

AP Economics

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Part I

Microeconomics

Chapter 1

Basic Economics

1.1 Definition of Economics

1.1.1 Economics

Economics is a social science that studies how resources are used and is often concerned with how resources can be used to their fullest potential.

Economics is about how we deploy our resources to deal with **scarcity**.

1.1.2 Macroeconomics

Macroeconomics deals with the overall economy, involving economic problems encountered by the nation as a whole.

1.1.3 Microeconomics

Microeconomics is concerned with particular individuals, firms, industries, or regions within the economy.

$$\text{Economics} \left\{ \begin{array}{l} \text{Microeconomics} \\ \text{Macroeconomics} \end{array} \right. \quad (1.1)$$

1.1.4 Positive Economics

Positive economics is a stream of economics that focuses on the description, quantification, and explanation of economic developments, expectations, and associated phenomena. It relies on objective data analysis, relevant facts, and associated figures, involving no value judgments.

1.1.5 Normative Economics

Normative economics focuses on the value of economic fairness, or what the economy “should be” or “ought to be.” While positive economics is based on fact and cannot be approved or disapproved, normative economics is based on value judgments.

$$\text{Economics} \begin{cases} \text{Positive Economics} & \Rightarrow \text{Truth} \\ \text{Normative Economics} & \Rightarrow \text{Judgment} \end{cases} \quad (1.2)$$

1.2 Resources (Factors) in Economics

1.2.1 Land

The land refers to all natural resources. Mind the difference between natural and productive.

1.2.2 Labor

Labor encompasses all human attributes that are productive.

1.2.3 Capital

Capital is the productive equipment or machinery.

1.2.4 Entrepreneurship

Entrepreneurs are individuals who start a new business or bring a new product to the market.

$$\text{Resources} \begin{cases} \text{Macro} \begin{cases} \text{Land} \\ \text{Labor} \\ \text{Capital} \end{cases} \\ \text{Micro: Entrepreneurship} \end{cases} \quad (1.3)$$

1.3 Basic Concepts

1.3.1 Opportunity Cost

All decisions involve trade-offs, which are all the alternatives that we give up whenever we choose one course of action over others. And opportunity cost is the most desirable alternative given up as a result of a decision (how valuable the second most desirable choice is).

1.3.2 Production Possibilities Curve / Frontier (PPC / PPF)

The PPC shows the combinations of two goods that can be produced if the economy uses all of its resources fully and efficiently. Efficiency implies using resources to their maximum potential.

Consider the table below.

| | Guns | Butter |
|-----------|------|--------|
| Country A | 20 | 80 |
| Country B | 60 | 100 |

We may represent the table with a graph, which is then called the PPC of the countries A and B.

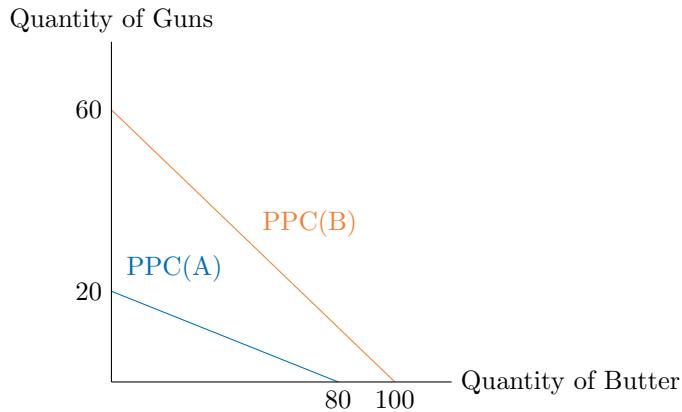


Figure 1.1: Production Possibilities Curves for countries A and B.

1.3.3 Calculating Opportunity Cost

From the figure above, we can see that if A plans to produce 20 guns, then it has to give up 80 units of butter. That is to say, the opportunity cost of A producing 20 guns is the 80 units of butter:

$$\text{Opportunity Cost of Guns} = \frac{\text{Change in Butter Production}}{\text{Change in Gun Production}} = \frac{80}{20} = 4 \text{ Units of Butter.} \quad (1.4)$$

If we denote the opportunity cost by OC and *A* and *B* are two products, then

$$OC_A = \frac{\Delta Q_B}{\Delta Q_A}, \quad OC_B = \frac{\Delta Q_A}{\Delta Q_B}. \quad (1.5)$$

Sometimes we may encounter another kind of table, which manifests the time needed to produce one unit of some product. In this case, we may consider a fixed amount of time and do the conversion from time to

quantity. Also, we can use the formula below:

$$OC_A = \frac{\Delta Q_B}{\Delta Q_A} = \frac{\Delta t_A}{\Delta t_B}. \quad (1.6)$$

1.3.4 Law of Increasing Costs

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The law of increasing costs states that as more of a product is produced, the opportunity cost increases.

Reasons

Some resources are more adept at the production of one good than another.

Note that when the ingredients or resources of some products are the same or similar, the law no longer holds.

1.3.5 Absolute Advantage and Comparative Advantage

Absolute advantage refers to the fact that a producer is more efficient than other producers in producing the same product. In tables that show the quantities of products, a larger number means absolute advantage.

Comparative advantage means that a producer has a lower opportunity cost than other producers in producing the same product.

Now return to the example above,

$$\begin{aligned} OC(A, \text{guns}) &= \frac{80}{20} = 4 \text{ Units of Butter} \\ OC(A, \text{Butter}) &= \frac{20}{80} = \frac{1}{4} \text{ Guns} \\ OC(B, \text{Guns}) &= \frac{100}{60} = \frac{5}{3} \text{ Units of Butter} \\ OC(B, \text{Butter}) &= \frac{60}{100} = \frac{3}{5} \text{ Guns}, \end{aligned}$$

and we may conclude:

$$OC(B, \text{Guns}) < OC(A, \text{Guns})$$

$$OC(A, \text{Butter}) < OC(B, \text{Butter}).$$

Therefore, while country B has absolute advantages in the production of both guns and butter, it only holds comparative advantage in the production of guns. Country A has the comparative advantage in butter production.

According to the theory of comparative advantage, every country should concentrate on producing and

exporting its products with “comparative advantages” and importing its products with “comparative disadvantages”. This process of concentrated production of products with a comparative advantage is called specialization.

1.3.6 Trade and Terms of Trade

Mutually advantageous trade can occur when the countries have different comparative advantages. For mutually advantageous trade to occur, the terms of trade must fall between the opportunity costs of both countries.

According to the example,

$$P(\text{Guns}) \in \left(\frac{5}{3}, 4\right) \text{ Units of Butter}$$

$$P(\text{Butter}) \in \left(\frac{1}{4}, \frac{3}{5}\right) \text{ Guns.}$$

1.3.7 Factors That Influence PPC

We shall return to what we have covered and discover that the factors are exactly land, labor, and capital.

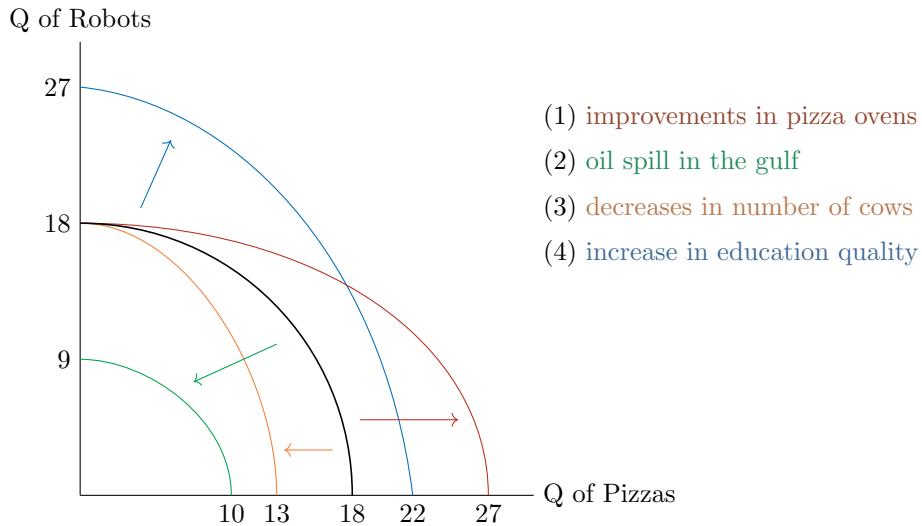


Figure 1.2: PPC changes due to different events.

One should pay attention that the event, (5) a decrease in the demand for pizzas, has no influence on the PPC; the production possibilities frontier has nothing to do with the preferences and demands of the consumers.

Notes

(1) PPC represents the border of an entity's production possibilities, and it thus has nothing to do with the consumers. The changes in PPC can be either "shifting outwards" or "shifting inwards." PPC is usually concave to the origin (due to the law of increasing costs). The straight line PPC as in Fig. 1.1 is actually called the budget line.

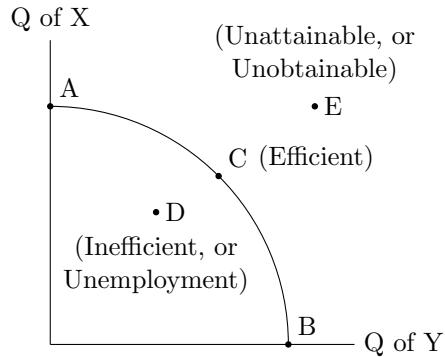


Figure 1.3: A typical Production Possibilities Curve.

(2) The points A, B, and C all represent the efficient use of the resources, as they are on the PPC of the entity. They are all best combinations of products, and a normative analysis is required to determine which point is preferred. Point D represents inefficient / unemployment, as it lies within the PPC. The point E is unattainable / unobtainable, as it lies outside the PPC. The economy can consume, but not produce, at E.

(3) Point shifts:

A decrease in employment may be represented by $B \rightarrow D$. Note that the process $D \rightarrow B$ involves no opportunity cost, as nothing is given up by producing more.

(4) Capital goods and consumer goods:

Capital goods help to shift outward the PPC.

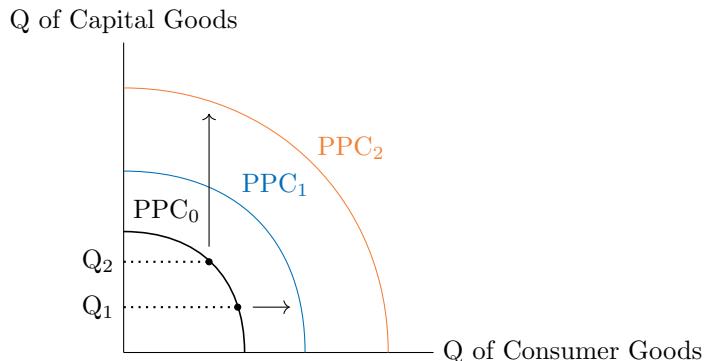


Figure 1.4: Producing more capital goods helps shifting the PPC outwards.

1.4 Economic Systems

1.4.1 Three Questions Governing the Economic System

- (1) What goods and services should be produced?
- (2) How should these goods and services be produced?
- (3) Who consumes these goods and services?

The way these questions are answered determines the economic system.

1.4.2 Communism and Capitalism

| | Communism | Capitalism |
|---------------------------|--|---|
| Characteristics | <ul style="list-style-type: none"> (1) The government owns all the resources. (2) The government answers the economic questions. | <ul style="list-style-type: none"> (1) Little government involvement in the economy; (2) Individuals own the resources and answer the economic questions. (3) The opportunity to make profits gives people incentive to produce quality items efficiently. (4) Wide variety of goods available to consumers; (5) Competition and self-interest regulate the economy. |
| Unemployment | Low | High |
| Job Security | Great | Low |
| Income | Equal | Unequal |
| Price of Health Care | Low | High |
| Incentives to Work Harder | No | Yes |
| Incentives to Innovate | No | Yes |
| Quality of Goods | Low (no competition) | High (competition) |

Table 1.1: Differences and Similarities between Communism and Capitalism.

1.4.3 Command Economy / Centrally Planned Economy / Communism

A command economy is one in which the central government dictates what will or will not be produced.

1.4.4 Capitalism / Free Market Economy

Capitalism is an economic system where supply and demand determines prices. In a capitalist economy, prices determine how much of each item will be produced. Consumers, not the government, determine how much of each item will be produced.

1.4.5 Productive Efficiency and Allocative Efficiency

Productive efficiency is a concept for a firm. It means producing the exact number of products to minimize the average total cost (ATC).

Allocative efficiency means that just the right goods and services are produced in just the right amounts to satisfy society's wants.

1.4.6 Mixed Economy

The mixed economy is the combination of both capitalism and communism.

1.5 Circular Flow Diagram

The circular flow diagram can clearly show the flow of money between households and companies. It includes two markets: product markets and factor markets. Goods and services (G&S) are the products we buy every day; the factors of production are the three major resources of economics (land, labor, and capital).

At the same time, it has two parts: households and firms. Households own the factors of production that firms need, and firms can use factors of production to produce goods and services.

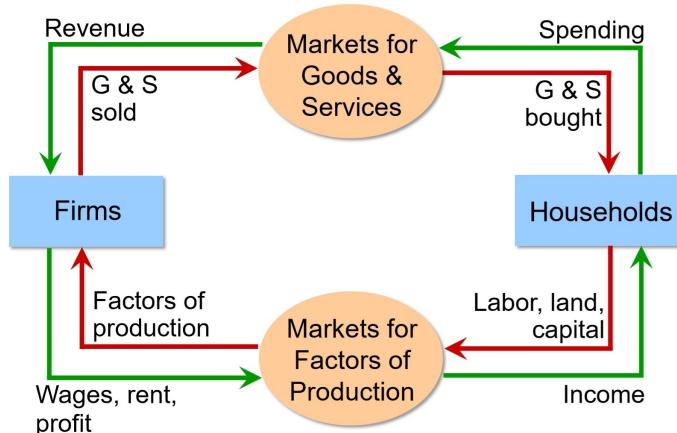


Figure 1.5: A typical circular flow diagram.

Economic activity can start from an exchange in any market. Viewed separately, the internal circulation is mainly the flow of goods and services; the external circulation is mainly the flow of money. The members of the family, as laborers, are the factors of production. They go out to look for jobs and enter the labor market. The business pays them wages, and the family gains income. Then, people will go to the product market to buy what they need. At the same time, companies sell the products they produce and the services they create to earn profits, so part of the money flows to the companies. With more and more money, the business can grow bigger and bigger. They may expand, requiring more land, machines, workers. They may then issue shares, or borrow money, which in turn flows money from households to businesses. The society develops in the continuous cycle of economic activities.

The circular flow diagram is a simplified representation of the macroeconomy.

1.5.1 Final Notes

Mind the difference between wage, income, revenue, and profit:

(1) Wage:

Wage is what we earn from our work.

(2) Income:

Income is the money we gain from any source. This implies $\text{Income} > \text{Wage}$.

$$\begin{aligned} \text{Income} &= \text{Consumption} + \text{Saving} \\ \frac{\Delta I}{\Delta I} &= \frac{\Delta C}{\Delta I} + \frac{\Delta S}{\Delta I} \Rightarrow \text{MPC} + \text{MPS} = 1. \end{aligned} \tag{1.7}$$

(3) Revenue:

Revenue is what the firms gain from business.

$$\text{TR} = P \times Q. \tag{1.8}$$

(4) Profit:

Profits are the part of money the firms gain after paying the costs.

$$\text{Profits} = \text{TR} - \text{TC} = Q(P - \text{ATC}). \tag{1.9}$$

The circular flow chart shows that Total Income = Total Expenditure, and this is why we can calculate the *GDP* of an economy by both income and expenditures approaches.

Chapter 2

Demand and Supply

2.1 Demand and the Law of Demand

2.1.1 Definition of Demand

A market's demand shows the quantity of a product a consumer is willing and able to purchase at each and every price. The demand for a product is shown graphically as a demand curve.

We should note the difference between the “quantity demanded” and the “demand” itself: quantity demanded is for a specific price, while demand is the quantity people are willing and able to buy at different prices.

Given the price of a product, rational people would buy until they believe the marginal benefit (MB) of buying the product is equal to the price of the product. That is to say, the demand curve is also the marginal benefit curve; they share the same definitions.

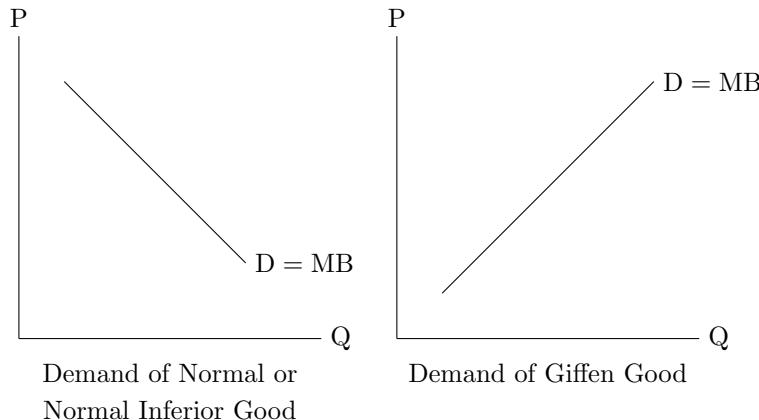


Figure 2.1: Demand curves for 3 types of goods.

2.1.2 Different Types of Products

Slutsky Equation

The Slutsky equation states the total change in demand consists of an income effect and a substitution effect and both effects collectively must equal the total change in demand.

$$\text{Total Change in Demand} = \text{Change by Substitution Effect} + \text{Change by Income Effect} \quad (2.1)$$

(1) Substitution Effect:

When the price of good changes, as it becomes relatively cheaper, if hypothetically consumer's consumption remains same, income would be freed up which could be spent on a combination of each or more of the goods.

The essence here is the change in relative prices, which leads to changes in quantity demanded.

(2) Income Effect:

The purchasing power of a consumer increases as a result of a price decrease, so the consumer can now afford better products or more of the same products, depending on whether the product itself is a normal good or an inferior good.

The essence here is the change in relative real income relative to product prices. When the product price increases, the real purchasing power and real income of the consumer decreases (and vice versa), which further leads to changes in quantity demanded.

Normal Goods

The demand curve for normal goods slopes downward. For normal goods, the signs of total effect, substitution effect, and income effect are all negative. That is to say, if the price of the good increases, then the optimal demand for the good decreases (the total effect is negative), and the total negative effect can be divided into the sum of negative substitution effect and negative income effect.

Inferior Goods

The demand curve for common inferior goods slopes downward. For inferior goods, the total effect is negative, where substitution effect is negative, but income effect is positive. That is, an increase in income reduces the demand for inferior goods. However, the absolute value of the change in the income effect is less than the substitution effect, making the total effect negative.

Giffen Goods

Giffen goods are a special class of inferior goods whose demand curves slope upward. The total effect of Giffen goods is positive, where the substitution effect is negative, and the income effect is positive. The absolute value of the income effect is larger than the substitution effect, which makes the total effect positive.

When the income effect and substitution effect are exactly equal, a change in price of the good has no effect on the quantity demanded. This means a vertical demand curve.

| | | Substitution Effect | Income Effect | Total Effect |
|----------------|-----------------------|---------------------|---------------|--------------|
| Normal Goods | | - | - | - |
| Inferior Goods | Normal Inferior Goods | | + | - |
| | Giffen Goods | | + | + |

Table 2.1: Substitution and income effects for different types of goods.

2.1.3 Law of Demand

Definition

The law of demand states that when the price of a product increases, the quantity demanded decreases.

The Giffen goods represent a violation of the law of demand, and this is called the Giffen effect.

Reasons

- (1) Income Effect;
- (2) Substitution Effect;
- (3) Law of Diminishing Marginal Utility:

As more units of the same product are consumed, the utility or satisfaction from each good decreases with each additional unit.

2.1.4 Factors that Influence Demand and Quantity Demanded

Factors that Influence Quantity Demanded: Price of the Good Itself

Factors that Influence Demand

- (1) Substitution Goods:

Two goods that can substitute for each other to satisfy the same desire or demand of consumers because of their similar functions are substitutes for each other. The price for a good moves in the same direction as the demand for its substitute.

(2) Complementary Goods:

Two goods that must be consumed together to satisfy the consumer are complements. The price of a good moves in opposite directions to the demand for its complement.

(3) Preference and Population:

When people like a good, there is a great demand for it. The larger the population, the larger the demand.

(4) Income:

An increase in income increases the demand for normal goods and decreases the demand for inferior goods.

(5) Expectation:

If people expect higher prices in the future, they will tend to buy more goods before the price rises, i.e. demand increases. If people expect a future price drop, they will tend to wait until the price falls before buying, i.e. demand decreases.

2.2 Supply and Law of Supply

2.2.1 Definition of Supply

Supply shows the quantity of a product a producer is willing and able to offer for sale at various prices.

Given a specific price, a rational producer would produce until the price of the product equals its marginal cost (MC).

That is to say, as demand and marginal benefit share the same definition, supply shares the same definition with marginal cost.

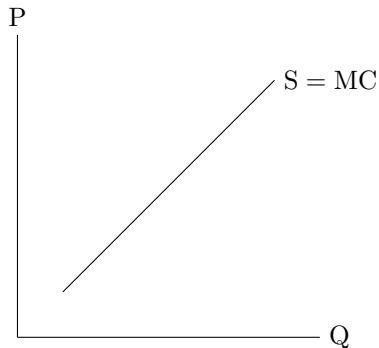


Figure 2.2: The supply curve.

2.2.2 Law of Supply

Definition

The law of supply states that when the price of a product increases, the quantity supplied increases.

Reasons

- (1) When prices increase, sellers have greater opportunities for increasing their profits.
- (2) The cost of producing each additional unit generally increases as sellers face rising marginal costs of production. Hence, it takes a higher price for the product to induce producers to offer more for sale.

2.2.3 Factors that Influence Supply and Quantity Supplied

Factors that Influence Quantity Supplied: Price of the Good Itself

Factors that Influence Supply

- (1) Costs of Inputs:

When costs of inputs increase, the supply decreases, and vice versa.

- (2) Prices of Other Goods:

If a firm can produce both product A and product B, then the increase in the price of B is equivalent to an increase in the opportunity cost of producing A, and the supply of A decreases.

- (3) Technology:

If production technology improves, the cost per unit of product produced falls, or the efficiency of production increases, supply increases.

- (4) Taxes and Subsidies:

Taxes reduce supply and subsidies increase supply.

- (5) Expectation:

If the producer believes that the price of the good will rise in the future, he will provide more products in the future and reduce the current supply; if the producer believes that the price of the commodity will fall in the future, he will provide more products now, that is, the supply increases.

2.3 Market Equilibrium

2.3.1 Surplus and Shortage

A situation where the quantity supplied is greater than the quantity demanded is called a surplus, and a situation where the quantity demanded is greater than the quantity supplied is called a shortage.

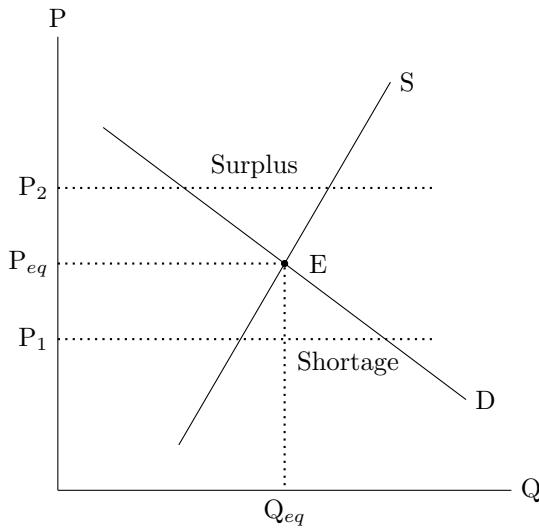


Figure 2.3: Surplus and shortage.

