

**Introduction to Industrial Organization**  
**Professor: Caixia Shen Fall 2014**  
**Lecture Note 1**

**Part 1: Introduction** to this course

1. What is Industrial Organization?

Industrial organization is concerned with the workings of *markets* and *industries*, in particular *the ways firms compete with each other*.

- Perfect competition ( $P=MC$ )
- Monopoly ( $MR=MC$ )
- Oligopolies (the main part of this course)

Example:

Zantac, a prescription drug, the well-known ulcer and heartburn medicine produced by Glaxo Wellcome., is the largest-selling prescription medicine in the world, with sales of \$1.6 billion.

Cost: it cost relatively little to produce Zantac.

Price: very high

- Price-Cost=very high

Why does the seller set price very high?

- Firm wants to maximize its profit. The high price of this drug is the results of the firm's Profit-Maximizing behavior.

Why can the seller set the price much higher than its cost? Why would consumer buy this drug at a high price, not instead to buy an alternative at lower price?

- There is no close substitute?
- What if there exists substitute? Advertising is designed to establish brand loyalty.
- Patent. After patent expired, generic products comes in. Product differentiation is now the key to win market share.
- The firm has market power.

2. Market power

2.1 What is market power?

Market power is define as the ability to set prices above cost, specifically above marginal cost, that is, the cost of producing one extra unit.

Example:

marginal cost for Zantac=\$10/box

price = \$50/box

There is substantial degree of market power in this case.

2.2 Is there market power?

Some economists believe there is very low market power in US economy from observing relatively low profit rates. Their argument: as long as there is free entry into each industry, the

extent of market power is never significant. A new firm would find it profitable to enter the market and undercut the incumbent's profit.

However, most economists believe there is significant market power in many industries. For example: the US airline industry. A 1996 US government report analyzed average fares in 43 large airports. In ten of these airports, one or a few airlines hold a tight control over takeoff and landing slots. Consumer paid *31% more at these airports* than the rest 33 airports. This means that there is evidence that airlines that manage to control the critical asset of airport access hold a significant degree of market power.

Another example, Staples and Office Depot proposed merger. The Federal Trade Commission examined prices of office supplies in areas with one, two or more competing superstores. In areas where only one chain operates, the report concludes that prices can be up *to 15% higher than in other areas*.

### 2.3 How do firms acquire and maintain market power?

How do firms acquire market power?

- Legal protection: patent.  
Given a patent, no other firm cannot produce similar product. This means that the firm can charge a high price without competition.
- Firm strategy: for example, the British Sky Broadcasting Group (BSkyB). In order to compete with its rival and acquire market power, BSKyB introduced an aggressive package in May 1999. The package includes a free set-top decoder box, free Internet access, and a 40% discount on telephone charges. This gives BSKyB an early lead in installed base of subscribers, finally gains market power.

How do firms maintain market power?

Patent expires; imitation takes place. Protected industries are deregulated. What can firms do after the regulated industry is deregulated?

For example: the airline industry.

In 1998, Japan deregulated its airline industry. Skymark airlines and Air Do entered a market, which was dominated by Japan Airlines (JAL) and All Nippon Airlines (ANA). The incumbents ANA and JAL cut down their prices. Also, ANA and JAL threaten to refuse to serve the maintenance for Skymark and Air Do.

*Predatory Pricing.* In US, American Airlines is fighting a court battle over alleged predatory pricing against entrants into its Dallas/Forth Worth hub. American Airlines cut down its prices by much. The results is that American Airlines drives out three competitors: Vanguard, Sun Jet and Western Pacific. For example, when Vanguard enters the market Dallas to Kansas city market, American lowers the price from \$108 to \$80. However, after Vanguard exits the market, American airlines raises the price to \$147.

