486SX is sold at lower price while being more expensive to produce.

Example 4: “Damaged Goods” – IBM’s LaserPrinter E

LOW-COST LASER PRINTER
Brother HL-4

Criterion	(Weighting)	Score
Performance		
Compatibility	(125)	Very Good

LOW-COST LASER PRINTER
Fujitsu RX7100 S/2

Criterion	(Weighting)	Score
Performance		
Compatibility	(125)	Very Good

LOW-COST LASER PRINTER
Hewlett-Packard Laserjet IIP

Criterion	(Weighting)	Score
Performance		

LOW-COST LASER PRINTER
IBM Laserprinter E

Criterion	(Weighting)	Score
Performance		
Compatibility	(125)	Very Good

- 1990年5月，IBM发布LaserPrinter E。其售价($1495)比当时公司的旗舰产品LaserPrinter ($2395)低许多。
- 外观上看， LaserPrinter E 与LaserPrinter相同。两者的唯一区别是，前者的打印速度(5ppm)比后者慢(10ppm)。
- 当时一些硬件评论者打开机器发现， LaserPrinter E 比LaserPrinter多出了5个芯片。
- 反复的测试表明，这5个芯片的用途是计算出纸速度并将速度减慢。
- 速度减慢只针对文本打印；在打印图片时两者速度相同。
- 事实上消费者可以花$1099将 LaserPrinter E 升级为 LaserPrinter。这比两者的市场价差多$200。