2.3.2 The Double-shift Rule

When demand and supply change together, then either the change in price or quantity is indeterminate.

| Demand | Supply | Effect on Price | Effect on Quantity |
|--------|--------|-----------------|--------------------|
| ↑ | ↑ | Indeterminate | ↑ |
| ↓ | ↓ | Indeterminate | ↓ |
| ↑ | ↓ | ↑ | Indeterminate |
| ↓ | ↑ | ↓ | Indeterminate |

Table 2.2: The double-shift rule.

2.3.3 Price Ceiling and Price Floor

A price ceiling keeps the market price from being higher than a certain price, and a price floor keeps the market price from being lower than a certain price.

When the price specified by the price ceiling is lower than the equilibrium price, the price ceiling is said to be effective (binding price ceiling).

When the price specified by the price ceiling is higher than the market equilibrium price, the price ceiling is invalid (unbinding), and has no effect on the market equilibrium price and quantity.

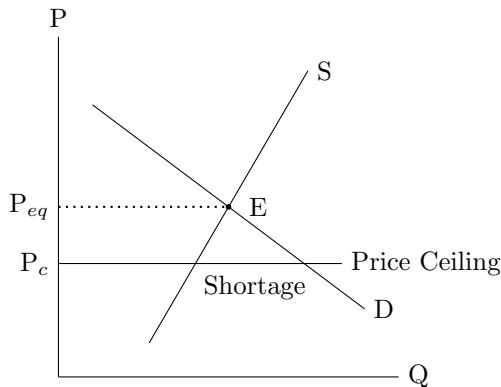


Figure 2.4: A binding price ceiling.

Similarly, when the price specified by the price floor is higher than the market equilibrium price, the price floor is called effective (binding price floor).

An example of a price floor in the labor market is the minimum wage. Although the minimum wage increases wages for those with jobs, the minimum wage reduces the number of people with jobs because companies hire fewer people when wages are high.

When the price specified by the price floor is lower than the market equilibrium price, the price floor is invalid (unbinding), and has no effect on the market's equilibrium price and quantity.

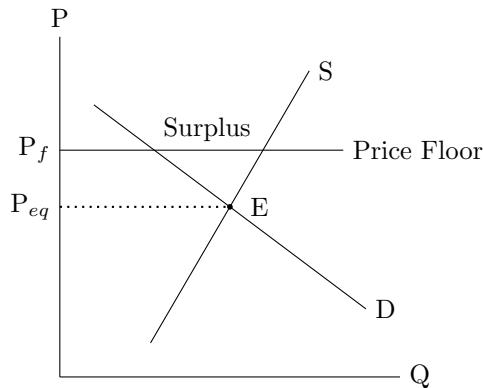


Figure 2.5: A binding price floor.

Chapter 3

Elasticity, Taxation, and Consumer Choice

3.1 Elasticity

3.1.1 Definition

Elasticity of demand measures how consumers respond to changes in price.

Elasticity describes the change in quantity demanded caused by price changes, and this is why the price is in the denominator.

3.1.2 Price Elasticity of Demand

Formula

$$\text{Price Elasticity of Demand} = \frac{\% \text{ Change in Quantity Demanded}}{\% \text{ Change in Price}} \quad (3.1)$$

$$\text{PED} = \frac{\Delta Q/Q_{\text{old}}}{\Delta P/P_{\text{old}}} \quad (3.2)$$

The above formulas always yield a negative value (except for Giffen goods). We process by taking the absolute value so that PED is positive.

Total Revenues Test

$$TR = P \times Q \quad (3.3)$$

$$\begin{cases} P \uparrow, TR \downarrow, & PED > 1 \\ P \uparrow, TR -, & PED = 1 \\ P \uparrow, TR \uparrow, & PED < 1 \end{cases} \quad (3.4)$$

Perfectly Elastic and Perfectly Inelastic

Perfect elasticity means that quantity changes by a prodigious amount by a little change in price, or $PED = \infty$. Any increase in P would decrease Q immediately to 0, and this means that a perfectly elastic demand curve is flat (Mr. Flat).

Perfect inelasticity means the quantity does not change by changes in price, or $PED = 0$. Any change in P has no influence on Q , and this means that a perfectly inelastic demand curve is vertical (Mr. Stick).

An elastic demand is flatter, while an inelastic demand is steeper.

Elasticity on the Demand Curve

The values of elasticity at different points on the demand curve are also different.

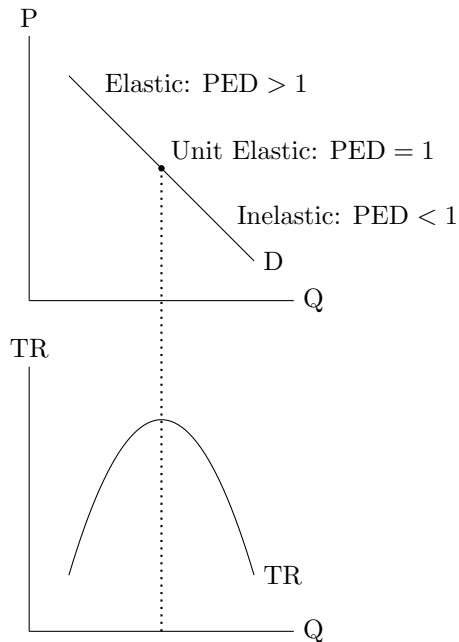


Figure 3.1: Elasticity on the Demand Curve.

Proof. Let the demand curve be denoted by $D : P = -aQ + b$.

From this, we know the intercept on P axis is b , and that on Q axis is $\frac{b}{a}$. Then, the midpoint has $Q = \frac{b}{2a}$.

As $TR = P \times Q$, where $P = -aQ + b$, we know:

$$TR = (-aQ + b)Q = -aQ^2 + bQ.$$

TR is a quadratic function of Q , and the coordinate of its vertex is:

$$Q = \frac{-b}{2(-a)} = \frac{b}{2a}, \text{ where}$$

$$\frac{dTR}{dQ} = -2aQ + b = 0 \Rightarrow dTR = 0.$$

Therefore, at the vertex, TR does not change by changes in Q (and thus P), so $PED = 1$. By the definition of elasticity,

$$PED = \left| \frac{\Delta Q / Q_{\text{old}}}{\Delta P / P_{\text{old}}} \right| = \left| \frac{\Delta Q}{\Delta P} \frac{P_{\text{old}}}{Q_{\text{old}}} \right| = \left| \frac{1}{dP/dQ} \frac{P_{\text{old}}}{Q_{\text{old}}} \right| = \left| \frac{1}{k} \frac{P_{\text{old}}}{Q_{\text{old}}} \right|.$$

As the demand curve is a straight line, k is a fixed value, and the above expression is 1 at $Q = \frac{b}{2a}$,

$$PED = \left| \frac{1}{k} \frac{P_m}{Q_m} \right| \Rightarrow k = -\frac{P_m}{Q_m}.$$

So, the formula of elasticity is:

$$PED = -\frac{1}{k} \frac{P_{\text{old}}}{Q_{\text{old}}} = \frac{Q_m}{P_m} \frac{P_{\text{old}}}{Q_{\text{old}}}.$$

Therefore, on the upper part of the curve, $Q_{\text{old}} < Q_m$, $P_{\text{old}} > P_m$, and $PED > 1$. On the lower part of the curve, $Q_{\text{old}} > Q_m$, $P_{\text{old}} < P_m$, and $PED < 1$. \square

Factors that Influence PED

(1) Are there substitutes available, or is the good a necessity?

If there are many substitutes, the demand is more elastic; if the good is a necessity, the demand is less elastic.

(2) Can the purchase be delayed?

If the purchase can be made after a certain period of time, then the elasticity is great.

(3) Does the purchase require a large percentage of income?

If the price accounts for a large share of income, then the elasticity is large.

3.1.3 Cross-price Elasticity of Demand (CPED)

Cross-price elasticity refers to the effect of a change in the price of one good on the quantity demanded of another:

$$\text{CPED}_X = \frac{\% \text{ Change in Quantity Demanded of } X}{\% \text{ Change in Price of } Y} = \frac{\Delta Q_X / Q_{X,\text{old}}}{\Delta P_Y / P_{Y,\text{old}}} \quad (3.5)$$

When the price of a product increases ($\% \text{ Change in Price of } Y > 0$), the demand for its substitutes would increase ($\% \text{ Change in Quantity Demanded of } X > 0$), and this means a positive CPED.

For complements, the logic flows to give a negative CPED.

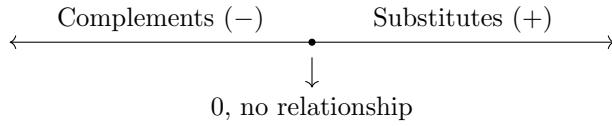


Figure 3.2: Cross-price elasticity of demand for different types of goods.

3.1.4 Income Elasticity of Demand

The income elasticity of demand measures the effect of a change in income on the quantity demanded of a good.

$$\text{Income Elasticity of Demand} = \frac{\% \text{ Change in Quantity Demanded}}{\% \text{ Change in Income}} \quad (3.6)$$

When income increases ($\% \text{ Change in Income} > 0$), the demand for normal goods increases ($\% \text{ Change in Quantity Demanded} > 0$), and this makes a positive IED.

For inferior goods including Giffen goods, an increase in income would reduce the quantity demanded ($\% \text{ Change in Quantity Demanded} < 0$), and this means a negative IED.

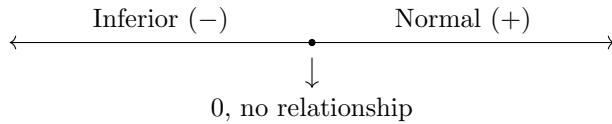


Figure 3.3: Income elasticity of demand for different types of goods.

3.1.5 Price Elasticity of Supply

In the long run, all costs of production are variable costs. In a perfectly competitive market in a constant-cost industry, the long-run supply curve is a horizontal straight line.

$$\text{Price Elasticity of Supply} = \frac{\% \text{ Change in Quantity Supplied}}{\% \text{ Change in Price}} \quad (3.7)$$

$$\text{PES} = \frac{\Delta Q/Q_{\text{old}}}{\Delta P/P_{\text{old}}} \quad (3.8)$$

Note that both supply and demand are more elastic in the long run.

3.2 Deadweight Loss (DWL)

3.2.1 Definition

When a market fails to produce an optimal output, there is a deadweight loss.

Deadweight loss refers to the social cost caused by the market not being in an optimal operating state, that is, the total surplus lost when the market deviates from the competitive equilibrium.

3.2.2 Consumer Surplus and Producer Surplus

The consumer surplus is the difference between the highest price a consumer would pay for a product and the actual price paid. The producer surplus is the difference between the lowest price a producer would sell a product and the actual price received.

3.2.3 Deadweight Loss Caused by Government Regulation

Price Ceiling & Price Floor

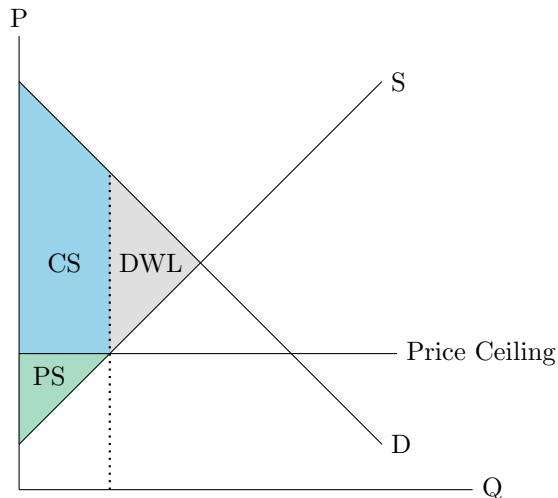


Figure 3.4: DWL caused by a binding price ceiling.

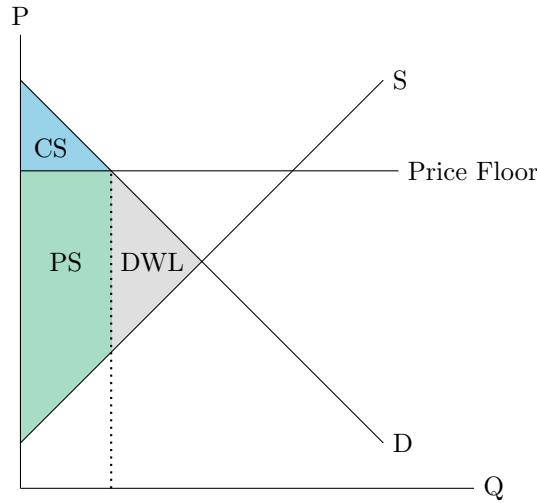


Figure 3.5: DWL caused by a binding price floor.

Taxes & Subsidies

A per-unit tax (excise tax) poses a extra marginal cost on every unit of product being produced. This means that the marginal cost curve is shifted up.

By contrast, a lump-sum tax is a tax of a fixed amount. It does not change the marginal cost nor the supply curve.

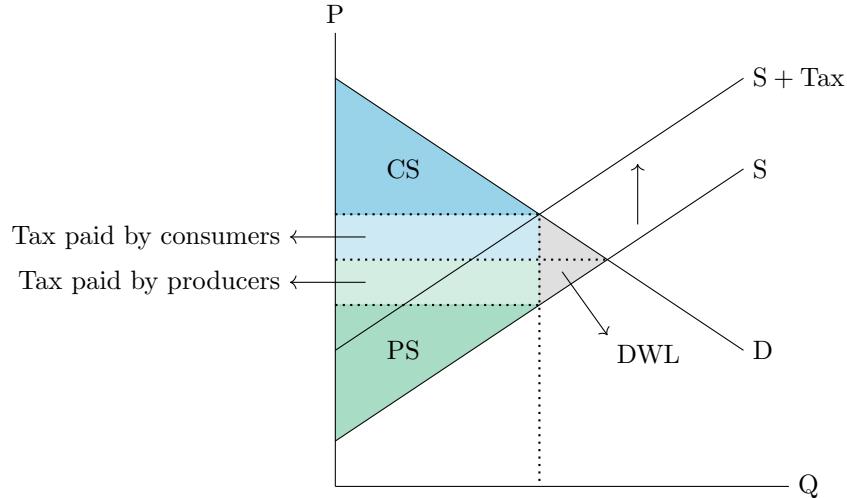


Figure 3.6: DWL caused by a per-unit tax.

A per-unit subsidy decreases the marginal cost of each product being produced by the same amount. This means that the marginal cost curve is shifted down.

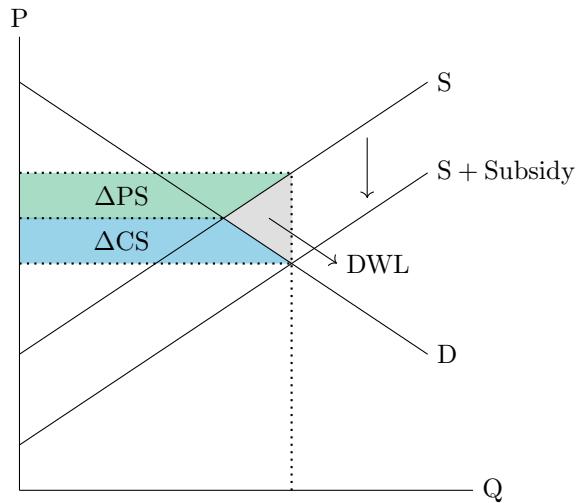


Figure 3.7: DWL caused by a per-unit subsidy.

Quotas

Quotas limit the amount of products that enter a country each year.

Remember that the price is always determined on the demand curve, not the supply curve.

This situation is very similar to the binding price floor, but the logic is the thing that marks a line of demarcation.

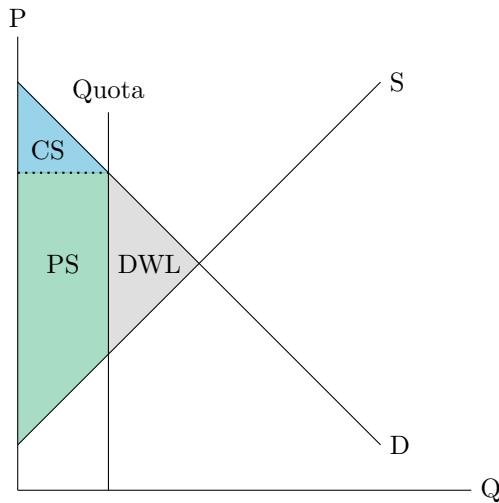


Figure 3.8: DWL caused by a quota.

International Trade and Tariff

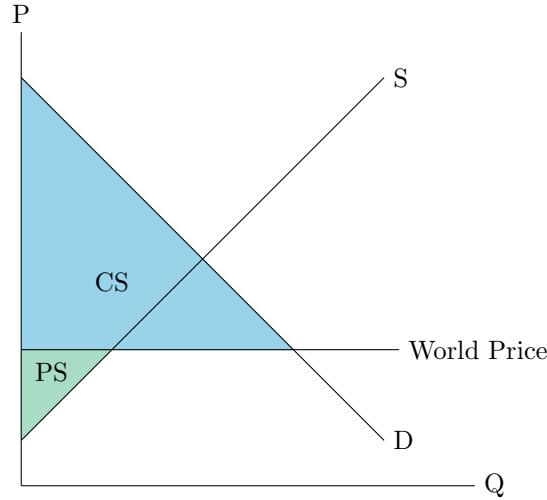


Figure 3.9: Normal international trade.

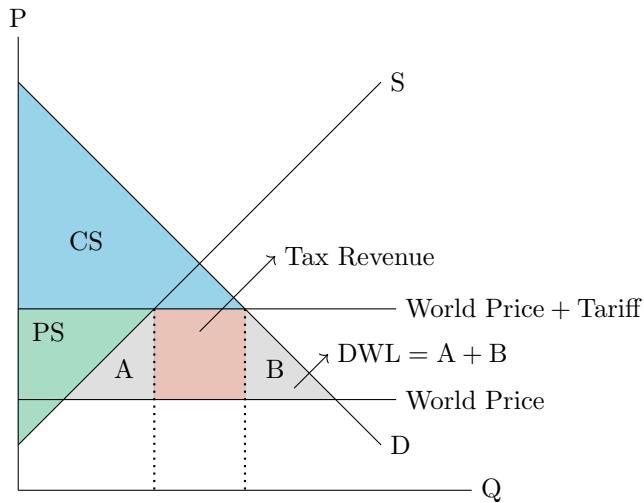


Figure 3.10: International trade with tariffs.

Note that in Fig. 3.10,

$$\text{Total Surplus} = \text{CS} + \text{PS} + \text{Tax Revenue}. \quad (3.9)$$

To sum up,

$$\text{Government Involvement} \left\{ \begin{array}{l} \text{Price Controls: Price Ceiling \& Price Floor} \\ \text{Taxes \& Subsidies} \\ \text{Tariffs \& Quotas} \end{array} \right. \quad (3.10)$$

3.3 Consumer Choice Theory

3.3.1 Law of Diminishing Marginal Utility

The law of diminishing marginal utility states that the marginal utility would decrease as we consume more of a product.

In a situation of a limited budget, we are always hoping to maximize our utility. Without this limited budget, we should consume until the marginal utility is 0.

3.3.2 Indifference Curves

An indifference curve connects points on a graph representing different quantities of two goods, points between which a consumer is indifferent. That is, any combinations of two products indicated by the curve will provide the consumer with equal levels of utility, and the consumer has no preference for one combination or bundle of goods over a different combination on the same curve.

Four properties of indifference curves:

- (1) There can be an infinite number of indifference curves between any two indifference curves. Indifference curves farther from the origin represent higher levels of utility.
- (2) No two indifference curves on the same coordinate plane will intersect.
- (3) Indifference curves are convex toward the origin. That is to say, the indifference curve slopes downward to the right, and the absolute value of the slope of the indifference curve is decreasing. This depends on the law of diminishing marginal rate of substitution of goods.
- (4) Under the condition of given income and price, in order to obtain the same utility, consumers must reduce the consumption of one good to increase consumption of another, and the two goods cannot be reduced or increased at the same time under the condition that consumers' preferences remain unchanged.

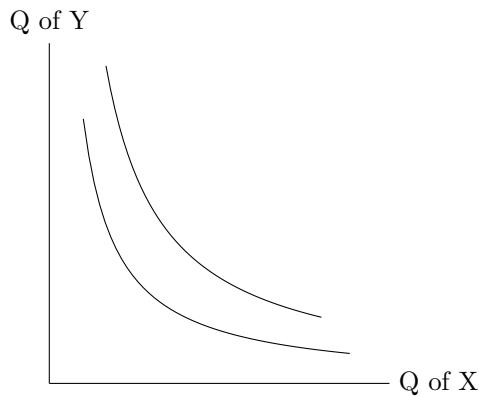


Figure 3.11: Indifference curves.

Law of Utility Maximization

Rational people want their indifference curves to be as high as possible. The budget line is calculated based on all the money a person is ready to consume. However, subject to the budget, people can only achieve various combinations within the budget line.

To find the combination of products that gives maximized utility on the line, go for the point where the budget line is tangent to the indifference curve. That point represents the highest indifference curve the consumer can reach under the budget.

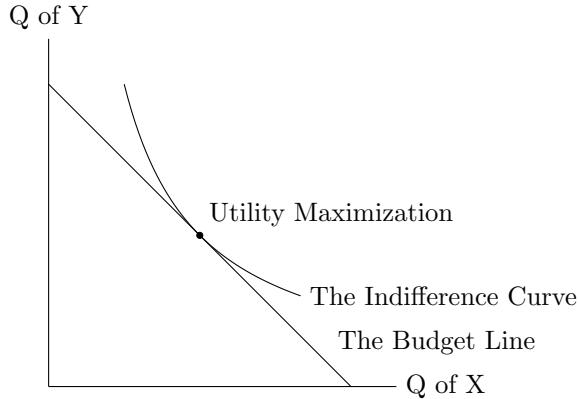


Figure 3.12: Utility Maximization.

Utility Maximization Formula

By the definition of indifference curves, we can write the function of the indifference curve:

$$U_X + U_Y = C,$$

where C is a constant.