## 2.4 What are the consequences of market power?

- From firm's point of view, market power implies greater profits.
- The high price is transferred from consumers to firms: for higher market power, firms charge higher price, so consumers have to pay more. In this sense, firms benefit from market power, while consumers lose.
- Antitrust and competition policies are motivated by the goal of protecting consumers.
- Allocative inefficiency. High price prevent some consumer buying products, for example, airplane tickets. For a social point of view, it could be more efficient for these consumer buying tickets since the cost may be very cheap for them to fly.
- Productive inefficiency. Firms with market power have less incentive to be cost efficient.
- Rent seeking. The unproductive resources spent on attempting to influence policymakers.
- Possible dynamic efficiency. Firms may do product innovation over time.

## 2.5 Is there a role for public policy regarding market power?

The goal of public policy is to avoid the negative consequences of market power. Three types:

- Regulation
- Antitrust
- Industrial policy

Regulation means the case in which a firm detains monopoly or near-monopoly power, and its actions are directly under a regulator's oversight.

Example: AT&T needed regulatory approval each time it changed its long-distance telephone rates.

Antitrust policy (or competition policy) is a much broader field. The idea is to prevent firms from taking actions that increase market power. Law enforcement by Federal Trade Commission (FTC) and Department of Justice (DOJ).

Example: In 1999, Exxon and Mobil try to merge. They claim that merger can help them to reduce cost, while antitrust regulators do not agree. The regulators worried about the increasing market share, market power Exxon and Mobil gain if they merge.

Industrial Policy: policy target at particular firms or groups of firms.

Example 1: Airbus competing with Boeing since the government's support.

Example 2: China green tax for cars in 2008:

Under the new ruling, for cars with a capacity between three and four liters, the tax rate will be raised to 25% from the current 15%. As for cars above four liters, the rate will be 40% instead of 20%.

Meanwhile, cars with an engine capacity below one liter will enjoy a tax cut from 3% to 1%. Taxes on other cars remained unchanged, 3% for those with 1 to 1.5 liters capacity, 5% for 1.5 to 2 liters, 9% for 2 to 2.5 liters and 12% for 2.5 to 3 liters.

## Part 2: Basic Microeconomics

### 1. Demand

Figure 2.1 illustrates your demand for pizza. On the horizontal axis, we have the number of pizza slices you buy. On the vertical axis, we measure *the willingness to pay*, that is, the maximum price at which you would still want to buy. From Figure 2.1, we can calculate the consumer's willingness to pay and consumer surplus.

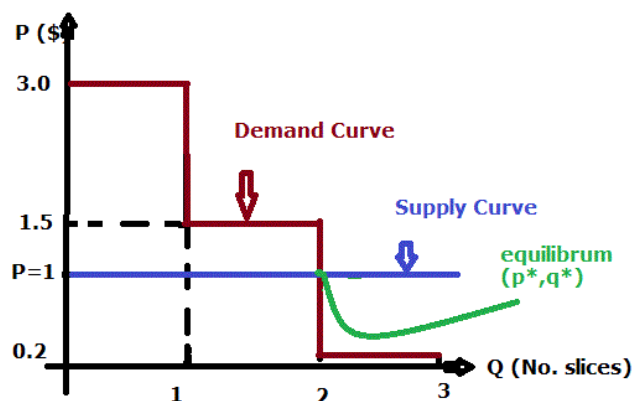


Figure 2.1 Consumer Demand for Pizza Slices

#### 1.1 Willingness to pay

Your willingness to pay is for the first slice, you are willing to pay \$3; for the second slice, you are willing to pay \$1.5; and for the third slice, you are willing to pay \$0.2.

#### 1.2 Consumer surplus

From figure 2.1, we know the demand curve, the supply curve, the equilibrium price, and the equilibrium quantity. The willingness to pay is the area under the demand curve. The revenue the pizza firm received is the area under the supply curve. The consumer's surplus is the difference between willingness to pay and price for all units purchased (the area under the supply curve). The consumer surplus is \$2.5.