Differentiate on both sides, and we get:

$$dU_X + dU_Y = dC = 0.$$

By the definition of marginal utility,

$$MU = \frac{dTU}{dQ}, \quad (3.11)$$

we can write:

$$MU_X dQ_X = -MU_Y dQ_Y$$

$$\frac{MU_X}{MU_Y} = -\frac{dQ_Y}{dQ_X}.$$

Let the budget line be represented by the equation

$$P_X Q_X + P_Y Q_Y = M.$$

Differentiate on both sides, and we get:

$$P_X dQ_X + P_Y dQ_Y = dM = 0.$$

Therefore, we know:

$$\begin{aligned} P_X dQ_X &= -P_Y dQ_Y \\ \frac{dQ_Y}{dQ_X} &= -\frac{P_X}{P_Y}. \end{aligned}$$

So,

$$\frac{MU_X}{MU_Y} = -\frac{dQ_Y}{dQ_X} = -\left(-\frac{P_X}{P_Y}\right) = \frac{P_X}{P_Y}.$$

By rearranging, we arrive at the utility maximization formula:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}. \quad (3.12)$$

Consider an example below:

We have a total of \$52, and there are two goods, souvenirs and games. Souvenirs cost \$8 each, and games, \$4. The chart below shows the relation between the total utility and the quantities we consume.

| Total Units | Total Utility of Souvenirs | Total Utility of Games |
|-------------|----------------------------|------------------------|
| 1 | 56 | 32 |
| 2 | 104 | 60 |
| 3 | 136 | 84 |
| 4 | 160 | 104 |
| 5 | 180 | 116 |
| 6 | 196 | 126 |
| 7 | 208 | 134 |

In order to calculate which combination to choose to obtain the greatest total utility and use the principle of utility maximization, we need to write the marginal utility and the ratio of the marginal utility to the price, and make a new table.

$$MU = \Delta U = U(n+1) - U(n). \quad (3.13)$$

| Total Units | MU _S | MU _S /P _S | MU _G | MU _G /P _G |
|-------------|-----------------|---------------------------------|-----------------|---------------------------------|
| 1 | 56 | 7 | 32 | 8 |
| 2 | 48 | 6 | 28 | 7 |
| 3 | 32 | 4 | 24 | 6 |
| 4 | 24 | 3 | 20 | 5 |
| 5 | 20 | 2.5 | 12 | 3 |
| 6 | 16 | 2 | 10 | 2.5 |
| 7 | 12 | 1.5 | 8 | 2 |

Then, search downwards from maximum values of MU/P until the budget is all spent.

As we can see

$$4 \times \$8 + 5 \times \$4 = \$52,$$

and therefore, the utility maximization combination in this case is 4 souvenirs and 5 games.

Chapter 4

Costs of Production

4.1 Basic Concepts in Production

4.1.1 The Short Run and the Long Run

The short run is where at least one production input is fixed and supply cannot fully adjust to changes in demand. The long run is when all resources used in production are variable and supply can adjust to changes in demand.

4.1.2 Law of Diminishing Marginal Returns

The law of diminishing marginal returns is a theory in economics that predicts that after some optimal level of capacity is reached, adding an additional factor of production will actually result in smaller increases in output.

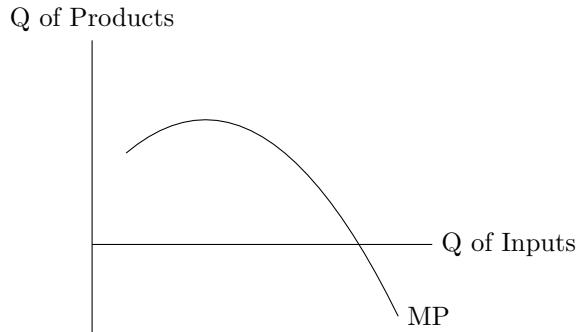


Figure 4.1: The Marginal product (MP) curve.

4.2 Common Functions in Production

4.2.1 Product Functions

Average Product (AP)

$$AP = \frac{\text{Total Outputs}}{\text{Total Inputs}} = \frac{TP}{I} \quad (4.1)$$

Marginal Product (MP)

$$MP = \frac{\text{Change in Output}}{\text{Change in Input}} = \frac{\Delta TP}{\Delta I} = \frac{dTP}{dI} \quad (4.2)$$

One should note that MP always crosses AP at the highest point of AP.

If $MP > AP$, the additional product is added to AP, and AP will rise. If $MP < AP$, the additional product is subtracted from AP, so AP falls. So, MP intersects AP at AP's highest point.

Also, the total product (TP) starts to decrease when MP falls to 0. This is so intuitive.

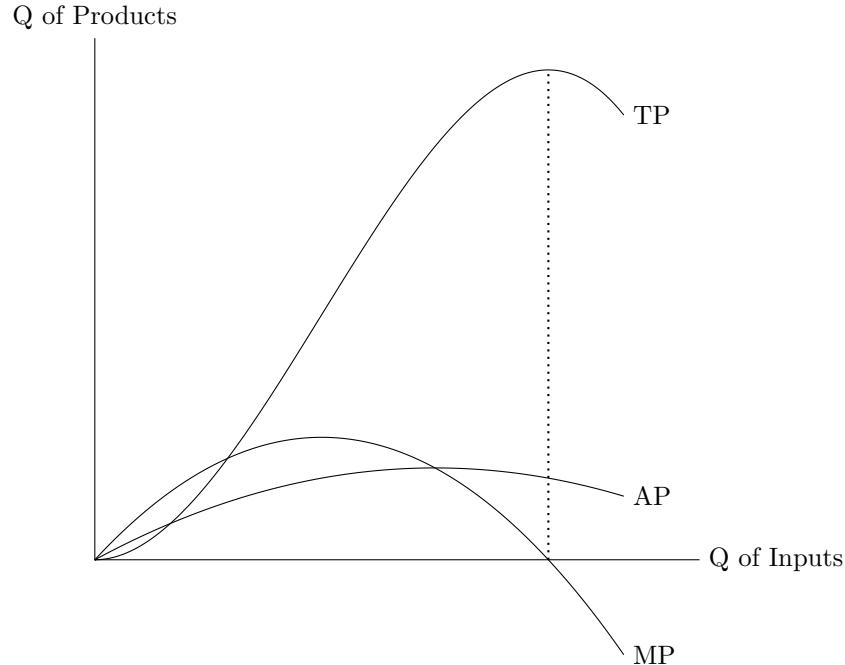


Figure 4.2: Product Functions.

4.2.2 Cost Functions

Total Cost (TC)

Total cost includes total fixed cost (TFC) and total variable cost (TVC).

$$TC = TFC + TVC. \quad (4.3)$$

In the long run, $TFC = 0$.

If a firm has costs when total product is zero, they are fixed costs.

Average Costs and Marginal Costs

$$ATC = \frac{TC}{Q}, \quad AFC = \frac{TFC}{Q}, \quad AVC = \frac{TVC}{Q}, \quad (4.4)$$

where Q stands for the quantity of products.

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{dTC}{dQ} \quad (4.5)$$

As TFC is a constant, AFC resembles the function of $y = \frac{1}{x}$. The relationships between ATC and MC and AVC and MC are very similar to that between AP and MP . MC crosses ATC and AVC at their bottoms. Also, as $TC = TFC + TVC$,

$$ATC = AFC + AVC. \quad (4.6)$$

As Q increases, the vertical distance between ATC and AVC decreases.

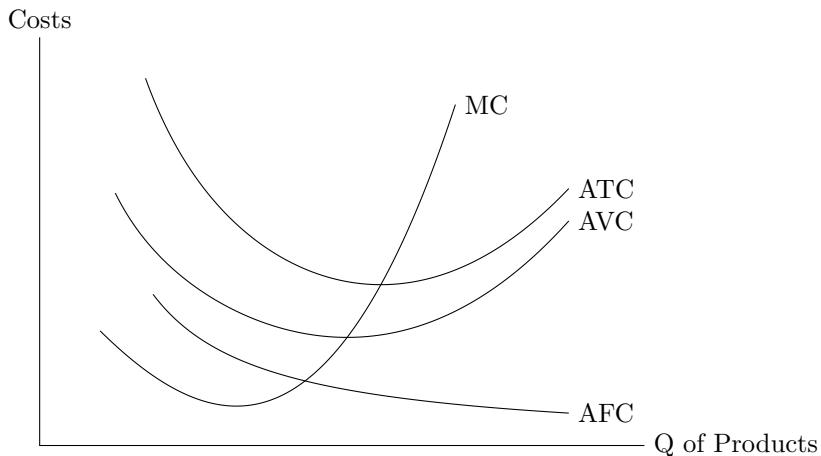


Figure 4.3: The four important cost curves.

4.2.3 Impact of Taxes on Costs

Lump-sum Taxes

A lump-sum tax is a fixed and unchanging tax regardless of the amount a firm produces. This tax is irrelevant of the quantity of the products. It changes TFC and TC, so the impact is on AFC and ATC.

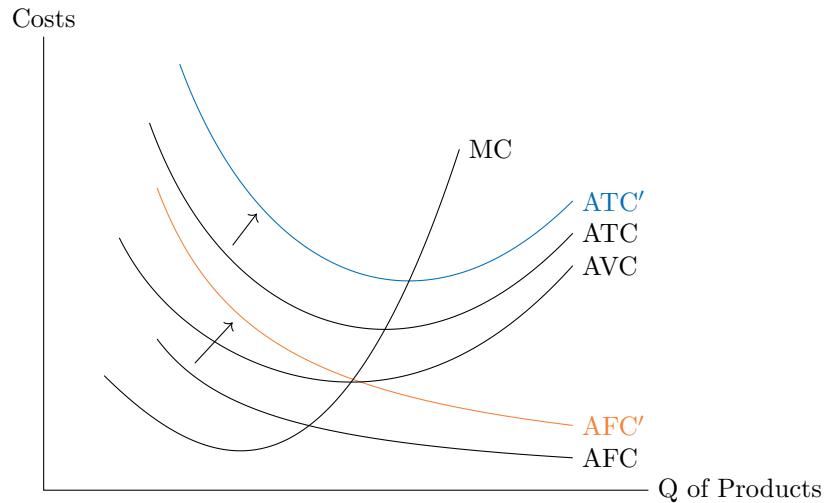


Figure 4.4: The impact of a lump-sum tax on cost curves.

Per-unit Taxes

A per-unit tax is a tax on each additional unit of output produced. Every unit of product produced means an additional tax. This leads to higher MC, higher TVC, and higher TC.

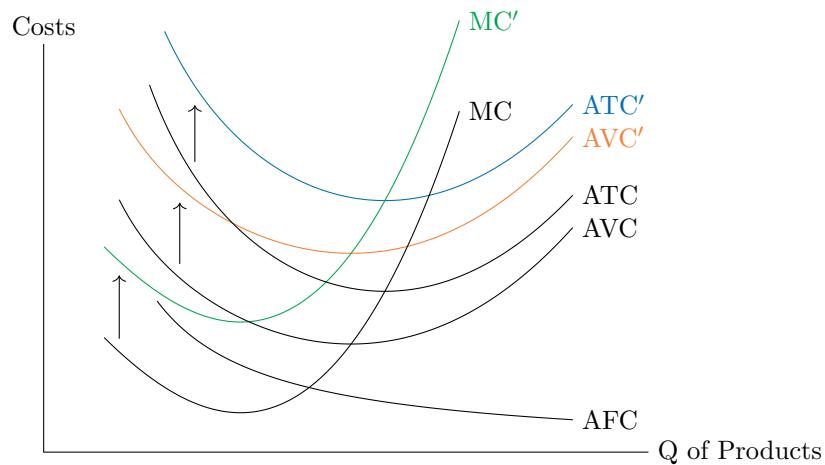


Figure 4.5: The impact of a per-unit tax on cost curves.

4.3 Costs and Economies of Scale

4.3.1 Long-run Average Total Cost (LRATC)

In the short run, we talk about the short-run average total cost (SRATC).

The long-run total cost curve is the envelope of the short-run total cost curve. In geometry, the envelope of a family of curves is a curve that is tangent to every line of the family at least one point.

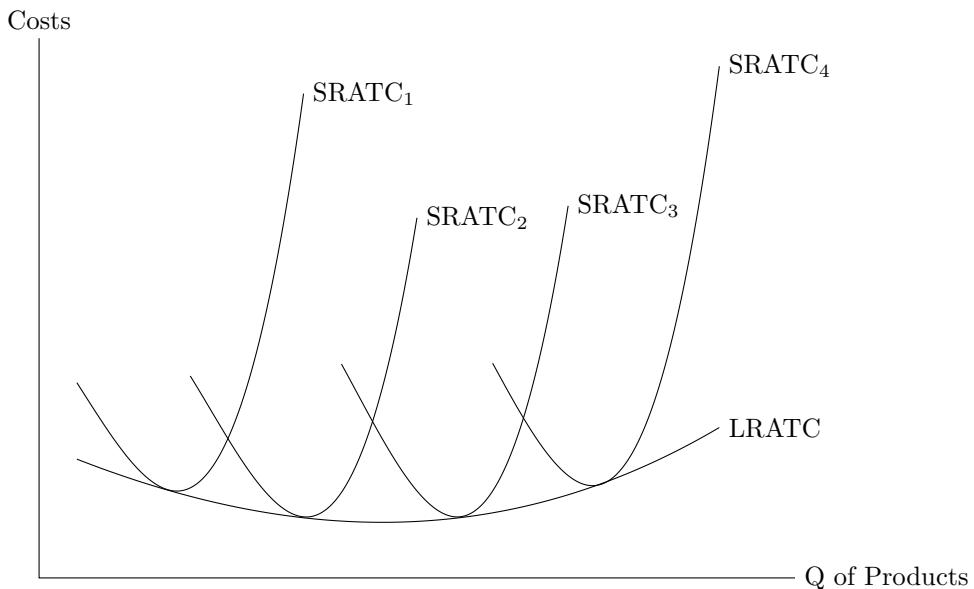


Figure 4.6: The short-run and long-run ATC curves.

LRATC is more flat than the SRATC. They are both U-shaped, but there are different reasons for their shape.

- (1) The reason why the SRATC curve is U-shaped is due to the effect of the law of diminishing marginal returns of the short-run production function.
- (2) The U-shaped feature of the LRATC curve is determined by economies of scale and diseconomies of scale in long-term production.

4.3.2 Economies of Scale

- (1) Economies of scale / Increasing Returns to Scale:

This is featured by LRATC curve sloping downwards.

- (2) Constant Returns to Scale:

This is featured by LRATC being a constant.

- (3) Diseconomies of Scale / Decreasing Returns to Scale:

This is featured by LRATC curve sloping upwards.

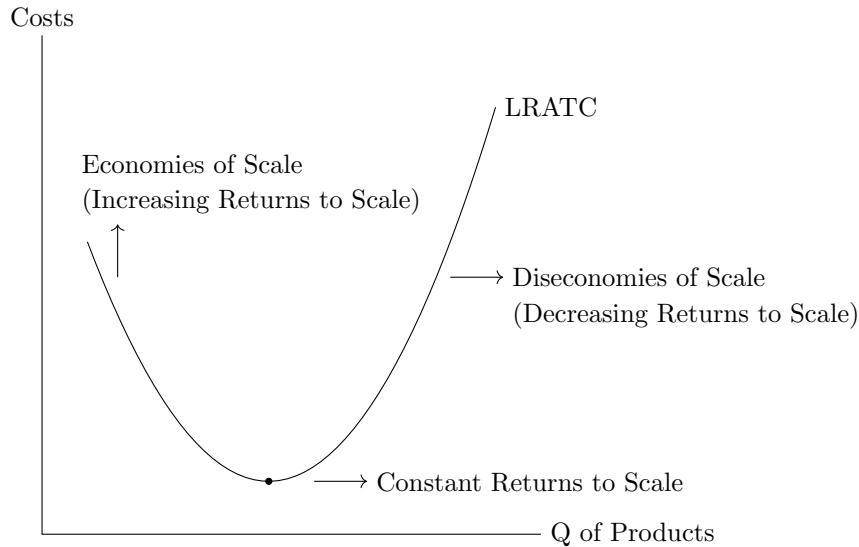


Figure 4.7: Economies of scale on LRATC curve.

Determining types of scale:

(1) By LRATC:

$$\text{When quantity of products increases, LRATC} \begin{cases} \text{increases} & \text{diseconomies of scale} \\ \text{does not change} & \text{constant returns to scale} \\ \text{decreases} & \text{economies of scale} \end{cases} \quad (4.7)$$

(2) By elasticity of production:

Elasticity of production refers to the percentage change in output caused by a given percentage change in one input factor when all other input factors are held constant. This elasticity refers to the sensitivity of changes in product output to changes in production factor inputs during production.

Let TP denote the total product and I denote the input, and

$$E_p = \frac{\% \Delta TP}{\% \Delta I} = \frac{\Delta TP / TP}{\Delta I / I} = \frac{\Delta TP}{TP} \times \frac{I}{\Delta I} = \frac{\Delta TP}{\Delta I} \times \frac{I}{TP} = \frac{MP}{AP}. \quad (4.8)$$

Therefore, actually, the elasticity of production is the ratio of MP to AP:

$$E_p = \frac{\% \Delta TP}{\% \Delta I} = \frac{MP}{AP}. \quad (4.9)$$

(A) When $E_p > 1$, the increase in output is greater than the increase in factors of production (economies of scale), and increasing the input of factors of production will lead to an increase in average output.

- (B) $E_p = 1$ means constant returns to scale, and AP reaches the highest point at this time.
- (C) $E_p < 1$ means diseconomies of scale, which means increasing the input of production factors will cause the average output to decrease.
- (D) When $E_p = 0$, MP = 0, and the TP reaches the maximum.
- (E) When $E_p < 0$, MP < 0, and increasing the input of production factors will cause the total output to decrease.

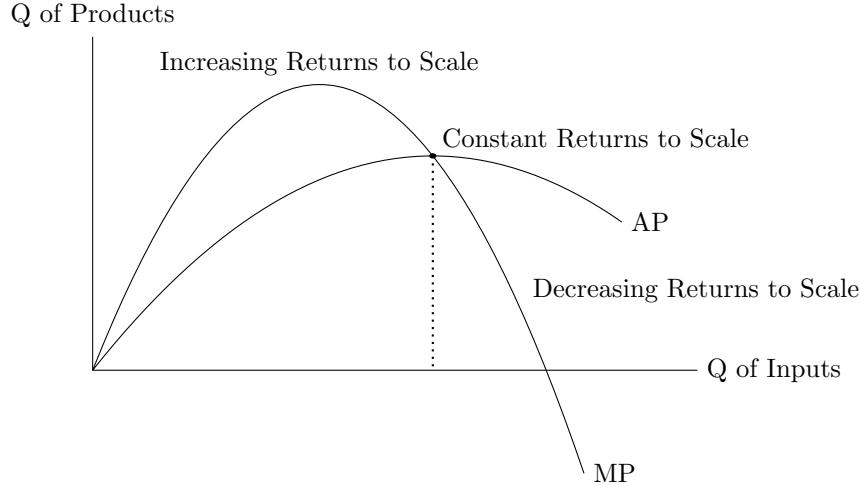


Figure 4.8: Determination of economies of scale based on elasticity of production.

4.4 Economic Profit and Accounting Profit

$$\text{Accounting Profits} = \text{Total Revenue} - \text{Explicit Costs} - \text{Depreciation}. \quad (4.10)$$

$$\begin{aligned} \text{Economic Profits} &= \text{Total Revenue} - \text{Explicit Costs} - \text{Implicit Costs} - \text{Depreciation} \\ &= \text{Accounting Profits} - \text{Implicit Costs}. \end{aligned} \quad (4.11)$$

The enterprise uses fixed assets in the process of production and operation to reduce its value, leaving only a certain residual value. The difference between its original value and residual value is apportioned within its useful life. This is the calculation method of depreciation.

$$\begin{cases} \text{Explicit Costs: Actual Money Spent} \\ \text{Implicit Costs: No Actual Money Spent} \end{cases} \quad (4.12)$$

We may comprehend implicit costs as the opportunity costs.

We recognize the situation where Economic Profits = 0 as a normal profit. At this time,

$$EP = AP - IC = 0 \Rightarrow AP = IC,$$

the accounting profit equals to the implicit costs.

Chapter 5

Product Markets

5.1 Basic Questions

5.1.1 Types of Product Markets

According to the competitiveness of various markets, the product market is divided into 4 categories, from the most competitive to the least competitive, namely perfect competition, monopolistic competition, oligopoly, and monopoly.

$$\left\{ \begin{array}{l} \text{Perfect Competition} \\ \text{Imperfect Competition} \end{array} \right. \left\{ \begin{array}{l} \text{Monopolistic Competition} \\ \text{Oligopoly} \\ \text{Monopoly} \end{array} \right. \quad (5.1)$$

5.1.2 The Principle of Profit Maximization

Marginal Revenue (MR)

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{dTR}{dQ} \quad (5.2)$$

The principle of profit maximization tells us when $MR = MC$, the profit of the company is maximized. This principle applies to every type of the market.

Average Revenue (AR)

The average revenue is the ratio of total revenue (TR) to the quantity of products:

$$AR = \frac{TR}{Q}. \quad (5.3)$$

5.2 Perfect Competition

5.2.1 Efficiency and Equity

In competitive markets, there is a trade-off between equity and efficiency.

$$\begin{cases} \text{Capitalism: efficiency} \\ \text{Communism: equity} \end{cases} \quad (5.4)$$

5.2.2 Properties

- (1) Many small firms;
- (2) Identical products (perfect substitutes);
- (3) Easy for firms to enter and exit the industry (no barrier);
- (4) Sellers have no need to advertise;
- (5) Firms are price takers; they have no control over prices.

5.2.3 Graph

The graph of a perfectly competitive market includes one of the market as a whole and another for a single firm.

Due to the large number of companies, all companies can only accept the price from the market, so in the graph of a single company, the demand curve is a horizontal line (perfect elasticity).

$$TR = P \cdot Q, \quad (5.5)$$

where P is a constant. Therefore,

$$AR = \frac{TR}{Q} = \frac{P \cdot Q}{Q} = P, \quad (5.6)$$

$$MR = \frac{dTR}{dQ} = \frac{d(P \cdot Q)}{dQ} = \frac{PdQ}{dQ} = P. \quad (5.7)$$

For a perfectly competitive market,

$$MR = D = AR = P. \quad (5.8)$$

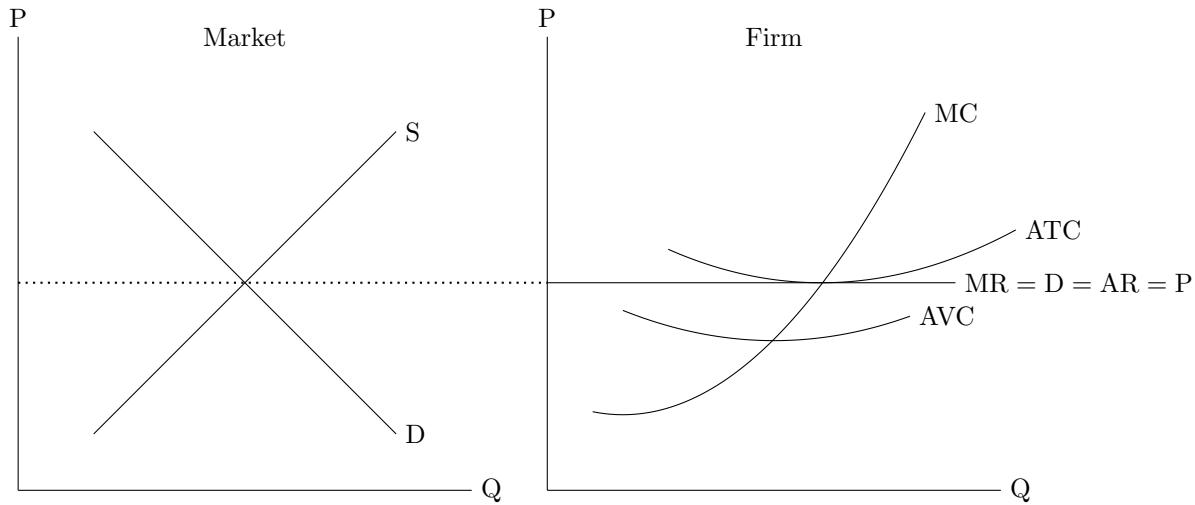


Figure 5.1: The graph for a perfectly competitive market.

Note that marginal cost is defined as the increase in total cost per unit of additional product, and supply is defined as the quantity that the firm can and is willing to produce at various prices. When the price is higher than the marginal cost, the producer is willing to provide this unit of product (profit maximization), which indicates the similarity of marginal cost curve to the supply curve.

The short-term supply curve of the company is the part where the MC curve is higher than the AVC curve. When the price is lower than the AVC curve, the company will go out of business and the quantity produced will be 0.

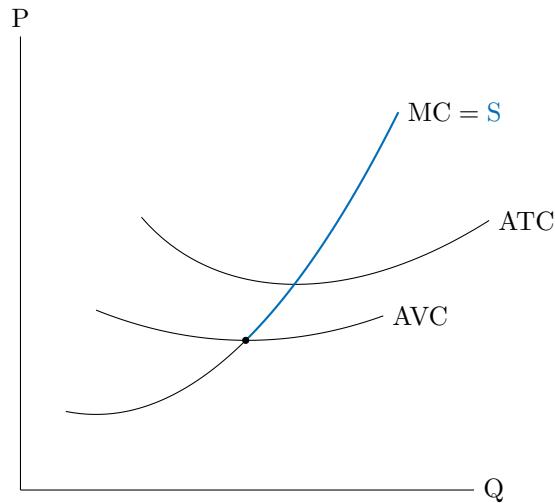


Figure 5.2: The short-run supply curve is the portion of MC above AVC.

5.2.4 Efficiency of Perfect Competition

In general, efficiency is the optimal use of societies' scarce resources.

Allocatively Efficient

The production is allocatively efficient when a firm produces the socially optimal output level where $P = MC$. Allocative efficiency maximizes social welfare and total surplus.

Productively Efficient

The firm is productively efficient when it produces at the minimum point of ATC.

$$\text{Inefficient} \left\{ \begin{array}{l} \text{DWL} \\ \text{produce within PPC} \end{array} \right. \quad (5.9)$$

$$\text{Efficiency} \left\{ \begin{array}{l} \text{Allocative Efficiency} \\ \text{Productive Efficiency} \end{array} \right. \quad (5.10)$$

Producing on the PPC means efficient use of resources.

5.2.5 The Shut-down Rule

In the short term, the price corresponding to the lowest point of AVC is the critical point for the company to go out of business. Even if the company has a loss, it will not withdraw from the market in the short term. In the long run, as long as the company has a loss, it will exit the market, and the price corresponding to the lowest point of ATC is the critical point for exiting the market.

| | Short Run Actions | Long Run Actions |
|--------------------|---------------------|---------------------|
| $P \geq ATC$ | Continue Production | Continue Production |
| $AVC \leq P < ATC$ | | Quit the Market |
| $P < AVC$ | Shut Down | |

Table 5.1: Firm actions in short run and long run.

| | Short Run Profit / Loss | Long Run Profit / Loss |
|--------------------|---|------------------------|
| $P \geq ATC$ | $\text{Profits} = Q(P - ATC) = PQ - TC$ | |
| $AVC \leq P < ATC$ | $\text{Losses} = Q(ATC - P) = TC - PQ$ | Firm Quits the Market |
| $P < AVC$ | $\text{Losses} = TFC$ | |

Table 5.2: Profits or losses of the firm.

5.2.6 Perfect Competition in the Long Run

- (1) Everything can be changed. There are no fixed costs but only variable costs;
- (2) Easy to enter or exit the market;

$$\begin{cases} \text{Profit: enter} \\ \text{Loss: exit} \end{cases} \quad (5.11)$$

- (3) All firms break even; they make no economic profits (normal profit).

The reason of zero economic profit is that perfectly competitive markets have no barriers to enter.

The perfectly competitive market is always efficient in distribution, and the long-term perfectly competitive market is efficient in production at the same time. The $MR = D = AR = P$ curve, MC curve, and ATC curve intersect at the same point.

The long-run supply curve for a constant-cost industry is a horizontal line whose price equals the long-run minimum average cost of output. When the price is higher than this price, there is a positive profit, and more manufacturers will enter, so that the short-term supply increases and the price falls. Note that constant cost does not mean $MC = 0$.

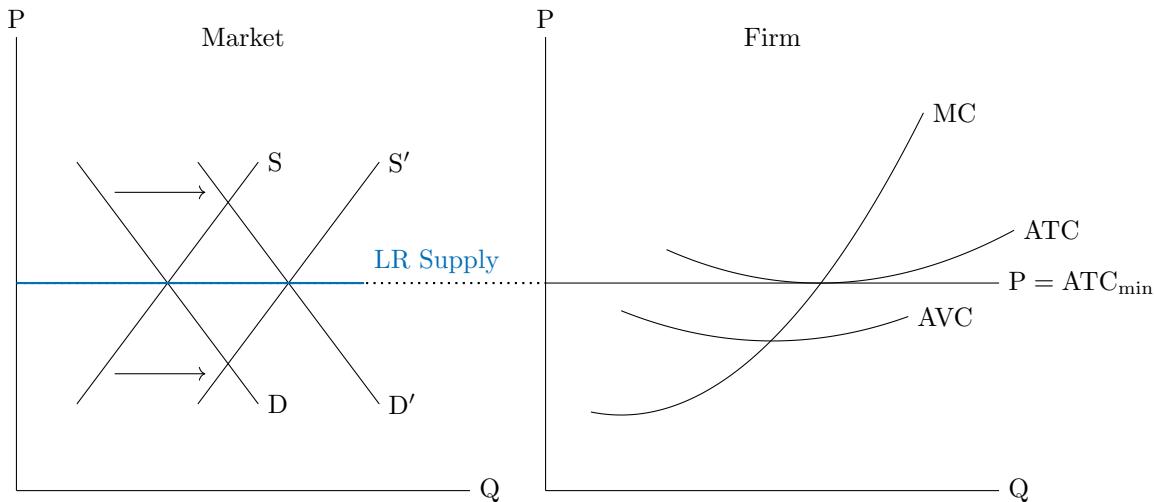


Figure 5.3: The long run supply for a constant-cost perfectly competitive market is a horizontal line.

The long-run supply curve of an increasing-cost industry is upward sloping, but the industry can produce more output only if prices are high enough to cover the increased input costs. “Increasing cost” means that the long-run average cost curve shifts upward, not that the slope of the cost curve is positive. The long-run effect of demand expansion in a cost-increasing industry is an increase in price, an increase in total output, and an increase in the number of firms. However, the output of a single firm may increase, decrease, or remain unchanged, depending on the position of the new marginal cost curve.

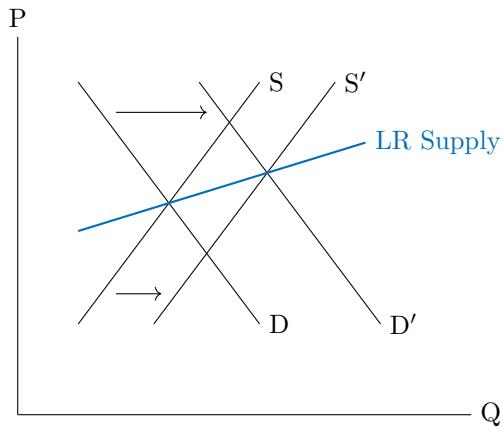


Figure 5.4: The long run supply for an increasing-cost perfectly competitive market is a line sloping upwards.

The long-run supply curve in a decreasing-cost industry is downward sloping, and this curve must be flatter than the demand curve.

5.3 Basics of Imperfect Competition

In all imperfectly competitive markets, the MR curve does not coincide with the $D = AR = P$ curve.

Let the demand curve be denoted by

$$D : P = a - bQ.$$

Assuming the same price is charged to all consumers, then:

$$MR = \frac{dTR}{dQ} = \frac{d(P \cdot Q)}{dQ} = \frac{d}{dQ}[Q(a - bQ)] = a - 2bQ.$$

Therefore, the slope of MR curve is double of that of the demand curve. To verify $AR = P$,

$$AR = \frac{TR}{Q} = \frac{P \cdot Q}{Q} = P = a - bQ.$$

Therefore, the demand curve in imperfect competition has the equation $D = AR = P$, and MR becomes another curve.

5.4 Monopoly

5.4.1 Properties

- (1) One single seller;

The firm controls the majority of the market, and the firm is the industry.

- (2) Unique good with no close substitutes;
- (3) Price maker;

The firm can manipulate the price by changing the quantity it produces. In imperfect competition, firms are not price takers. Prices are variable.

- (4) High barriers to entry;

New firms cannot enter the market. There are no immediate competitors, and the firm can make profit in the long run.

- (5) Some “non-price” competition;

Despite having no close competitors, the firm still advertises its products in order to increase demand and make the demand more inelastic.

5.4.2 Source

- (A) Geography or resource is the barrier to enter;
- (B) The government is the barrier to enter (public benefits / patents);
- (C) Technology is the barrier to enter;
- (D) Mass production and low costs are barriers to enter (economies of scale);

This leads to natural monopoly. It's natural for only one firm to produce, because it can produce at the lowest cost.

5.4.3 Graph

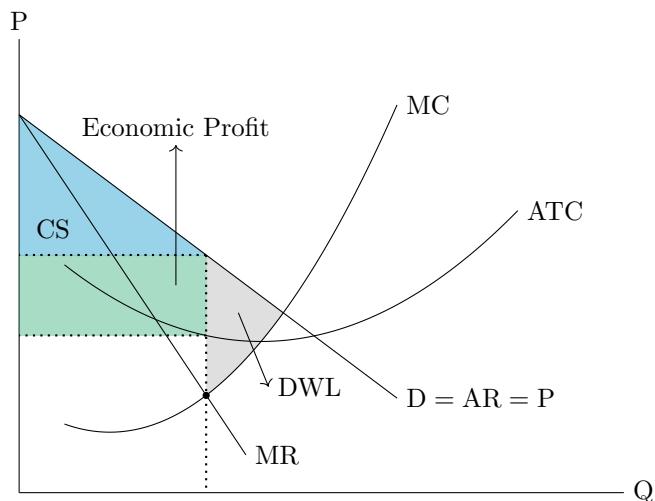


Figure 5.5: The graph of a typical monopoly industry.

5.4.4 Notes

(1) Monopoly makes profits in the long run.

The reason for long run profits is the barrier other firms face to enter the industry.

(2) The D and MR curves of monopoly:

A profit-maximizing monopoly always produce in the elastic range of the demand curve, because $MR < 0$ when the demand goes into inelastic range.

5.4.5 Efficiency of Monopoly

Monopolies are inefficient as they:

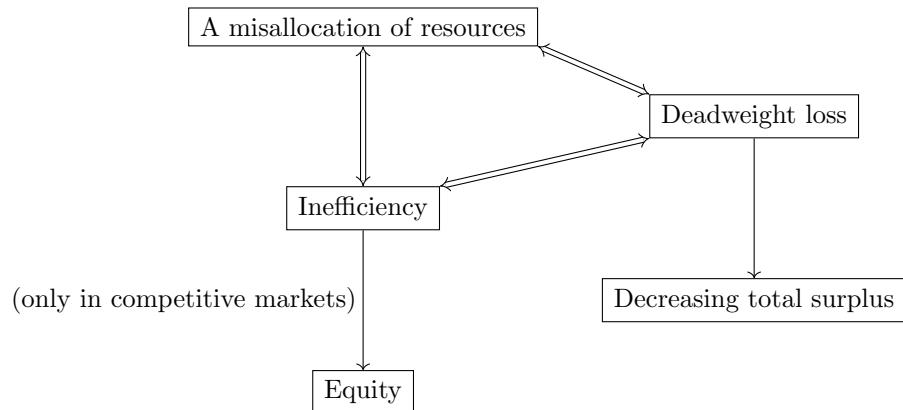
- (1) Charge a higher price;
- (2) Don't produce enough (not allocatively efficient);
- (3) Produce at higher costs (not productively efficient);
- (4) Have little incentive to innovate.

Monopoly is not allocatively efficient, as

$$P = D > MR = MC.$$

$P > MC$ means not allocatively efficient.

Monopoly is not productively efficient either, as the company would produce at the minimum of ATC only when ATC, MR, and MC cross together. This is practically impossible.



5.4.6 Price Discrimination

Conditions

- (1) The firm can separate markets for consumers based on different price elasticities.
- (2) There must not be opportunities for the resale of the product.

- (3) The price differences are not based on cost differences.
- (4) The firm is a price maker.

Types of Price Discrimination

- (1) First-degree price discrimination / perfect price discrimination:

The company would charge the highest price consumers are willing to pay per unit of product.

Because the manufacturer charges the highest price that each consumer is willing to pay, the price of all products will not be lowered by selling multiple products, so the MR curve coincides with the $D = AR = P$ curve again at this time.

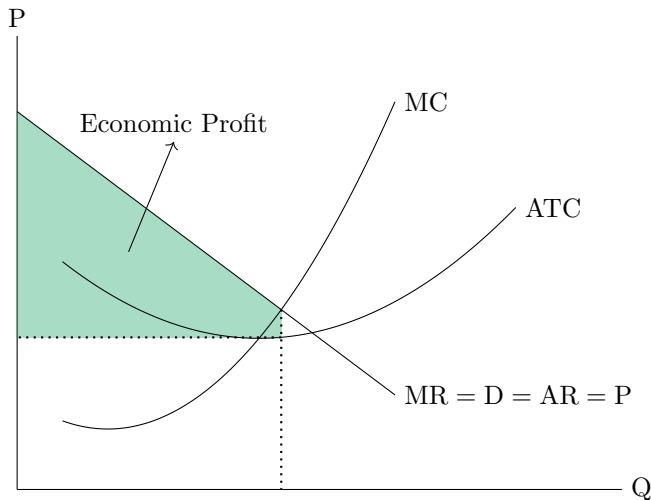


Figure 5.6: Perfect price discrimination.

Note that perfect price discrimination is such that the firm now produces at $P = MC$, then perfect price discrimination is allocatively efficient.

Perfect price discrimination is more effective than ordinary monopoly.

- (2) Second-degree price discrimination:

Second-degree price discrimination involves charging different prices based on the quantity purchased.

- (3) Third-degree price discrimination:

Third-degree price discrimination refers to the fact that a manufacturer sells the same product to people of different people at different prices, including the use of coupons. High-end products that are much more expensive than ordinary products (and whose profits are much higher than ordinary products) also belong to third-degree price discrimination.

5.4.7 Natural Monopoly

When only one firm produces in the industry, it can reach economies of scale, where LRATC continues to decrease.

Note that in the natural monopoly range, the MC curve and the ATC curve do not intersect, and the MC curve is always lower than the ATC curve, because only when MC is smaller than ATC will ATC decrease.

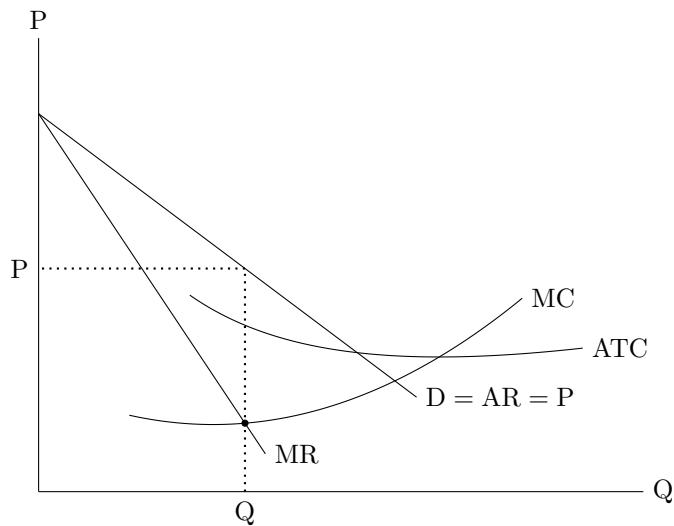


Figure 5.7: The graph of a natural monopoly industry.

5.4.8 Regulation of Monopoly

Reasons

- (1) To keep prices low;
- (2) To make monopolies efficient (to increase quantity).

Methods

- (1) Use price controls: price ceilings;
- (2) Taxes do not work: taxes limit the supply, and quantity is the problem.

Consider a typical monopoly. First, because of the nature of monopoly, firms already produce too little and charge too much, so they should not be taxed because this would cause firms to produce even less (overcharge and underproduction).

Note that the reason for not using the subsidy is because the government is unwilling to pay. Besides, the profits of monopoly manufacturers are already high enough, and the government does not need to subsidize them.

Therefore, one of the regulation methods is to set a price ceiling.

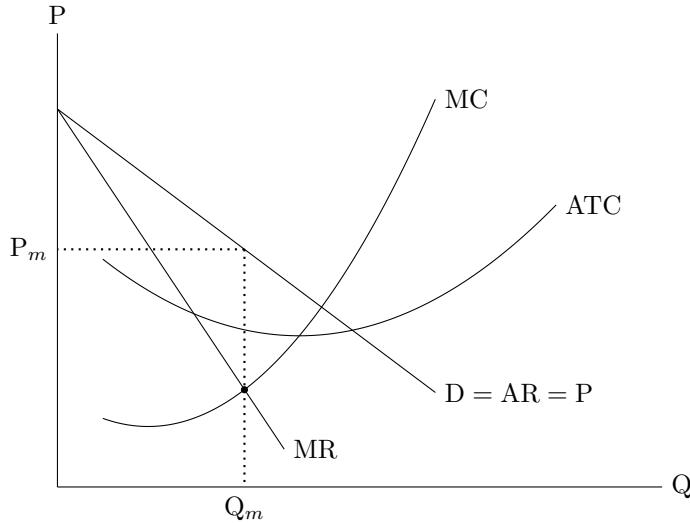


Figure 5.8: An unregulated monopoly industry.

A binding price ceiling must set a lower price than it would otherwise be. In the figure, an effective price ceiling dictates that the price must satisfy $P < P_m$.

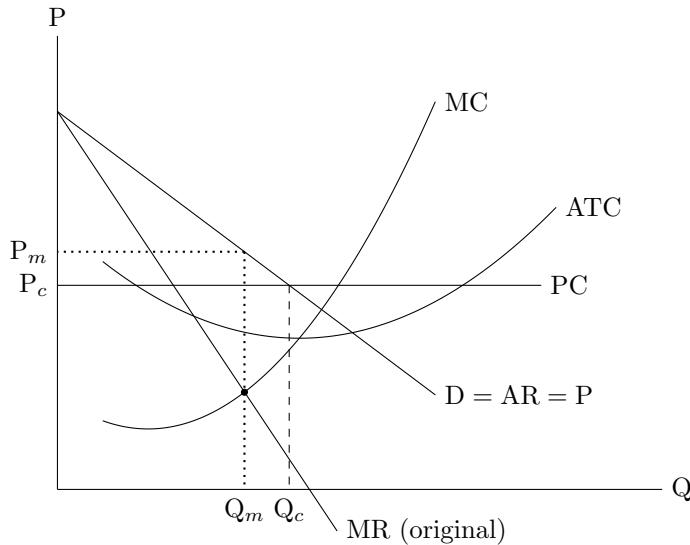


Figure 5.9: A binding price ceiling on the monopoly industry.

When there is a price ceiling, the quantity produced by the firm will increase to Q_c . According to the principle of profit maximization, if the MR curve does not change (see $MR(\text{original})$), the company should not increase quantity supplied. Therefore, the MR curve must be due to a change in the price ceiling.

Recall what we have learned in a perfectly competitive market. A single manufacturer does not have the

so-called market power, and can only accept the price set by the market. In the case of a monopoly price ceiling, similarly, firms can no longer control their own prices within the range of Q_c , and can only accept prices set by the government. So, the MR curve actually changes.

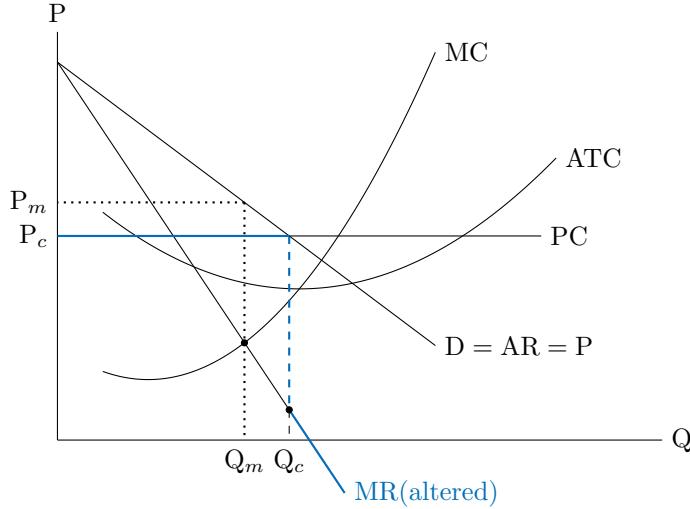


Figure 5.10: The MR curve is changed by the price ceiling.

When the price is less than PC ($Q > Q_c$), the reason $D > MR$ in imperfect competition now applies again: in the case of non-price discrimination, in order to sell more, the manufacturer has to cut the price of each unit of product, so MR falls faster than D . Note that the market is still in equilibrium at this point.

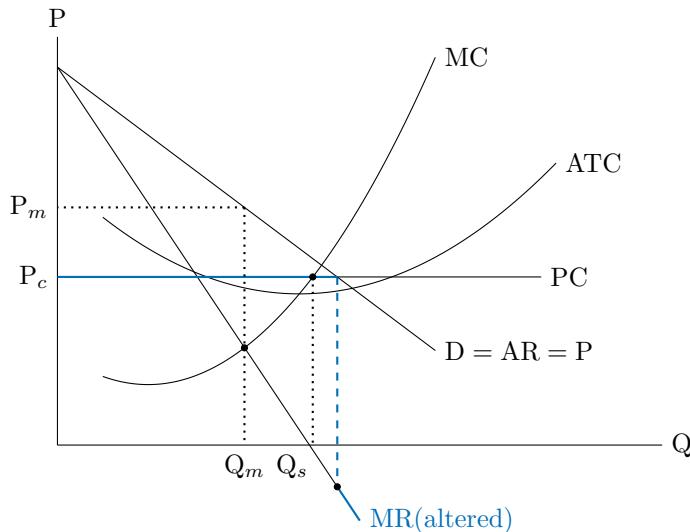


Figure 5.11: An even lower price ceiling decreases the equilibrium quantity.

Now, suppose the government applies a stricter regulation, so that the price is already lower than the

price corresponding to the intersection of MC and the $D = AR = P$ curve (pricing in a perfectly competitive market).

Manufacturers always follow the principle of profit maximization. Therefore, when the price ceiling set at this time is even lower than the price in a perfectly competitive market, the monopoly firm is no longer willing to provide products equal to the quantity demanded, resulting in a shortage in the market.

That is, throughout the control process, before regulation, the market was in equilibrium. When the price set by the price ceiling is between P_m and the price in perfect competition (P_p), the quantity produced by the manufacturer will increase, the market is still in equilibrium, and $Q_{\max} = Q_p$.

When the price set by the price ceiling is even lower, the quantity produced will decrease again, and the market is no longer in equilibrium, but in a state of shortage.