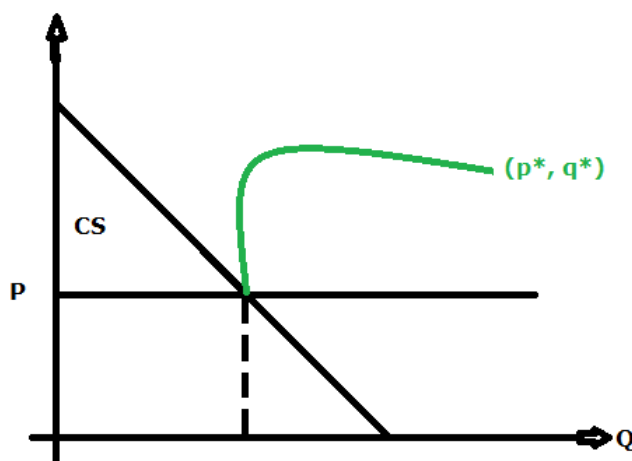


Figure 2.2 Market Demand

The market demand curve is an aggregation of each individual's demand curve in the market. *The demand curve  $D(p)$  give the total quantity demanded by consumers for a given price.* Figure 2.2 illustrates the market demand curve and the consumer surplus.

### 1.3 Demand elasticity

The demand elasticity is defined as the percent variation of quantity demanded divided by the percent variation in price.

$$\epsilon = -\frac{dq}{dp} * \frac{p}{q} = -\frac{\Delta q/q}{\Delta p/p}$$

## 2. Costs

- *Cost function  $C(q)$*  is the total cost of inputs the firm needs to pay to produce output  $q$ .
- *Fixed cost (FC)*: the cost that does not depend on the output level.
- *Variable cost (VC)*: the cost which would be zero if the output level were zero.
- *Total cost (TC)*: sum of fixed cost and variable cost.
- *Average cost (AC)*: total cost divided by output level.
- *Marginal cost (MC)*: the cost of one additional unit. In other words, total cost of producing  $q+1$  units minus total cost of producing  $q$  units of output.

Example: In a small T-shirt factory, to produce T-shirts, a manager leases one machine at the rate of \$20 per week. The machine must be operated by one worker. The hourly wage paid to that worker is as follows: \$1 during weekdays (up to 40 hours), \$2 on Saturdays (up to 8 hours), and \$3 on Sundays (up to 8 hours). Finally, the machine-operated by the workers-produces one T-shirt per hour. Assuming that current output ( $q$ ) is 40 T-shirts per week, we have the following:

- The fixed cost is given by the machine weekly lease. We have  $FC=\$20$ .
- The variable cost is given by 40 T-shirts times one hour per T-shirt times \$1 per hour, that is  $VC=\$40$ .
- The average cost is  $(20+40)/40=\$1.5$ .
- The marginal cost is \$2. In fact, producing the 41st T-shirt in a given week would imply asking the worker to work on Saturday, which would be paid at the hourly rate of \$2; moreover, producing a T-shirt requires one hour of work.

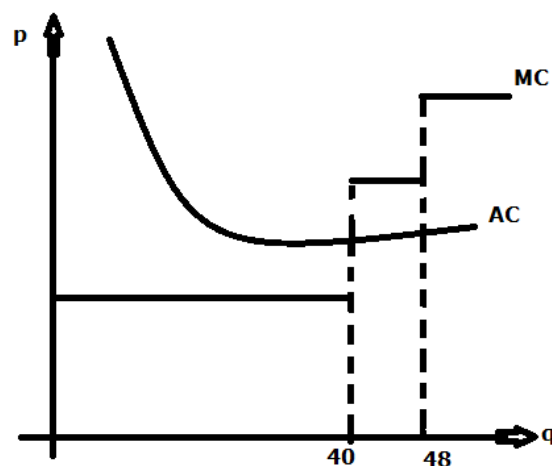
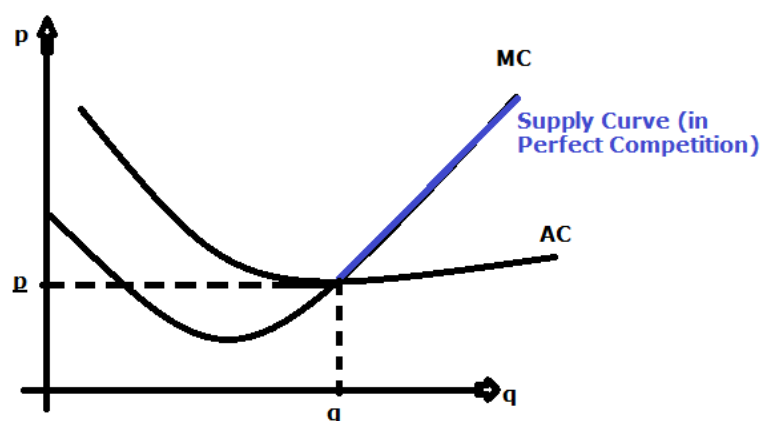