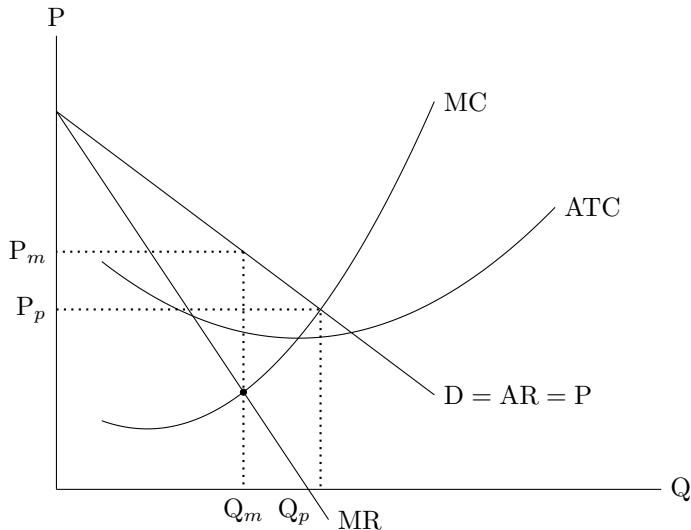


Figure 5.12: Setting the price ceiling for a monopoly industry needs discreet consideration.

Determining MR Curve under Price Ceiling

Before the straight line assumed by the price ceiling intersects the demand curve, MR and the price ceiling coincide; when the quantity is greater than the demand caused by the price specified by the price ceiling, the MR curve coincides with the original MR curve again, and there is a jump discontinuity.

Aside: the definition of continuity:

The function $y = f(x)$ is continuous at $x = c$ if:

- (A) $f(c)$ exists;
- (B) $\lim_{x \rightarrow c} f(x)$ exists;
- (C) $\lim_{x \rightarrow c} f(x) = f(c)$.

The necessary and sufficient condition for differentiability is that the left and right derivatives exist and are equal:

$$\lim_{h \rightarrow 0^-} \frac{f(x_0 + h) - f(x_0)}{h} = \lim_{h \rightarrow 0^+} \frac{f(x_0 + h) - f(x_0)}{h}.$$

Two Kinds of Price Ceilings

(A) Socially optimal pricing: $P = MC$

Since the government restricts prices at $P = MC$, the portion of the MR curve to the left of its intersection with the D curve becomes a horizontal line.

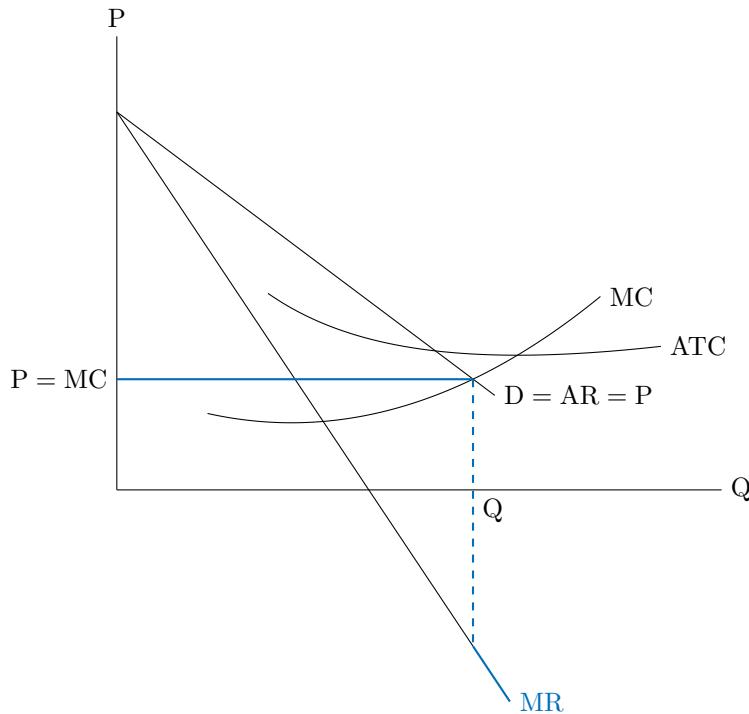


Figure 5.13: Socially optimal pricing.

(B) Fair return pricing: $P = ATC$

Since the government restricts the price at $P = ATC$, the portion of the MR curve to the left of its intersection with the D curve becomes a horizontal line.

Note both regulations are under the situation of natural monopoly. The regulation of a typical monopoly follows the same procedure.

Note that if a natural monopoly is allowed to produce at the socially optimal quantity, the firm will actually lose money. Therefore, the government must provide corresponding subsidies.

Concepts such as underproduce, overproduce, undercharge, and overcharge are all relative to the socially optimal quantity and price.

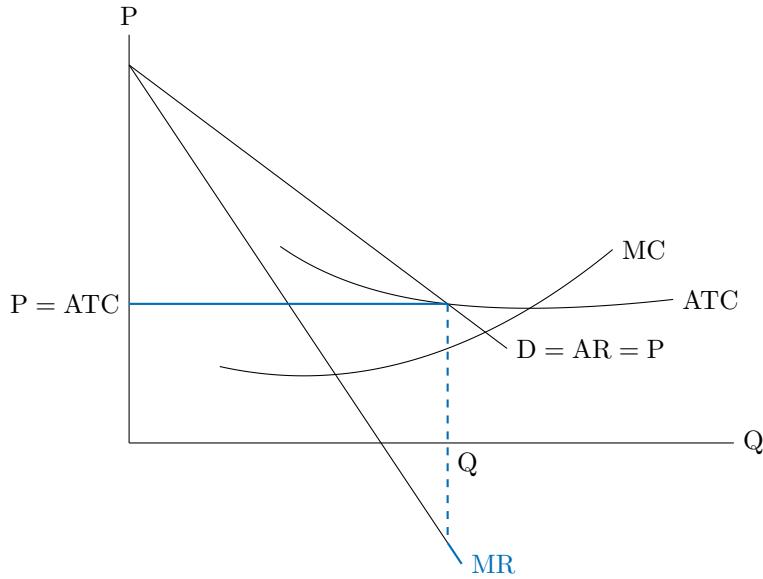


Figure 5.14: Fair Return pricing.

For an ordinary monopoly, down the $D = AR = P$ curve:

- (A) Unregulated pricing; (B) Socially optimal pricing; (C) Fair-return pricing.

For a natural monopoly, down the $D = AR = P$ curve:

- (A) Unregulated pricing; (B) Fair-return pricing; (C) Socially optimal pricing.

5.4.9 Explaining a Graph of Monopoly

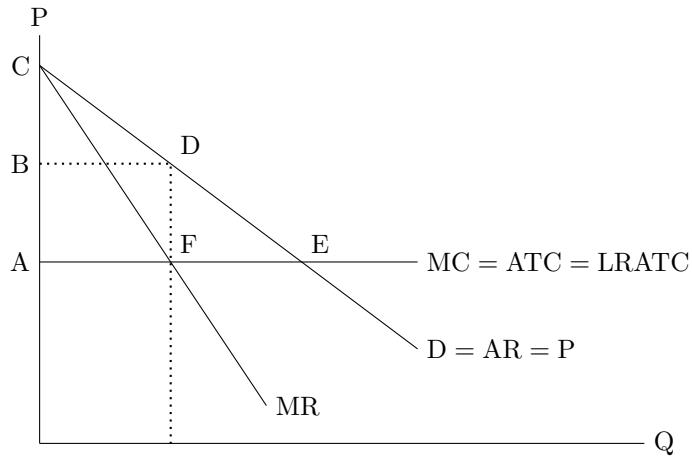


Figure 5.15: A graph of monopoly.

In this graph, the economic profit is the area ABDF. The deadweight loss is the area DEF. The consumer

surplus is the area BCD.

In a perfectly competitive market, the consumer surplus is area CBE. With price discrimination, there is no consumer surplus, and the producer surplus is area CBE.

5.4.10 Monopoly and Perfect Competition

| | Perfect Competition | Monopoly |
|--|--------------------------|----------------------|
| Number of Sellers | Many | Only One |
| Substitutes of Products | Many Perfect Substitutes | No Close Substitutes |
| Relation between Price and the Sellers | Price Taker | Price Maker |
| Barriers | No | Very Strong |
| Demand and Marginal Revenue | $MR = D = AR = P$ | $D = AR = P > MR$ |
| Long Run Profits | No | Yes |
| Efficiency | Very Efficient | Not Efficient |

Table 5.3: Comparison and contrast between monopoly and perfect competition.

5.5 Monopolistic Competition

5.5.1 Properties

- (A) Relatively large number of sellers;
- (B) Differentiated products;
- (C) Some control over price;
- (D) Easy entry and exit;
- (E) A lot of non-price competition (advertising).

Examples of non-price competition:

- (A) Brand names and packaging;
- (B) Product attributes;
- (C) Services;
- (D) Location;
- (E) Advertising.

The purpose of advertising is to attract consumers (increased demand) and to reduce the price elasticity of demand of original consumers.

5.5.2 Similarities with Monopoly and Perfect Competition

Monopoly quality:

- (A) Control over price;
- (B) $D > MR$;
- (C) Plenty of advertising;
- (D) Not efficient.

Perfect competition quality:

- (A) Large number of small firms;
- (B) Relatively easy entry and exit;
- (C) No economic profit in the long run.

5.5.3 Graph

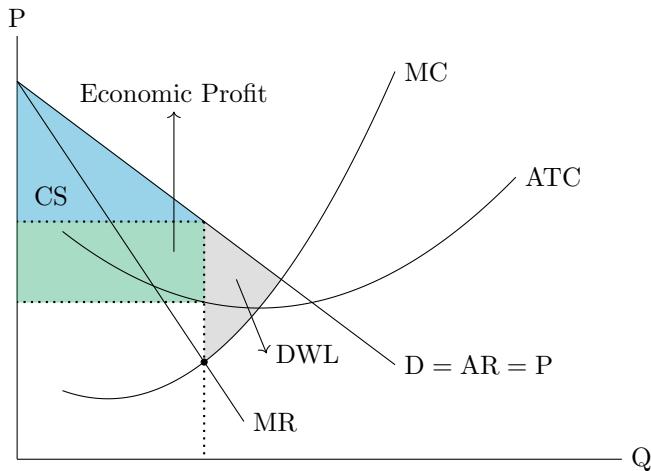


Figure 5.16: Short run monopolistic competition: profits.

The picture of monopolistic competition is exactly the same as monopoly, but there is no corresponding long-term change in monopoly. In the long run, the ATC curve is tangent to the $D = AR = P$ curve.

Changes in the long run:

SR profits: In the long run, new firms will enter due to low barrier to entry. The market share of existing firms will decrease, and the demand for individual firms will decrease.

New firms mean more close substitutes and less market share for the existing firms.

5.5.4 Advantages of Monopolistic Competition

- (A) Large number of firms and product variation meets the society's needs;

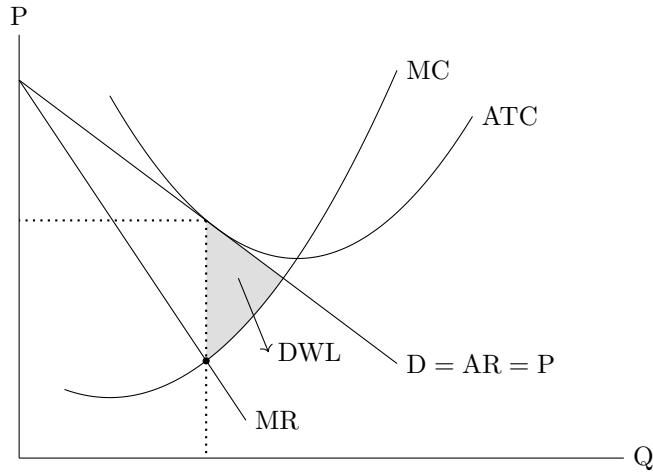


Figure 5.17: Long run monopolistic competition: break even.

(B) Non-price competition (advertising and product differentiation) may result in sustained profits for some firms.

5.5.5 Excess Capacity

Excess capacity is a concept specific to monopolistic competition. It refers to the part of the output that the firm could have produced in the productive position, but finally gave up because of profit maximization.

Given current resources, the firms can produce at min ATC but they decide not.

The firm can produce at a lower cost, but it holds back production to maximize profits.

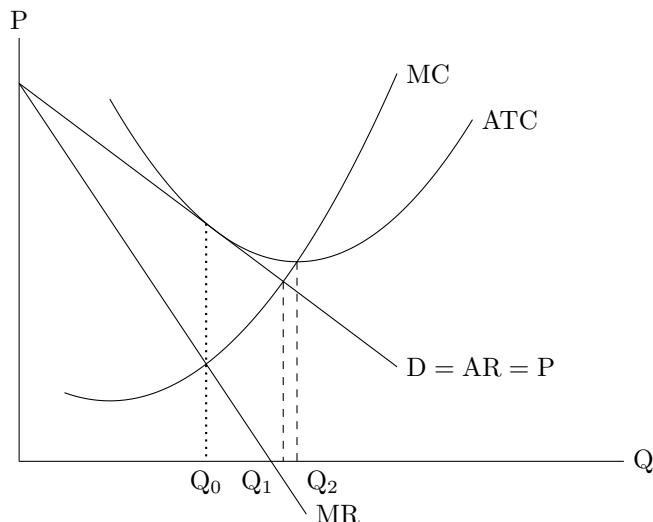


Figure 5.18: Excess capacity and underproduction.

$$\begin{aligned} \text{Excess Capacity} &= Q_2 - Q_0 \\ \text{Underproduction} &= Q_1 - Q_0 \end{aligned} \tag{5.12}$$

5.6 Oligopoly

5.6.1 Properties

- (A) A few large firms (fewer than 10);
- (B) Identical or differentiated products;
- (C) High barriers to entry;
- (D) Control over price;
- (E) Mutual interdependence / collusion.

Oligopoly companies are interdependent on each other, and they use strategic pricing.

5.6.2 Types of Barriers

- (A) Economies of scale;
- (B) High start-up costs;
- (C) Ownership of materials.

5.6.3 Source

- (A) Oligopolies occur when only a few large firms start to control an industry.
- (B) High barriers to entry keep others from entering the industry.

5.6.4 Three Types of Oligopoly

- (A) Price leadership:

The strongest firm, or the leader, determines the price.

When there are breakdowns, there can be temporary price wars, and each firm tries to undercut each other.

- (B) Colluding oligopoly: cartel

A cartel is a group of producers that create an agreement to fix prices high.

- (a) Cartel sets the price at an agreed level.
- (b) Firms have highly similar or identical products and costs.
- (c) A cartel has ways to punish cheaters.
- (d) Together the firms act as a monopolist.

(C) Non-colluding oligopoly:

The kinked demand curve model shows how the firms are interdependent:

- (a) Match price: when one firm decreases its price, others will follow;
- (b) Ignore change: when one firm increases its price, others ignore it and keep the same.

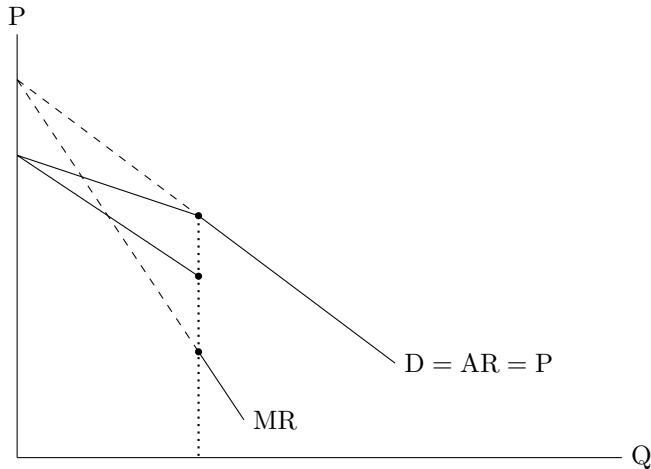


Figure 5.19: The kinked demand curve and its corresponding MR curve.

5.6.5 Game Theory, Nash Equilibrium, and Prisoner's Dilemma

Game theory is that two people use each other's strategy to change their own confrontation strategy in an equal game to achieve the goal of winning. It considers the predicted and actual behavior of individuals in games and studies their optimization strategies.

Nash equilibrium is a concept of solution in game theory, which refers to a strategy combination that satisfies the following properties: under this strategy combination, any player who unilaterally changes his strategy (other players' strategies remain unchanged) will not improve his own income. (No one can be better off without making others worse off.)

The Prisoner's Dilemma refers to a particular game between two captured prisoners, illustrating why it is difficult to maintain cooperation even when cooperation is beneficial to both parties. The Prisoner's Dilemma is a representative example of a non-zero-sum game in game theory, reflecting that the individual's best choice is not the group's best choice. Although the predicament itself is only a model, similar situations frequently occur in reality in terms of price competition, environmental protection, and interpersonal relationships.

Consider the following table (payoff matrix).

| | | Red's Bug Zappas | |
|----------------|------|------------------|------------|
| | | High | Low |
| Grant's Garage | High | \$50, \$45 | \$25, \$35 |
| | Low | \$40, \$10 | \$15, \$20 |

Table 5.4: A typical payoff matrix.

This table shows the game relationship between Red's Bug Zappas and Grant's Garage.

Both parties can choose high pricing (high) or low pricing (low), and each combination corresponds to the corresponding benefits.

Dominant strategy: dominant strategy

Dominant strategy refers to the competitive strategy that is the best choice of the enterprise no matter how the competitor responds.

Sometimes, the two players in the game may not have a dominant strategy.

First consider the situation of Red's Bug Zappas pricing high. Because $\$50 > \40 , Grant's Garage will also choose price high in this case. Then consider Red's Bug Zappas pricing low. Because $\$25 > \15 , Grant's Garage will still choose price high in this case.

Therefore, pricing high is the dominant strategy of Grant's Garage.

Similarly, Red's Bug Zappas can be analyzed. But it can be found that Red's Bug Zappas actually has no dominant strategy.

If both players know the information in the matrix, a Nash equilibrium can still be reached despite Red's Bug Zappas not having a dominant strategy.

Because Red's Bug Zappas knows that Grant's Garage will choose price high, Red's Bug Zappas will also choose price high, because $\$45 > \35 .

Chapter 6

Labor Markets

6.1 Basics

6.1.1 Derived Demand

Derived demand relates the product and the labor market together. There is demand for the factors of production because this demand is derived from the goods that are produced by these inputs.

The demand for resources is determined (derived) by the products they help produce.

All demands for resources are derived demands.

Factors that influence derived demand:

(1) Changes in product demand:

As consumers' demand for a product increases, the demand for the elements of this product will also increase.

(2) Changes in productivity:

As factor productivity increases, marginal revenue output increases, and derived demand also increases.

$$D \uparrow = MRP \uparrow = MR \cdot MP \uparrow$$

(3) Changes in the prices of other factors:

Factors of production also have complements and substitutes.

6.1.2 Marginal Revenue Product (MRP)

Marginal revenue product refers to the increase in revenue brought about by the increase in the input of a certain factor, given the quantity of other factors.

The marginal revenue product is the addition to a firm's revenue when an additional input is employed.

$$MRP = \frac{dTR}{dI} = \frac{dTR}{dQ} \cdot \frac{dQ}{dI} = MR \cdot MP. \quad (6.1)$$

MRP is downward sloping because of the law of diminishing marginal returns. Each additional resource is less productive and thus worth less than the previous one.

In the labor market, $D = MRP$. MRP shows the amount of wages firms are willing and able to pay each worker, and this is just the definition of labor demand.

6.1.3 Marginal Factor Cost (MFC)

The marginal factor cost is the additional cost of employing an additional input.

In a perfectly competitive labor market, $S = MFC = \text{Wage}$, while in a monopoly market, the MFC curve appears above the S curve.

The S curve represents the minimum price at which individuals are willing to work. Note that S is always equal to Wage, just as D is always equal to P in the product market.

$$\begin{cases} MFC: \text{cost incurred by using an additional input} \\ MC: \text{cost incurred by producing an additional product} \end{cases} \quad (6.2)$$

6.2 Profit Maximization in Labor Markets

A company would purchase inputs until

$$MRP = MFC. \quad (6.3)$$

$$\begin{cases} \text{Product Markets: } MR = MC \\ \text{Labor Markets: } MRP = MFC \end{cases} \quad (6.4)$$

6.3 The Least Cost Rule

A firm will adjust the ratio of inputs until

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}, \quad (6.5)$$

where L and K are two types of inputs.

The method of proving the least cost rule is the same as that of consumer utility maximization.

Let the budget line be represented by the equation

$$P_L Q_L + P_K Q_K = M.$$

Factors of production are different from consumer goods. Consumer goods correspond to utility, while factors of production correspond to output. We consider not the indifference curve, but the curve that represents constant total product:

$$TP_L + TP_K = Q,$$

where Q is a constant.

Differentiate on both sides, and we get:

$$dTP_L + dTP_K = dQ = 0.$$

By the definition of marginal product,

$$MP = \frac{dTP}{dQ} \Rightarrow dTP = MP dQ. \quad (6.6)$$

So,

$$\begin{aligned} MP_L dQ_L &= -MP_K dQ_K \\ \frac{MP_L}{MP_K} &= -\frac{dQ_K}{dQ_L}. \end{aligned}$$

Differentiate on both sides of the budget line, and we get:

$$P_L dQ_L + P_K dQ_K = dM = 0.$$

Therefore, we know:

$$\begin{aligned} P_L dQ_L &= -P_K dQ_K \\ \frac{dQ_K}{dQ_L} &= -\frac{P_L}{P_K}. \end{aligned}$$

So,

$$\frac{MP_L}{MP_K} = -\frac{dQ_K}{dQ_L} = -\left(-\frac{P_L}{P_K}\right) = \frac{P_L}{P_K}.$$

By rearranging, we arrive at the least cost rule:

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}. \quad (6.7)$$

6.4 Labor Markets in Perfect Competition

6.4.1 Properties

(1) Many small firms are hiring workers.

No one firm is large enough to manipulate the market.

(2) Many workers with identical skills;

(3) Wages are constant.

(4) Workers and firms are both wage takers.

Firms can hire as many workers as they want at a wage set by the industry.

Note that in a perfectly competitive product market and labor market, firms are only price (wage) takers.

In the labor market, we also say that all labor is also wage takers. This does not mean that a perfectly competitive labor market is different from a perfectly competitive product market. By analogy, products in a perfectly competitive product market are also “price takers”. However, the product itself cannot manipulate the price or have any opinion on the price, we just don’t say so. So, don’t be surprised that labor is wage taker in a perfectly competitive labor market.

6.4.2 Graph

The wages are constant, determined by the market.

$$MFC = \frac{dTC}{dI} = \frac{d(Wage \cdot I)}{dI} = \frac{Wage \cdot dI}{dI} = Wage \quad (6.8)$$

The wage is the amount of money the labor is willing and able to be hired and work for the firms, and this is the definition of labor supply. This is why $S = MFC = Wage$.