Figure 2.3 Marginal Cost and Average Cost in the T-shirt Factory

Figure 2.3 illustrates these cost functions in the T-shirt factory. Suppose a buyer named Benetton, who is offering  $p = \$1.8$  per T-shirt. Benetton is willing to buy as many T-shirts as the factory wants to sell at that price. Should the factory operate on Saturday?

At  $q = 40/\text{week}$ , average cost =  $\$1.5$ .  $\rightarrow$  when  $p = \$1.8$ , the factory makes money. However, the marginal cost to operate on Saturday is  $\$2$ , it is not worth to produce T-shirts on Saturday. If Benetton offer  $\$1.5$  per T-shirt, the factory should not produce at all since the average cost is  $\$1.5$ , which is higher the price.

*Marginal cost is the appropriate cost to decide how much to produce, whereas average cost is the appropriate cost to decide whether to produce at all.*



**Figure 2.4 Marginal Cost and Average Cost: General Case**

Figure 2.4 illustrate the general case of marginal cost and average cost. Firm should shut down when price is lower than the minimum of average cost. However, the marginal cost will decide which optimum quantity to produce once the price is higher than average cost. More generally, the firm's *supply function* is given by the marginal cost function for values of price greater than the minimum of average cost in perfect competition.

## 2.1 Opportunity cost and sunk cost

- *Opportunity cost* of using time, money, or any other resource for a given purpose is defined as the forgone benefit from not applying the resource in the best alternative use.
- *Sunk cost* is an investment in an asset with no alternative use. Something should not be taken into consideration in economic decisions.

## 2.2 Economies of scale and economies of scope

- Scale economies if average cost declines with output.
- Constant returns to scale if average cost is constant.
- Diseconomies of scale if average cost is increasing in output.

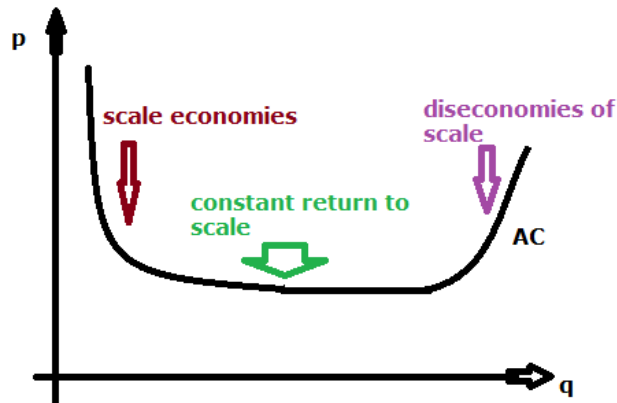


Figure 2.e1 Economies of scale

- Economies of scope when the cost of producing outputs  $q_1$  and  $q_2$  together is lower than the cost of doing so separately.

$$C(q_1, q_2) < C(q_1, 0) + C(0, q_2)$$

Example: the economies of scope exist when one airline operates both flights from NYC to London and from London to NYC. Since for two airlines, one operates flights from NYC to London, and the other airline flies from London to NYC, there are two fixed costs. Each airline has to invest fixed cost on airplane, airports. With one airline, the fixed cost is lower than that in two airlines case.

### 3. Profit Maximization

Firm's profit is

$$\pi(q) = R(q) - C(q)$$

What is the optimum output,  $q^*$ , level to maximize profit? First order condition shows that  $q^*$  should satisfy

$$R'(q) - C'(q) = 0$$

$$MR = MC$$

Where MR, marginal revenue, the derivative of revenue with respect to output; and MC is marginal cost.