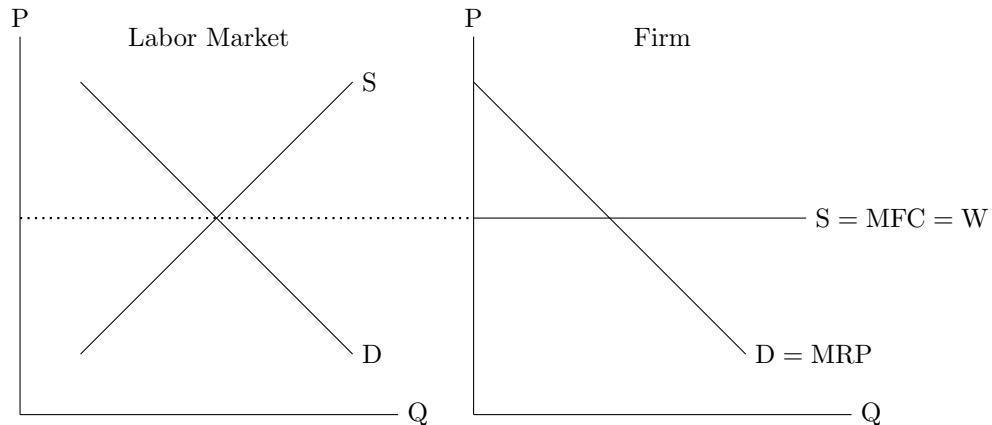


Figure 6.1: The graph for a perfectly competitive labor market.

6.5 Economic Rent

Economic rent occurs when payments for one of the factors of production exceeds the minimum amount needed to continue with a market transaction.

From the perspective of the whole society, there is an income that can be earned by taking advantage of price differences in different markets, which is called economic rent. Economic rent is similar to producer surplus.

Economic rent represents the portion of a factor input that exceeds the income it might receive elsewhere. Economic rent is equal to the difference between a factor input and its opportunity cost.

6.6 Monopsony

6.6.1 Properties

(1) There's only one firm hiring workers.

The firm is large enough to manipulate the market.

(2) Workers are relatively immobile to hire.

(3) The firm is a wage maker.

To hire an additional worker, the firm must increase wages for all workers, and this is why $MFC > S$.

(4) If the firm can wage discriminate, then $MFC = S$.

Wage discrimination here corresponds to primary price discrimination in the product market.

6.6.2 Graph

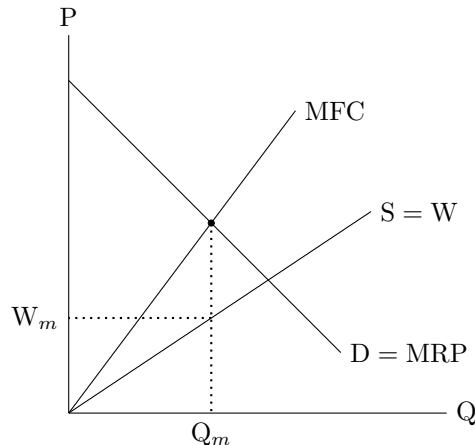


Figure 6.2: The graph for a typical monopsony.

Monopsony is very similar to monopoly: the graph of a company is the graph of the entire industry.

Let the supply curve be:

$$S : W = aQ + b.$$

Then,

$$MFC = \frac{dTC}{dQ} = \frac{d(W \cdot Q)}{dQ} = \frac{d}{dQ}(aQ^2 + bQ) = 2aQ + b.$$

Therefore, the slope of MFC curve is double of that of the supply curve.

6.6.3 Regulations: Minimum Wage

A monopsony will pay less to workers than in a perfectly competitive labor market and hire fewer. An effective minimum wage is $W > W_m$. When the minimum wage is below the equilibrium wage in a perfectly competitive labor market, the number of workers hired by firms will rise.

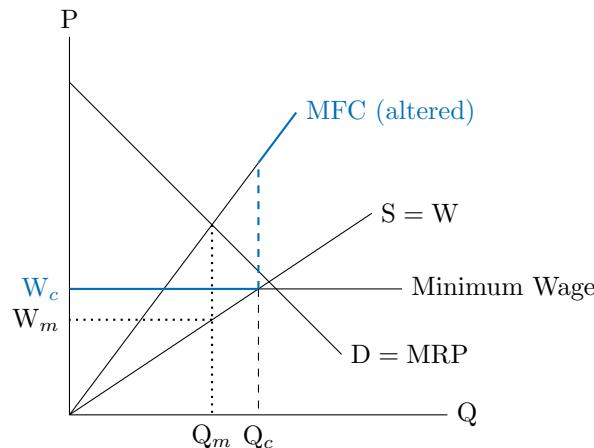


Figure 6.3: The minimum wage here makes the company hire more.

When the minimum wage is placed above the equilibrium wage in a perfectly competitive labor market, the number of workers hired by firms falls again.

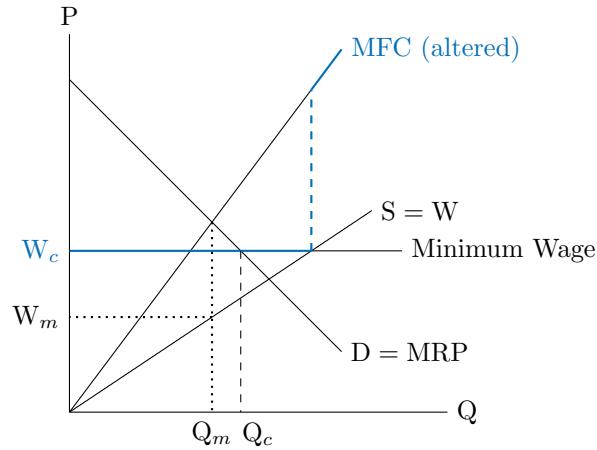


Figure 6.4: The minimum wage here makes the company hire fewer.

Before regulation, the market was in equilibrium.

When the minimum wage is set between W_m and W_p , the number of workers recruited by the firm will increase, the market is still in equilibrium, and $Q_{\max} = Q_p$.

When the minimum wage is higher than W_p , the number of workers recruited by the firm will decrease again, the market will no longer be in equilibrium, and unemployment will occur.

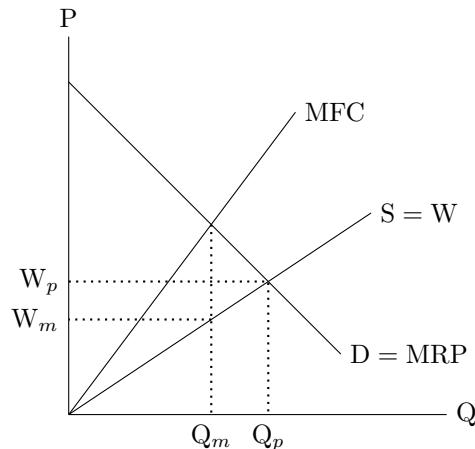


Figure 6.5: Regulation of monopsony.

Chapter 7

Market Failures

7.1 Properties of Free Market

- (1) Little government involvement in the economy;
- (2) Individuals own resources and determine what to produce, how to produce, and who gets the product.
- (3) The opportunity to make profit gives people incentive to produce quality items efficiently.
- (4) Wide variety of goods available to consumers;
- (5) Competition and self-interest work together to regulate the economy. The government's role is to enforce contracts, secure property rights, and defend the country.

7.2 Market Failure

A market failure is a situation in which the free-market system fails to satisfy the society's wants (when the invisible hand does not work). There are four types of market failures.

- (1) Externalities;
- (2) Public Goods;
- (3) Monopolies;
- (4) Income Inequality.

Why are market failures?

The free market fails to include external costs or external benefits. Without government involvement, the market may be producing too much of some goods and too little of others.

7.3 Socially Optimal Quantity of Products

The concept of socially optimal quantity regards the whole society.

We can divide the impact of a product on society into costs and benefits. To meet the needs of the society, consumption should be at a position where the marginal social benefit (MSB) and the marginal social cost (MSC) meet. That is,

$$\text{MSB} = \text{MSC} \quad (7.1)$$

determines the socially optimal quantity of the product.

Nevertheless, the equilibrium point is always determined by

$$D = MPB = MPC = S, \quad (7.2)$$

as it is the individuals that make the choice of purchase. They pay no attention to the society's opinion.

7.4 Externality

7.4.1 Definition

An externality is a third-person side effect. It means there are external benefits or costs to someone other than the original decision maker.

7.4.2 Coase Theorem

Coase theorem says that private parties can solve the issues created by externalities on their own without government intervention.

Regarding the Coase theorem, the more popular explanation is that as long as the property rights are clear and the transaction cost is zero or very small, then no matter who is given the property rights at the beginning, the final result of the market equilibrium is efficient and the Pareto optimality of resource allocation is realized. Of course, in the real world, the premise required by the Coase Theorem often does not exist: it is very difficult to clarify property rights, and the transaction cost cannot be zero, and sometimes it is even relatively large. Therefore, relying on the market mechanism to correct externalities is somewhat difficult. However, the Coase theorem provides a new way of thinking and method to solve the externality problem through the market mechanism.

7.4.3 Pareto Optimality / Efficiency

Pareto optimality refers to an ideal state of resource allocation. Assuming that there are groups of people and allocatable resources, a change from one state of allocation to another makes at least one person better off without making anyone worse off, and this is Pareto optimization.

7.4.4 Positive Externality

Positive externality is the situation that results in a benefit for someone other than the original decision maker. The benefit “spillovers” to other people or society.

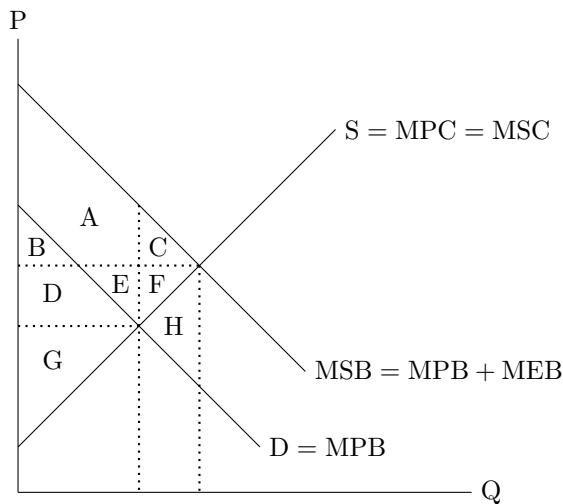


Figure 7.1: Positive externality.

The free market equilibrium:

$$\left\{ \begin{array}{l} \text{Consumer Surplus} = BD \\ \text{Producer Surplus} = G \\ \text{External Benefit} = AE \\ \text{Total Surplus} = ABDEG \end{array} \right.$$

Social optimum:

$$\left\{ \begin{array}{l} \text{Consumer Surplus} = B - EFH \\ \text{Producer Surplus} = DEFG \\ \text{External Benefit} = ACEFH \\ \text{Total Surplus} = ABCDEFG \end{array} \right.$$

Therefore, the deadweight loss in this case is DWL = CF. The underproduction / underallocation is $Q_S - Q_{MKT}$.

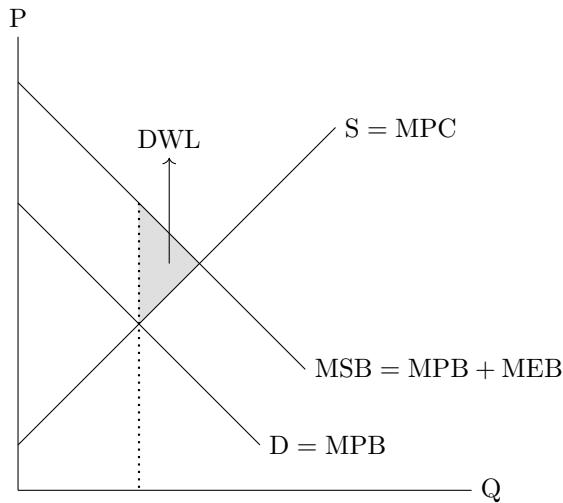


Figure 7.2: Deadweight loss of positive externality.

7.4.5 Negative Externality

Negative externality is the situation in which this is a cost for others other than the original decision makers. The costs “spillover” to other people or society.

MEC is marginal external cost. MSC is parallel to MPC if the increase in cost is constant per unit of product. If the added cost is not constant, MSC is not parallel to MPC.

Why is this a market failure?

- (1) Because it produces too much; (2) Because it ignores MEC; (3) Because there is DWL.

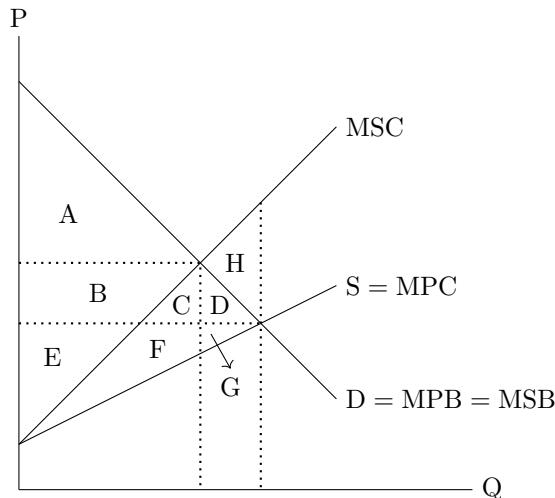


Figure 7.3: Negative externality.

Free market Equilibrium:

$$\left\{ \begin{array}{l} \text{Consumer Surplus = ABCD} \\ \text{Producer Surplus = EFG} \\ \text{External Cost = CDFGH} \\ \text{Total Surplus = ABE - H} \end{array} \right.$$

Social optimum:

$$\left\{ \begin{array}{l} \text{Consumer Surplus = A} \\ \text{Producer Surplus = BCEF} \\ \text{External Benefit = CF} \\ \text{Total Surplus = ABE} \end{array} \right.$$

Therefore, the deadweight loss in this case is $DWL = H$. The overproduction / overallocation is $Q_{MKT} - Q_S$.

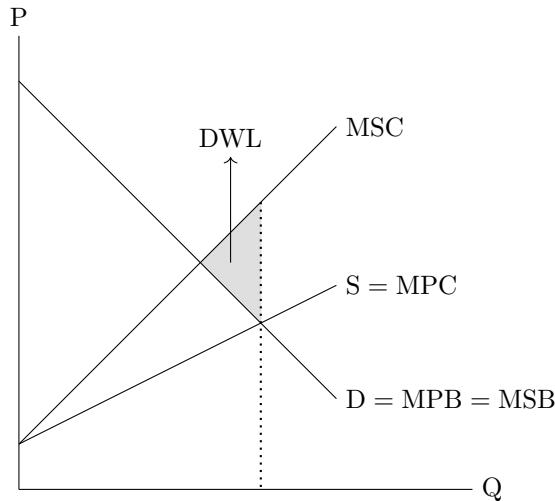


Figure 7.4: Deadweight loss of negative externality.

7.5 Public Goods

The nature of public goods causes market failures.

7.5.1 Private Goods

(1) Exclusive:

One who is unwilling or unable to buy a good is denying its benefits.

One manifestation of exclusion can be price. People who do not have enough money cannot enjoy this good.

(2) Rivalry:

One more good for me means one less for you.

(3) Distribution:

Goods can be divided into several goods to sell.

7.5.2 Public Goods

(1) Non-exclusive:

Everyone can use the good.

We cannot exclude benefits of the good for those who will not pay.

(2) Non-rivalry:

One person's consumption of a good does not reduce the usefulness to others.

Street light is a public good. Railways and national defense are also public goods.

Public goods are not distributable to private goods.

7.5.3 Quasi-public Good

Quasi-public goods refer to limited non-rivalry or limited non-exclusive public goods, which are between pure public goods and private goods, such as education, government-built parks, and congested roads.

It is considered that goods with non-rivalry or non-exclusive (but not both) are quasi-public goods.

7.5.4 Free-rider Problem

The free-rider problem is a problem that occurs in public property. It means that an individual in the economy consumes more resources than his fair share, or bears less than his fair share of production costs. It refers to some people needing some kind of public property, but they choose to enjoy the results for nothing after others pay the price to obtain them.

7.5.5 Tragedy of the Commons

The tragedy of the commons is a metaphoric label for a concept that is widely discussed in economics, ecology and other sciences. According to the concept, if numerous independent individuals should enjoy unfettered access to a finite, valuable resource e.g. a pasture, they will tend to over-use it, and may end up by destroying its value altogether.

7.6 Income Distribution

7.6.1 Lorenz Curve

The Lorenz curve is a curve composed of points corresponding to the income percentages of each population percentage from the “poorest population to the richest population” within a population.

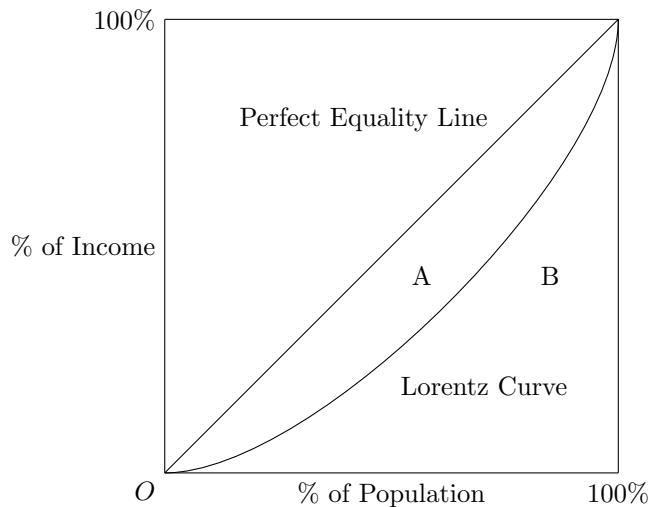


Figure 7.5: The Lorenz curve.

7.6.2 Gini Coefficient

The Gini coefficient is a measure of statistical dispersion intended to represent the income inequality, the wealth inequality, or the consumption inequality within a nation or a social group.

The maximum value of this coefficient is 1, and the minimum is 0. Gini coefficient close to 0 means equal wealth distribution.

$$\text{Gini Coefficient} = \frac{A}{A + B} \quad (7.3)$$

7.7 Types of Taxes

(1) Progressive Tax:

A progressive tax results in higher tax rates as income increases.

A progressive tax can lessen the amount of income inequality in a society.

(2) Proportional Tax:

A proportional tax imposes the same tax rates on everyone regardless of income.

(3) Regressive Tax: A regressive tax is where the average tax burden decreases as perfect of income rises.

All consumption taxes are regressive.

After the regressive tax is imposed, the Lorenz curve will be further away from the perfect equality line, and the Gini coefficient will increase.

Part II

Macroeconomics

Chapter 8

GDP and the Twin Evils

8.1 Gross Domestic Product (GDP)

8.1.1 Definition

GDP measures the dollar value of production within the nation's borders.

- (1) Market value;
- (2) Final goods;

Final goods refer to products that are directly oriented to consumers, rather than factors of production that need to be further processed.

- (3) Produced, not sold;

Any product not produced in the year in which it is measured should not be included in GDP. The transfer of wealth or investment in a purely financial sense does not involve any physical production and should not be counted in GDP.

- (4) Within a country.

GDP is the gross product of a country geographically. If the measure is the production of people in the country, gross national product (GNP) should be used.

$$\begin{cases} \text{GDP: geographically produced within the country} \\ \text{GNP: final goods produced by the people that belong to this country} \end{cases} \quad (8.1)$$

8.1.2 Nominal GDP and Real GDP

Nominal GDP is the market value of all final products calculated at current year prices of goods and services produced. Real GDP is the market value of all final products in the current year calculated using

the prices of a certain previous year as the base year.

Real GDP and nominal GDP are usually not the same. Nominal GDP growth rate is equal to the sum of real GDP growth rate and inflation rate. Even if output has not changed, nominal GDP still remains will rise due to inflation.

Nominal GDP and real GDP are the same in the base year because they use the same price level at that time.

The real GDP has been adjusted for inflation.

8.1.3 GDP per Capita

GDP per capita is GDP divided by the number of population. It measures the standards of living, and is usually used with purchasing power parity (PPP).

$$\text{GDP per capita} = \frac{\text{GDP}}{\text{Population}} \quad (8.2)$$

Real GDP per capita is an imperfect measure of the quality of life in part because it includes expenditures on natural disasters.

Reconstruction after the earthquake is included in the GDP. The building was actually built before this year, but it was included in GDP again this year because of reconstruction. Therefore, real GDP per capita is not a perfect way to measure people's living standards.

Purchasing power parity is a measure of the price of specific goods in different countries and is used to compare the absolute purchasing power of the countries' currencies. PPP is effectively the ratio of the price of a basket of goods at one location divided by the price of the basket of goods at a different location. The PPP inflation and exchange rate may differ from the market exchange rate because of tariffs, and other transaction costs.

8.1.4 Methods to Calculate GDP

We may calculate GDP through both the income approach and the expenditure approach. According to the circular flow diagram, the total expenditure equals the total income. These two methods yield the same value for GDP.

The Expenditures Approach

$$\text{GDP} \left\{ \begin{array}{l} \text{Consumption expenditures} \\ \text{Investment expenditures} \\ \text{Government expenditures} \\ \text{Exports and Imports} \end{array} \right. \quad (8.3)$$

In the expenditure approach, consumption by people contributes the most to GDP.

Transfer payments, public debt interest, etc. by government cannot be included in GDP because they are not used to purchase final products or services. They are purely financial actions.

Transfer payments, like tax cuts, can be used as a fiscal policy to have an indirect impact on GDP. However, the principal of transfer payments and taxes are not included in GDP.

Net exports are represented by NX , which is numerically equal to the country's total exports (exports, X) minus total imports (imports, M). Only net exports are included in GDP, and it may be positive, called a trade surplus, or negative, called a trade deficit.

$$\begin{aligned} \text{GDP} &= C + I + G + NX \\ &= C + I + G + (X - M). \end{aligned} \quad (8.4)$$

Savings (S) in an economy refer to the difference between total output minus total consumption.

$$\begin{aligned} S &= G - C - G \\ &= I + NX. \end{aligned} \quad (8.5)$$

In a trade surplus, $S > I$; in a trade deficit $S < I$.

The Income Approach

The second way of estimating GDP is to use “the sum of primary incomes distributed by resident producer units”.

8.1.5 Terms not Included in GDP

(1) Underground economy:

$$\text{Underground Economy} \left\{ \begin{array}{l} \text{Illegal items and activities} \\ \text{Households} \end{array} \right. \quad (8.6)$$

Illegal activities such as gambling may create value, but because they are illegal, they can only be carried

out underground, so they are not included in GDP.

Anything households do for themselves and that does not pass through a market goes unmeasured.

- (2) Second-hand sales;
- (3) Purely financial transactions;

In a purely financial transaction, there is a transfer of funds, but no actual production.

Note that the fees incurred in the pure financial transaction process belong to the brokerage business (brokerage), which is the labor income of the broker and belongs to the scope of GDP measurement (services).

- (4) Intermediate sales.

Various intermediate goods, such as factors of production, are not counted in GDP because they are not final goods.

8.1.6 Disadvantages

- (1) Nonmarket sales are non counted.
- (2) The value of leisure time is not counted.
- (3) GDP does not include the improvements of quality in goods.

8.1.7 Other Indicators that Reflect Economy

In addition to GDP and GNP, common measurement indicators include national income (NI), personal income (PI) and personal disposable income (DPI).

8.1.8 Rule of 70

A variable will double in $\frac{70}{x}$ years, where x is the annual growth rate of the variable. There is no need to add a percentage sign when calculating.

8.2 The Twin Evils

8.2.1 Inflation

Definition

Inflation refers to the continuous increase in the overall price level of a country.

Inflation reduced the purchasing power of money.

Calculating Inflation Rate

(1) Consumer price index (CPI):

The consumer price index reflects the relative number of the price change trend and degree of consumer goods and services purchased by urban and rural residents within a certain period of time.

The bucket of goods used to calculate the CPI includes most of the things people buy on a daily basis. All kinds of luxury goods account for a small proportion, and new products cannot be included in the calculation.

$$\text{CPI} = \frac{\text{Total Cost This Period}}{\text{Total Cost Base Period}} \times 100 \quad (8.7)$$

Disadvantages of CPI:

- (A) Substitution bias;
- (B) Introduction of new goods;
- (C) Unmeasured quality changes;

CPI overstates the amount of inflation and the cost of living.

Calculating inflation rate by CPI:

$$\text{Inflation Rate} = \frac{\Delta \text{CPI}}{\text{CPI}}. \quad (8.8)$$

As

$$\text{Inflation Rate} = \frac{\Delta \text{CPI}}{\text{CPI}} = \frac{\text{CPI}_2 - \text{CPI}_1}{\text{CPI}_1} = \frac{\frac{100}{\text{TC}_0} \left(\frac{\text{TC}_2}{\text{TC}_0} - \frac{\text{TC}_1}{\text{TC}_0} \right)}{100 \left(\frac{\text{TC}_1}{\text{TC}_0} \right)} = \frac{\text{TC}_2 - \text{TC}_1}{\text{TC}_1},$$

the inflation rate for a given period has nothing to do with the base period selected by the CPI.

$$\text{Inflation Rate} = \frac{\Delta \text{CPI}}{\text{CPI}} = \frac{\Delta \text{TC}}{\text{TC}}. \quad (8.9)$$

(2) GDP deflator:

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100. \quad (8.10)$$

From this formula, we can calculate the value of Nominal GDP and real GDP:

$$\text{Nominal GDP} = \frac{\text{GDP deflator} \times \text{Real GDP}}{100}, \quad (8.11)$$

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP deflator}} \times 100 \quad (8.12)$$

Calculating inflation rate by GDP deflator:

$$\text{Inflation Rate} = \frac{\Delta \text{GDP deflator}}{\text{GDP deflator}}. \quad (8.13)$$

The GDP deflator does not include the prices of imported products, but the CPI does.

The price level is best measured with the GDP deflator.

Reasons

(A) Government prints too much money (hyperinflation).

There are more “rich” people but the same amount of products.

(B) Demand-pull inflation: demand pulls up prices.

“Too many dollars chasing too few goods.”

(C) Cost-push inflation:

Higher production costs increase prices.

A negative supply shock increases the costs of production and forces producers to increase prices.

Costs of Inflation

(A) Inflation reduces the purchasing power of money.

(B) Price increases brought about by inflation cause manufacturers to spend unnecessary resources printing menus (menu costs).

Menu costs refer to the need to reprint menus when prices rise, while shoe-leather costs refer to the cost of people frequently going to the bank.

(C) Lenders suffer losses due to inflation.

Fisher’s Hypothesis holds that the real interest rate on a loan is equal to the sum of the expected inflation rate and the real interest rate:

$$\text{Nominal interest rate} = \text{Real interest rate} + \text{Inflation rate}. \quad (8.14)$$

When the actual rate of inflation is greater than expected, real interest rates fall and lenders lose money. But at the same time, the borrowers benefits from it.

When the actual inflation rate is lower than expected, the real interest rate rises, and the lender benefits from it, while the borrower suffers a loss.

$$\text{Costs of inflation} \left\{ \begin{array}{l} \text{Financial wealth is eroded} \\ \text{Savings are discouraged} \\ \text{Menu costs: resources are misallocated with rising prices} \\ \text{Shoe-leather costs: people waste resources on the way to bank} \\ \text{Inflation tax: wealth is redistributed between lenders and borrowers} \end{array} \right. \quad (8.15)$$

8.2.2 Unemployment

Labor Force

The labor forces are those who are able and willing to work.

Housewives are not counted as labor force, because they choose the former between family and work, which means they are not willing to work, then they are not labor force. People who have retired are not counted as part of the labor force.

Definition of Unemployment

In order to be counted as unemployed, people have to be out of work and looking for a job.

Unemployment is a concept within the labor force, referring to people in the labor force who are willing to work but do not have a job and are actively looking for a job.

People who are not actively looking for work are not in the labor force and therefore are not counted as unemployed.

Types of Unemployment

(A) Hidden unemployment:

Those who are able to work, but not actively seeking employment because they are discouraged about their prospects for finding employment, are referred to as discouraged workers or the hidden unemployed.

As the people counted as hidden unemployment are no longer actively looking for a job, they are factually not counted in unemployment.

(B) Structural unemployment:

The structurally unemployed are out of work because the economy is structured, or set up, to their disadvantage.

Structural unemployment is inevitable, mainly because the change in the structure of economy (industrial structure, product structure, regional structure, etc.) (unemployment due to mismatch of needs).

The reason why people lose their jobs may be that their skills are no longer needed by society.

(C) Seasonal unemployment:

Some persons are able to find work for only a portion of the year due to the seasonal nature of their jobs.

Farmers, fishermen and construction workers may be subject to seasonal unemployment, because they only work part of the year.

(D) Cyclical unemployment:

Cyclical unemployment is consistent with cyclical fluctuations in the economy, with the rate falling during economic booms and rising during recessions.

Some individuals lose job because of the business cycle.

(E) Frictional unemployment:

A number of persons are not working because they are in between jobs. Someone who is scheduled to begin a new job next month and does not presently hold a job is considered to be frictionally unemployed.

Natural Rate of Unemployment (NRU)

At any time, there will be some people who are looking for work in the economy. Economists' definition of the natural rate of unemployment is sometimes referred to as the "unemployment rate under full employment" or the non-accelerating inflation rate of unemployment (NAIRU) .

Natural unemployment includes frictional unemployment and structural unemployment, because these two kinds of unemployment are unavoidable.

Note that full employment does not mean that all people have jobs.

Okun's Law

Okun's law is an empirical law stating that for every 1% increase in the unemployment rate, a country's GDP will be roughly an additional 2% lower than its potential GDP.

Formulas

$$\text{Unemployment Rate} = \frac{\text{Number of Unemployed}}{\text{Civilian labor force}} \quad (8.16)$$

$$\text{Labor Force Participation Rate} = \frac{\text{Labor force}}{\text{Population}} \quad (8.17)$$

Chapter 9

Aggregate Supply and Aggregate Demand

9.1 Aggregate Supply

Aggregate supply is the supply of all goods and services by all suppliers in the economy. In other words, aggregate supply is the supply of everything by all producers.

Short-run aggregate supply and long-run aggregate supply are two different curves.

In the short run, wages and factor prices are considered sticky, and they do not change. In the long run, wages and factors of production prices will change with the price level. Thus, an increase in the price level no longer allows producers to supply more in the long run because wages and factor prices rise in tandem.

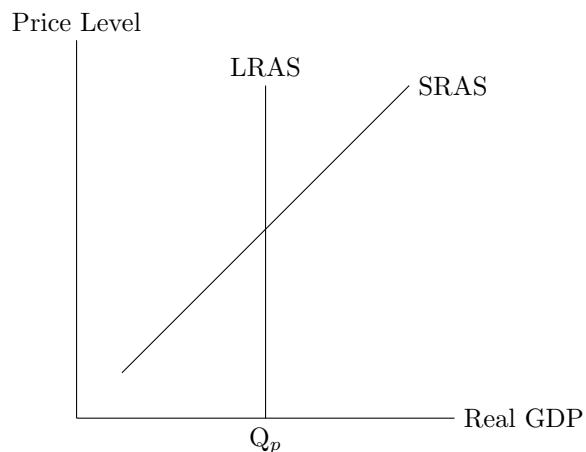


Figure 9.1: The short-run and long-run aggregate supply.

The short-run aggregate supply curve (SRAS) is an upward sloping curve, while the long-run aggregate supply curve (LRAS) is a vertical curve.

The intersection of LRAS and the horizontal axis is Q_p , which represents the potential GDP, which is the gross production value of the economy when resources are effectively used. Producing on LRAS means producing on PPC, which means that the economy is productively efficient.

9.2 Aggregate Demand

The aggregate demand curve represents the total demand for goods and services in the economy by households, businesses, governments, and foreigners. In other words, aggregate demand is the demand for everything by everyone.

Analyzing the aggregate demand and aggregate supply curves together is a common model in macroeconomics: the AS/AD model.

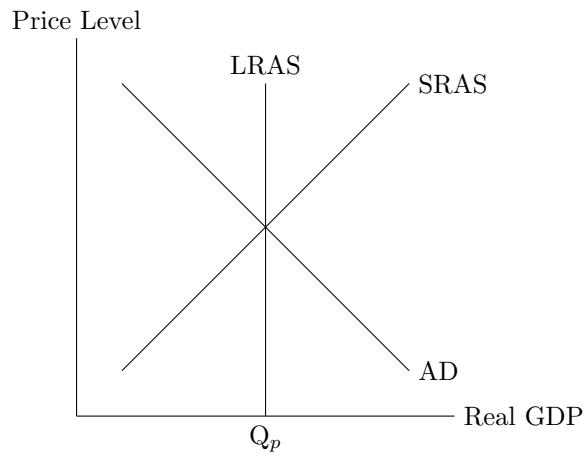


Figure 9.2: The AS/AD model.

The horizontal axis of the AS/AD model can be Real GDP, Q of Output, Yield, or Real Output.

9.3 The Classic Economic Theory

The basis of classical economic theory is Say's law. Say's law states that supply creates its own demand. It indicates that it would be impossible to produce too much.

- (1) A change in AD will not change output.
- (2) AS is vertical, so AD can't increase without causing inflation.
- (3) Prices of resources are flexible.

9.4 Keynesian Theory

Keynes suggested that the price adjustment the Classical economists relied upon to ensure that supply would always equal demand did not work under certain circumstances.

(1) A decrease in AD will lead to a persistent decrease in output (recession) as prices of resources are not flexible.

(2) Increase in AD during a recession puts no pressure on prices.

Another kind of AS curve can be drawn by combining both the classic and Keynesian theories.

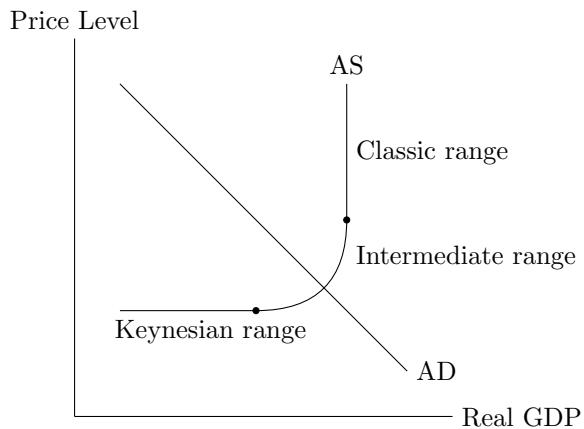


Figure 9.3: AS curve based on the combination of classic and Keynesian theories.

9.5 Applications of AS/AD Model

9.5.1 Factors that Influence AS

SRAS

(1) Changes in resource availability;

Relaxing immigration laws to allow more labor into the country shifts AS right.

Discovering new oil fields shifts AS right.

(2) Changes in productivity;

New technologies that benefit producers shift AS right. Relaxing government regulations can increase productivity and shift AS right.

(3) Changes in expected price level (only SRAS);

If suppliers expect prices to be lower in the future, they will supply more right now, shifting SRAS right.

Resource prices change can also shift SRAS. A fall in resource prices increases profit margins and shifts SRAS right.

A negative supply shock shifts SRAS left by increasing resource prices.

(4) Taxes and subsidies.

LRAS

One should pay attention that only the amount of resources and the state of technology will affect LRAS or long run living standards.

9.5.2 Reasons for AD Sloping Downwards

(1) Wealth effect (real-balance effect);

The wealth effect states that rising prices erode financial wealth. When prices go high, the purchasing power of savings would drop, so AD falls.

(2) interest rate effect;

When price level rises, the interest rate will rise too. Then, the interest-sensitive spending (mostly investment) would drop, so AD falls.

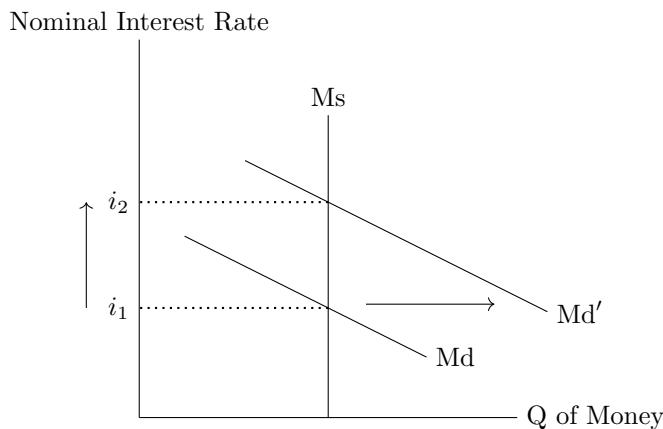


Figure 9.4: The increase in demand for money raises the nominal interest rate in the money market.

(3) Foreign purchases effect;

When the price level rises, domestic interest rates rise (as shown above). Foreigners will invest their money, which makes the domestic currency appreciate against foreign currencies. After the domestic currency appreciates, domestic products become expensive for foreigners, while foreign products become cheap for the domestic. Therefore, when exports decrease while imports increase, AD decreases.

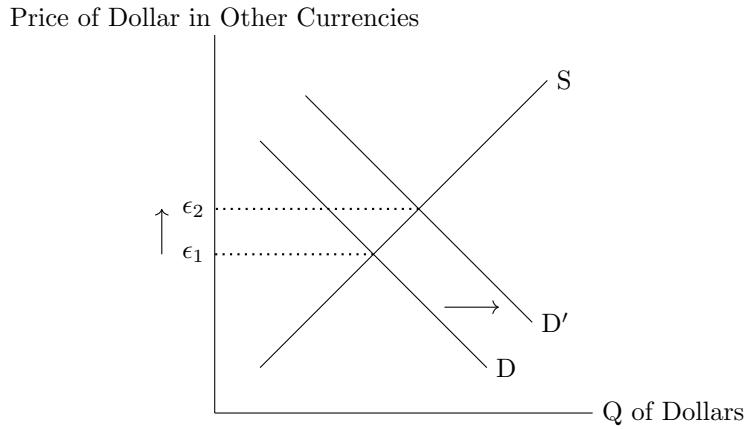


Figure 9.5: Foreigners' investments make dollar appreciate in the foreign exchange market.

9.5.3 Factors that Influence AD

The influencing factors of AD happen to be the four aspects of GDP expenditure method calculation - consumption, investment, government expenditure, and net export.

Money supply also affects aggregate demand, because an increase in the money supply lowers the nominal interest rate and increases investment.

9.5.4 Inflation, Recession, and Stagflation

Inflation is manifested as a continuous increase in the price level, which is the result of AD shifting to the right. Both aggregate output and the price level rise.

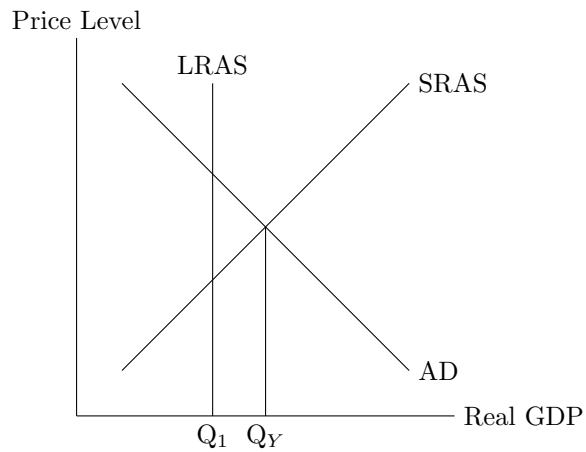


Figure 9.6: This is possibly an inflationary gap.

The above gap is caused by AD or AS moving to the right. The distance between Q_1 and Q_Y may be

an inflationary gap.

Note that, according to Okun's law, an increase in aggregate output leads to an increase in employment. When there is inflation, although the inflation rate rises, the employment rate will also rise at the same time.

Recession is the opposite of inflation and is caused by AD shifting to the left. When a recession occurs, both aggregate output and the price level fall.

Stagflation is the result of a leftward shift in the SRAS, when not only aggregate output falls but the price level rises.

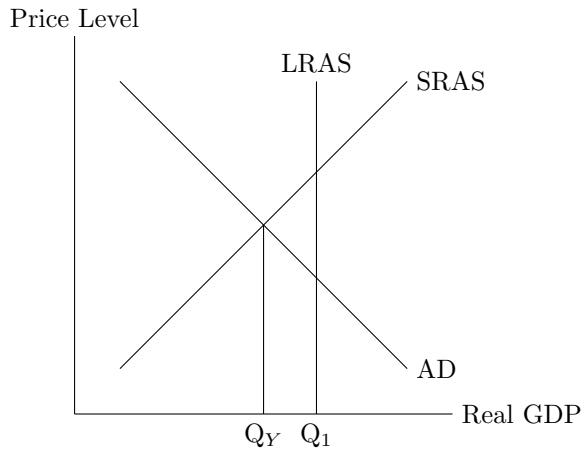


Figure 9.7: A recessionary / deflationary gap or a stagflationary gap.

The above gap may be caused by AD or AS moving to the left. The distance between Q_Y and Q_1 may be a deflationary / recessionary gap or a stagflationary gap.

9.5.5 From Short Run to Long Run

In the short run, the economy may operate at the intersection of SRAS and AD, but in the long run, the economy will still return to the intersection of LRAS and AD.

In the long run, the three curves of LRAS, SRAS and AD always intersect at the same point, and the economy will operate at this intersection.

In the short-term to long-term process, the AD or SRAS curve changes at the beginning, and then the economy returns to a stable state after the SRAS curve continues to move.

(1) Inflation: $Q > Q_p$

In the long run, wages and input prices would rise, which shifts SRAS to the left. Also, producers expect prices to be higher in the future, so they attempt to supply less right now.

(2) Stagflation / recession: $Q < Q_p$

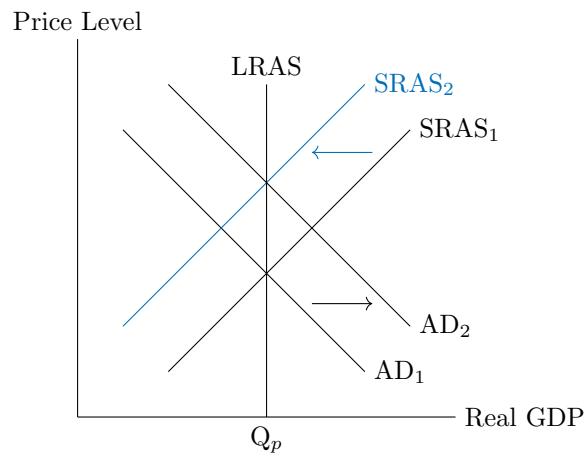


Figure 9.8: The economy adjusts itself to the long run equilibrium.

In the long run, wages and input prices will fall, which shifts SRAS to the right. Also, producers expect prices to be lower in the future, so they attempt to supply more right now.

Chapter 10

Fiscal Policy

10.1 Definition

Fiscal policy is changes in government spending and taxes to fight recessions or inflations.

Fiscal policy changes the aggregate demand by changing the consumption (C) or the government expenditure (G) in the aggregate demand AD, so that the economy moves to the long-term equilibrium.

The fiscal policy that increases AD is called expansionary fiscal policy, and the fiscal policy that reduces AD is called contractionary / tight fiscal policy.

10.2 Multiplier of Fiscal Policy

10.2.1 Marginal Propensity to Consume (MPC)

The marginal propensity to consume is the ratio of the increase or decrease in consumption to the increase or decrease in disposable income, which indicates the change in consumption when one unit of disposable income is increased or decreased:

$$MPC = \frac{\Delta C}{\Delta I}. \quad (10.1)$$

When people get a sum of money, their increased consumption does not necessarily equal the amount of the money. Generally speaking, people will choose to save part of it and spend part of it. The spent part talks about the marginal propensity to consume. The saved part is the marginal propensity to save (MPS).

$$MPS = \frac{\Delta S}{\Delta I}. \quad (10.2)$$

Also, note that

$$\text{Income} = \text{Consumption} + \text{Saving}. \quad (10.3)$$

Similarly,

$$\Delta I = \Delta C + \Delta S, \quad (10.4)$$

and

$$\frac{\Delta I}{I} = \frac{\Delta C}{I} + \frac{\Delta S}{I} \Rightarrow MPC + MPS = 1. \quad (10.5)$$

10.2.2 Multiplier of Government Expenditure

Consider the government expenditure of a .

According to the calculation of GDP, the value a is directly included in the GDP. This money flows into the market:

$$\Delta I = a.$$

This increase in income makes people consume more (MPC):

$$\Delta C = \frac{\Delta C}{\Delta I} \times \Delta I = MPC \times \Delta I = MPC \cdot a.$$

This consumption becomes a second increase in the income, and people would consume even more:

$$\Delta C_2 = MPC \times \Delta I_2 = MPC(MPC \cdot a) = MPC^2 \cdot a.$$

Therefore,

$$\begin{aligned} \Delta GDP &= \Delta G + \Delta C_1 + \Delta C_2 + \dots \\ &= a + MPC \cdot a + MPC^2 \cdot a + \dots \end{aligned}$$

One would notice that this is a convergent geometric series, as $MPC < 1$ generally. Therefore,

$$\Delta GDP = \sum_{n=0}^{\infty} MPC^n \cdot a = \frac{a}{1 - MPC}.$$

Let a be the unit measure of money, and we get the multiplier of government expenditure:

$$\text{multiplier} = \frac{1}{1 - MPC} = \frac{1}{MPS}. \quad (10.6)$$

10.2.3 Multiplier of Taxes and Transfer Payments

Unlike direct government spending, the first money from taxes and transfers does not count towards GDP.

Therefore,

$$\Delta \text{GDP} = \sum_{n=0}^{\infty} \text{MPC}^n \cdot a - a = \frac{a}{1 - \text{MPC}} - a = \frac{\text{MPC}}{1 - \text{MPC}} a.$$

So, the multiplier of taxes and transfer payments is:

$$\text{multiplier} = \frac{\text{MPC}}{1 - \text{MPC}} = \frac{\text{MPC}}{\text{MPS}}. \quad (10.7)$$

10.2.4 Multiplier of Balanced-budget Move

Governments can change spending and taxes as much at the same time, adjusting the economy without changing their own budgets. So,

$$\Delta \text{GDP} = \sum_{n=0}^{\infty} \text{MPC}^n \cdot a - \left(\sum_{n=0}^{\infty} \text{MPC}^n \cdot a - a \right) = a.$$

This means that the multiplier of balanced-budget move is exactly 1:

$$\text{multiplier} = 1. \quad (10.8)$$

When the government increases both spending and taxes, GDP increases; when the government decreases both spending and taxes, GDP decreases.

The reason why taxes have smaller effect on GDP than spending:

The entire changed government spending goes toward the AD directly, while only a portion of changed income resulting from changed taxes is consumed due to marginal propensity to consume.

10.3 Philips Tradeoff

10.3.1 Content

Fiscal policy that affects aggregate demand cannot reduce unemployment and inflation at the same time. We need to make a trade-off between unemployment and inflation.