In competitive market, firms are price taker, where  $MR=P$ . Therefore,  $P=MC$ . In monopoly market,  $MR=MC$ . Figure 2.e2 illustrates  $MR=MC$  when a monopoly maximize its profit.

### 4. Efficiency

#### 4.1 Allocative efficiency

In figure 2.e2,

$$\text{consumer surplus} + \text{producer surplus} = \text{total surplus}$$

The total surplus measures the increase in value that results from production and trade, in other words, it measures how much the society (consumer and firm) total benefit from the production and trade.

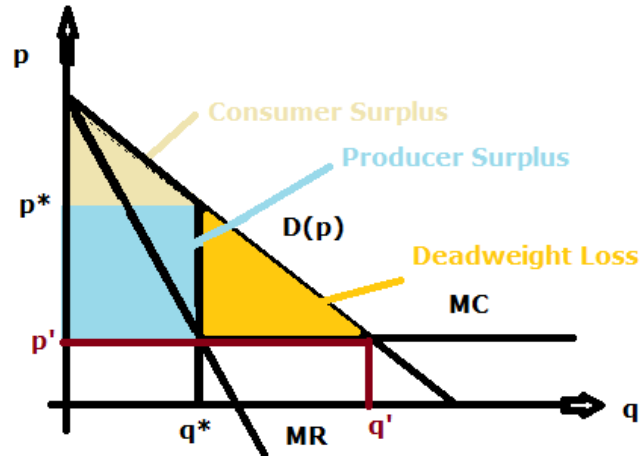


Figure 2.e2 Monopoly case: firm max profit (MR=MC)

*Allocative efficiency* requires that resources be allocated to their most efficient use. In figure 2.e2,  $p^*$  is not at the allocative efficiency since there are still consumer want to buy products but do not get. In other words, the  $q^*$  is smaller than the quantity at allocative efficiency. This can be measured by total surplus. Maximum allocative efficiency is achieved at point  $(p', q')$  where marginal cost is equal to the willingness to pay. In the case above, when the deadweight loss is zero.

#### 4.2 Productive efficiency

Productive efficiency refers to how close the actual production cost is to the lowest cost achievable. Figure 2.6 illustrate low productivity implies high marginal cost curve, where two marginal cost curves are depicted.

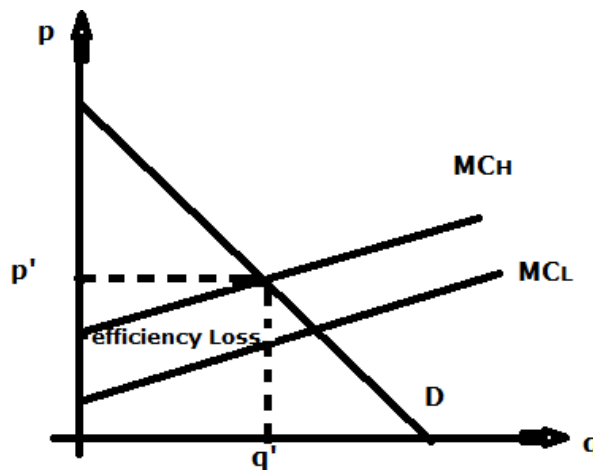


Figure 2.6 Inefficiency in Production

#### 4.3 Dynamic efficiency

For example in computer industry, the rate of introduction of new products, as well as improvement in the production techniques of existing ones, is the result of an industry's dynamic efficiency.



Dynamic efficiency is hard to measure. It is also hard to compare with the static inefficiencies (allocative or productive inefficiency). There usually a tradeoff between static and dynamic efficiency. It can be shown that perfect competition implies the maximum allocative and productive efficiency possible, that is, the maximum static efficiency. However, this may not count much in industries where technology evolves rapidly, such that static efficiency is a second-order effect with respect to dynamic efficiency.

*Allocative efficiency requires that output be at the appropriate level. Productive efficiency requires that such output be produced in the least expensive way given the available set of technologies. Dynamic efficiency refers to the improvement over time of products and production techniques.*