When AD increases, the increase in total output leads to an increase in the employment rate and a decrease in the unemployment rate, but at the same time the price level also increases, which means inflation. When

AD decreases, the price level decreases and the inflation rate decreases, but at the same time the total output decreases, which makes the employment rate decrease and the unemployment rate increase.

When AD moves, the short-term aggregate output will change with AD, which makes the unemployment rate fall when the inflation rate rises, and the unemployment rate rises when the inflation rate falls. In the long run, no matter how the inflation rate changes, the unemployment rate of the economy is always equal to the natural unemployment rate. Therefore, in the long run, we no longer need to weigh the unemployment rate and the inflation rate, but only need to control the inflation rate.

10.3.2 Philips Curve

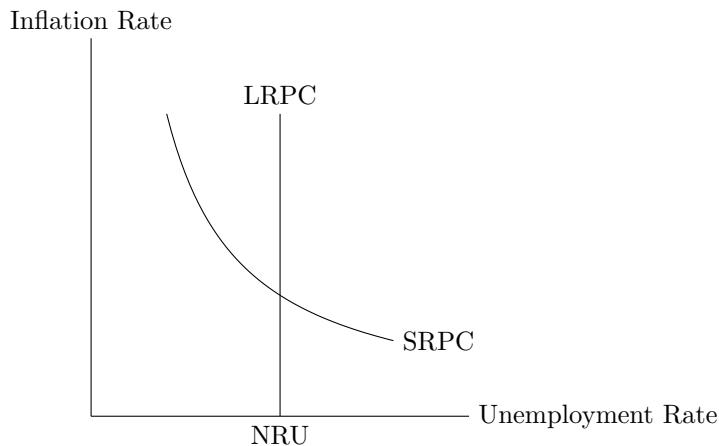


Figure 10.1: Short-run and long-run Philips curve.

10.3.3 AD and Philips Curve

When AD increases, short-run unemployment falls and inflation rises. When AD decreases, short-run unemployment rises and inflation falls. This is reflected as a point shift in the short-term Phillips curve.

When AD changes in the long run, an increase in AD makes the inflation rate rise, and a decrease in AD makes the inflation rate fall.

When AD increases, the PC point moves upwards; when AD decreases, the PC point moves downwards.

10.3.4 AS and Philips Curve

When stagflation occurs, the unemployment rate and inflation rate rise at the same time, and this is not something that can be done by a point move.

Therefore, the change in AS actually causes the entire line of the Phillips curve to move.

When AS increases, PC moves toward the origin; when AS decreases, PC moves outward.

$$\begin{cases} \text{AD } \uparrow, \text{ the economy slides up the Philips curve.} \\ \text{AD } \downarrow, \text{ the economy slides down the Philips curve.} \\ \text{AS } \uparrow, \text{ the Philips curve shifts left.} \\ \text{AS } \downarrow, \text{ the Philips curve shifts right.} \end{cases} \quad (10.9)$$

10.4 Factors that Nullify Fiscal Policies

10.4.1 Crowding out Effect

When government spending increases, the demand for money by the government will increase. This would cause the interest rates to rise, so the interest-sensitive spending, like investment, will drop.

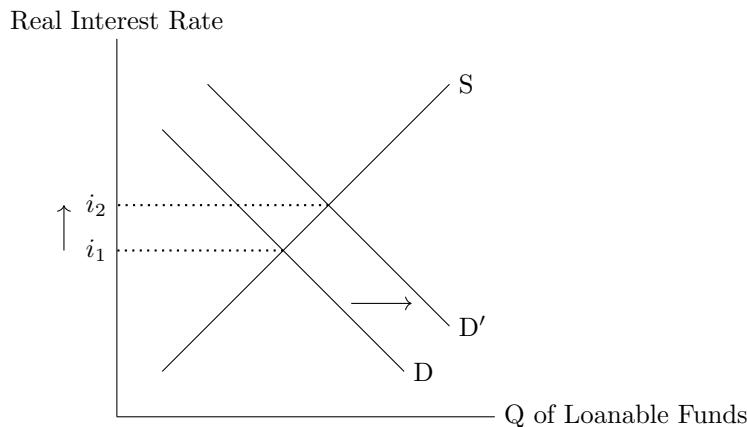


Figure 10.2: The increase in interest rate caused by expansionary fiscal policy decreases investment.

The opposite of the crowding out effect is the crowding in effect. When the government spends less, interest rates fall, which leads to higher investment.

10.4.2 Rational Expectations

When government spending rises, people expect the prices to rise. So, the suppliers would attempt to reduce the number of products they supply by now to chase for high prices.

10.5 Automatic Stabilizers

The government taking active measures to achieve certain macroeconomic goals is called the discretionary policy. The opposite is the non-discretionary policy.

One example of the non-discretionary policy is the automatic stabilizers.

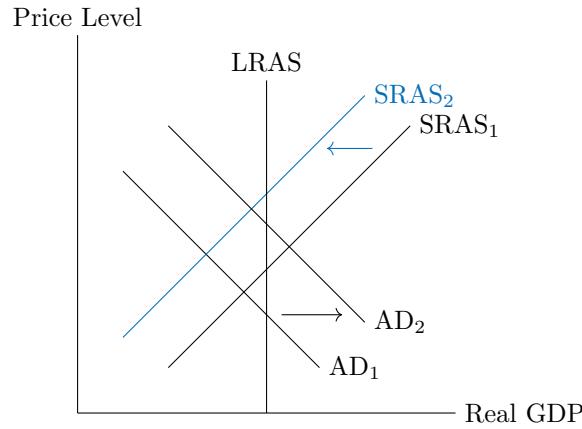


Figure 10.3: Rational expectations of producers make the fiscal policy ineffective.

Automatic stabilizers are shock absorbers that help alleviate fluctuations in economic factors such as employment levels, price levels, and income levels without frequent changes in government economic policies, so that they tend to stabilize automatically.

There are many kinds of automatic stabilizers. The most important stabilizers in the public sector are income taxes and corporate income taxes. In addition, there are unemployment insurance, various social welfare expenditures, agricultural product price maintenance systems, food stamps, and medical aid. The most important stabilizer in the personal sector is the marginal propensity to save.

Chapter 11

Money, Banking, and Monetary Policy

11.1 The Supply of Money

Money supply refers to the total stock of money that can be used for various transactions within a certain period of time in a country's economy. Money supply can be divided into different levels according to the strength of money liquidity, namely M_0 , M_1 , M_2 , M_3 , M_4 , etc.

Liquidity is the ease with which an asset can be accessed and converted into cash (liquidized).

M_0 is the currency, which has the highest liquidity.

M_1 is called the narrow money.

$$M_1 = M_0 + \text{transaction accounts} + \text{traveler's checks} \quad (11.1)$$

M_2 is called the broad money.

$$M_2 = M_1 + \text{saving accounts} + \text{deposits} + \text{retail money funds} \quad (11.2)$$

The deposit here refers to large deposits, and retail money funds are customer deposits of securities companies, the amount of which is less than \$100,000.

11.2 Fiat Money

11.2.1 Fiat Money

The coins and paper money have nothing standing behind them except the fact that they are legal tender.

11.2.2 Commodity Money

Commodity money is something that performs the function of money and has alternative uses, such as gold and silver, and currencies under the gold standard, such as the U.S. dollar under the Bretton Woods system. Fiat money is something that serves as money but have no other important uses.

$$\text{Commodity money} \begin{cases} \text{backed by silver} \\ \text{backed by gold} \end{cases} \quad (11.3)$$

11.2.3 Money, Wealth, Assets, and Income

Money is not the same as wealth or income.

Wealth is the total collection of assets that store value.

Assets are anything of monetary value owned by a person or business.

Income is the flow of earnings per unit of time.

11.2.4 Stocks and Bonds

Bonds and stocks are loans that represent debt that the government or a corporation must repay to an investor. The bond holder has no ownership of the company.

| | Stock | Bond |
|----------|-------------|------------|
| Holder | Stockholder | Bondholder |
| Revenue | ”Dividend” | ”Interest” |
| Return | High | Low |
| Risk | High | Low |
| Priority | High | Low |

Table 11.1: Difference between stocks and bonds.

$$\begin{cases} \text{Corporate bond: high risk, high return} \\ \text{National bond: low risk, low return} \end{cases} \quad (11.4)$$

Deposits have the lowest return, and the risk is between corporate bond and national bond.

Stock owners can earn a profit in two ways:

(1) Dividends:

Dividends are portions of a corporation's profits. The higher the corporate profit, the higher the dividends.

(2) Capital gain:

A capital gain is earned when a stockholder sells stocks for more than he or she paid for it.

11.3 Federal Reserve System (Fed)

The Fed operates as the bank of banks.

There are 12 branches of the Fed located in major cities throughout the nation. This makes it convenient for banks and other depository institutions to do their banking.

The main headquarters of the Fed is in Washington, D.C.

The President of the United States appoints the seven members of the Board of Governors of the Fed. The President also appoints one of the members to be the chairman of the Board of Governors and another member to be the vice chairman.

All the members of the Board of Governors serve 14-year terms.

The Board of Governors makes the important decisions concerning the money supply.

11.4 Fractional Reserve Banking and the T-accounts

The fractional reserve system is relative to the full reserve system. It refers to the system in which commercial banks keep a part of their reserves and lend out the rest of the funds. Banks don't need to keep all the deposits they get in the treasury or deposit them in the central bank as reserves; the statutory reserve ratio is the ratio of the minimum reserves to deposits stipulated by the central bank and maintained by banks.

Money held in reserve by banks is not counted in M_1 or M_2 .

The fractional reserve requirement system can amplify the money supply similar to the fiscal policy multiplier.

Consider someone makes a deposit of $\$a$ in bank A. Let the reserve requirement rate of the bank be r .

| Commercial Bank A | |
|-------------------|------------------------|
| Assets | Liabilities |
| $+\$a$ currency | $+\$a$ demand deposits |

Table 11.2: The bank T-account.

This a dollar enters bank A and becomes the bank's reserve fund. The reserve system says that banks must keep ar dollars, and the rest of the money can be taken out for loans. Then,

| Commercial Bank A | |
|-------------------------------|------------------------|
| Assets | Liabilities |
| $+\$a$ required reserves | $+\$a$ demand deposits |
| $+\$a(1 - r)$ excess reserves | |
| $-\$a(1 - r)$ excess reserves | |
| $+\$a(1 - r)$ loans | |

Table 11.3: The bank makes loans.

The second person gets a loan worth $\$a(1 - r)$, and this person will then deposit the money back into Bank B. Bank B will continue to release loans after depositing reserves....

In this whole process, the increase in money supply is:

$$\Delta MS = a + a(1 - r) + a(1 - r)^2 + \dots = \sum_{n=0}^{\infty} a(1 - r)^n.$$

This is also a convergent geometric series, and we get:

$$\Delta MS = \sum_{n=0}^{\infty} a(1 - r)^n = \frac{a}{1 - (1 - r)} = \frac{a}{r}.$$

Therefore, the multiplier of fractional reserve is:

$$\text{money multiplier} = \frac{1}{\text{reserve requirement}}. \quad (11.5)$$

11.5 Monetary Policy

The Fed has several ways to control the amount of reserves held by banks and thus the money supply. Monetary policy is mainly to control the money supply, change the interest rate by changing the money supply, and then affect the aggregate demand.

11.5.1 Reserve Requirement

When the reserve ratio increases, the money multiplier decreases, and the money supply decreases; when the reserve ratio decreases, the money multiplier increases, and the money supply increases.

11.5.2 Discount Rate

The discount rate is the rate at which banks lend money at the Federal Reserve. If the discount rate increases, the money supply decreases; if the discount rate decreases, the money supply increases.

11.5.3 Open Market Purchases

The Fed can control the money supply by trading bonds in the secondary market.

If the Fed sells bonds in the secondary market, the money will return to the Fed, and the money supply will decrease; if it buys bonds in the secondary market, money will start to circulate, and the money supply will increase.

11.5.4 Federal Funds Rate

Controlling the federal funds rate is not part of monetary policy, but it can also manipulate the money supply.

The federal funds rate is the rate at which banks lend among themselves.

When the fed funds rate rises, the money supply falls; when the fed funds rate falls, the money supply rises.

11.6 The Equation of Exchange

11.6.1 Content

The equation of exchange states that the quantity of money multiplied by the number of uses of money must equal nominal income.

11.6.2 Equation

$$MV = PQ, \quad (11.6)$$

Where M is the money supply (M_1 or M_2), V is the velocity of money, P is the price level, and Q is the quantity of output.

The velocity of money is the number of times the typical dollar of M_1 or M_2 is used to make purchases during a year.

And as $PQ = \text{Nominal GDP}$,

$$V = \frac{PQ}{M} = \frac{\text{Nominal GDP}}{M}. \quad (11.7)$$

11.7 Three Kinds of Views

11.7.1 Classic View

In the equation of exchange, M does not change Q , and V and Q are constants. V and Q are constants indicating that M is proportional to changes in P . This result is known as monetary neutrality or the Quantity Theory of Money.

The quantity theory of money states that there is a causal relationship between changes in the quantity of money (M) and changes in prices (P) and the value of money. Monetary neutrality is a brief description of a basic proposition of the quantity theory of money, which means that an increase in the money supply will lead to an increase in the same proportion of the price level, and has no effect on the actual output level.

11.7.2 Monetarist View

In the equation of exchange, M can change Q . The value of V and Q are stable, but not constant. This view exaggerated the influence money supply (MS) can have on the society and economy.

11.7.3 Keynesian View

The Keynesian view is very similar to the monetarist view, but it believes M has a smaller impact on Q . The influence M can have on the interest rate is also small, as the money demand is a very flat line (elastic).

11.8 The Money Market

11.8.1 Definition

The money market refers to the market in which financial assets with a maturity of less than one year are traded. The main function of this market is to maintain the liquidity of financial assets so that they can be converted into tradable currencies at any time.

The two curves in the money market are money demand (Md) and money supply (Ms). The money supply is controlled by the Federal Reserve, so it is a vertical curve. The demand for money is flat and elastic.

11.8.2 Factors that Influence Money Demand

- (1) Price level;

The price level and the money demand move in the same direction.

- (2) Income;

Income and the money demand move in the same direction. If income increases, then households will want to buy more things and this means larger money holdings in their wallets or in their checking accounts.

(3) Changes in Technology to Access Money;

If people can get money more easily (like the invention of ATM machine), the money demand would decrease:

$$M \downarrow = \frac{PQ}{V \uparrow}$$

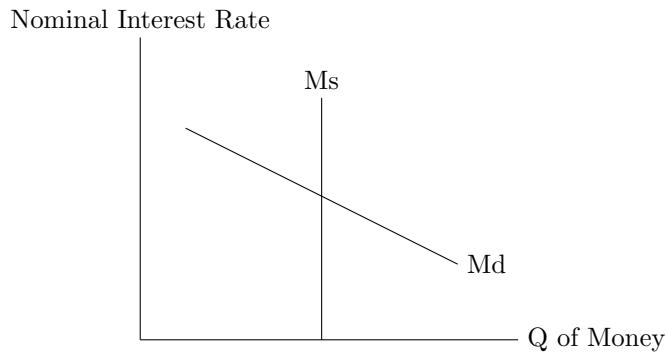


Figure 11.1: The money market.

11.8.3 Reasons for Money Demand Sloping Downwards

A rise in the nominal interest rate induces people and firms to place their funds where they can earn the higher return. This means they have less on hand.

11.8.4 Liquidity Trap

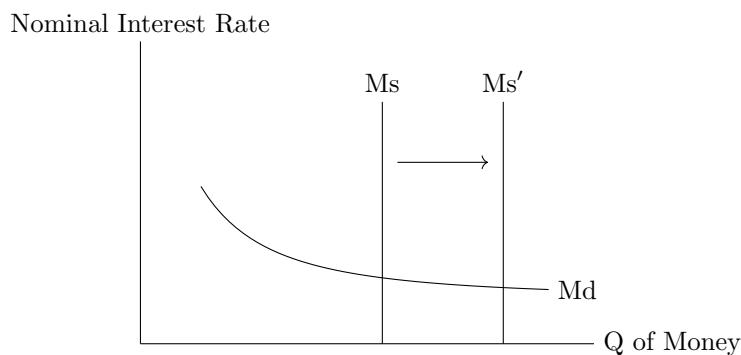


Figure 11.2: The liquidity trap.

Liquidity trap means that when the nominal interest rate is reduced to the point where it can no longer

be lowered, people prefer to hold wealth in the form of cash or savings because of the effect of a certain “liquidity preference”, rather than invest this wealth in the form of capital, and are unwilling to consume this wealth as consumption materials for personal enjoyment. Any increase in the country’s money supply will be absorbed in the form of “idle money”, as if falling into a “liquidity trap”, so it will not have any impact on aggregate demand, income, or prices.

11.9 loanable Funds Market

11.9.1 Definition

The loanable funds market is the private sector supply and demand of loans. This market shows the effect on real interest rates.

Different from the money market, the supply curve of loanable funds market slopes upwards, and the vertical axis is the real interest rate.

11.9.2 Factors that Influence Demand

- (1) Changes in perceived business opportunities;

If people believe that they may benefit from investment, they would try to loan money, and the demand increases.

- (2) Changes in government borrowing;

Government borrowing money would increase the demand for loanable funds.

11.9.3 Factors that Influence Supply

- (1) Changes in private savings behavior;

$$\text{Income} = \text{Consumption} + \text{Saving} \quad (11.8)$$

The savings are the main source of the supply of loanable funds. Therefore, the change in MPS of people would have a great impact on the supply of loanable funds.

- (2) Changes in public / government savings;

The savings of government changes in the same direction as the supply.

- (3) Changes in foreign investment;

The foreign investment changes in the same direction as the supply.

- (4) Changes in expected profitability;

If people believe they can benefit from lending money, the supply of loanable funds would increase.

11.9.4 Graph

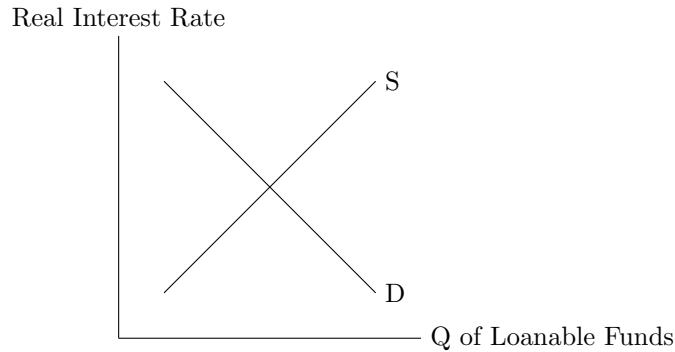


Figure 11.3: The loanable funds market.

11.10 Economic Growth

The determining factors of economic growth is labor, resources, and technology.

In order to encourage scientific and technological research and development and encourage investment, interest rates should be lowered. The way to lower interest rates is to increase supply in the money market or loanable funds market.

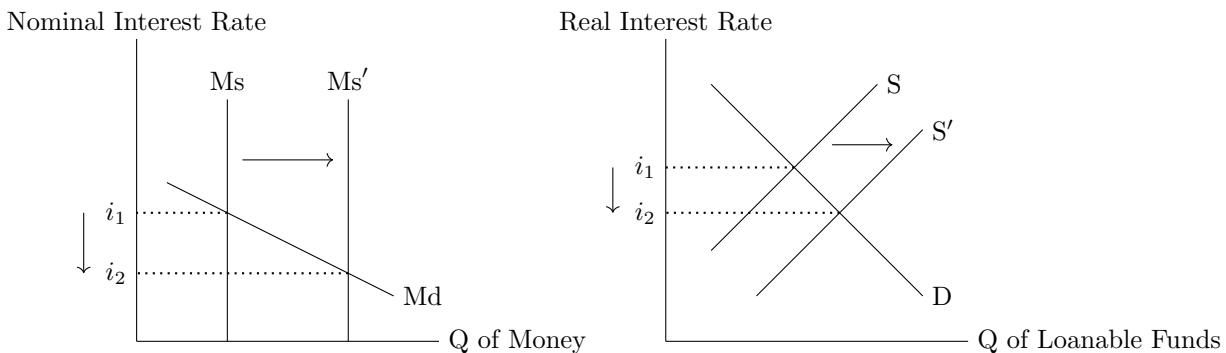


Figure 11.4: Lowering the interest rate.

11.11 Fiscal Policy and Monetary Policy

$$\text{Government} \left\{ \begin{array}{l} \text{Non-discretionary: Automatic Stabilizers} \\ \text{Discretionary: Fiscal Policies} \left\{ \begin{array}{l} \text{Government Spending (+)} : m = \frac{1}{1 - MPC} \\ \text{Taxes (-)} : m = \frac{MPC}{1 - MPC} \\ \text{Balanced-budget Move: } m = 1 \end{array} \right. \end{array} \right. \quad (11.9)$$

$$\text{Federal Reserve} \left\{ \begin{array}{l} \text{Monetary Policies: } m = \frac{1}{r} \left\{ \begin{array}{l} \text{Required Reserve Ratio (-)} \\ \text{Discount Rate (-)} \\ \text{Open-market Operations} \end{array} \right. \\ \text{Federal Funds Rate (-)} \end{array} \right. \quad (11.10)$$

$$\text{Demand Management Policies} \left\{ \begin{array}{l} \text{Fiscal Policy} \left\{ \begin{array}{l} \text{Expansionary} \\ \text{Contractionary} \end{array} \right. \\ \text{Monetary Policy} \left\{ \begin{array}{l} \text{Easy} \\ \text{Tight} \end{array} \right. \end{array} \right. \quad (11.11)$$

$$\left\{ \begin{array}{l} \text{Fiscal Policy: Change in Real GDP} = \text{Initial Change in Spending} \times \text{Multiplier} \\ \text{Monetary Policy: Change in Money Supply} = \text{Initial Change in Bank Reserves} \times \text{Multiplier} \end{array} \right. \quad (11.12)$$

Chapter 12

International Trade and Exchange

12.1 The Balance of Trade

12.1.1 Definition

A nation's balance of trade is equal to its exports minus its imports.

$$\text{Balance of Trade} = \text{Exports} - \text{Imports} \quad (12.1)$$

The balance of trade for a country is equal to the net exports (NX).

12.1.2 Trade Surplus and Trade Deficit

If a country's balance of trade is positive, it means that exports are greater than imports, and the country is in a trade surplus;

If a country's balance of trade is negative, it means that it imports more than it exports and the country is in a trade deficit.

12.1.3 Net Capital Outflow (NCO)

The net capital outflow is equal to net exports:

$$\text{NCO} = \text{NX}. \quad (12.2)$$

We may determine the net capital outflow by considering the relative size of savings and investment:

$$\begin{aligned} Y &= C + I + G + NX \\ (Y - C - T) + (T - G) &= I + NCO \quad (12.3) \\ S &= I + NCO. \end{aligned}$$

12.2 Trade Restriction

12.2.1 Reasons

- (1) Promote domestic employment;
- (2) Infant industry argument;
- (3) Diversity of production;
- (4) Prevent dumping.

Dumping refers to the act of taking market share at very low prices (maybe even below cost), which has a huge blow to the domestic market.

12.2.2 Methods

The two ways of restricting trade are quotas and tariffs.

Another way to restrict trade is the licensing requirement for sale. Only foreign merchants with a license can sell the corresponding products in the country. In fact, such licenses serve no purpose other than to restrict trade and competition.

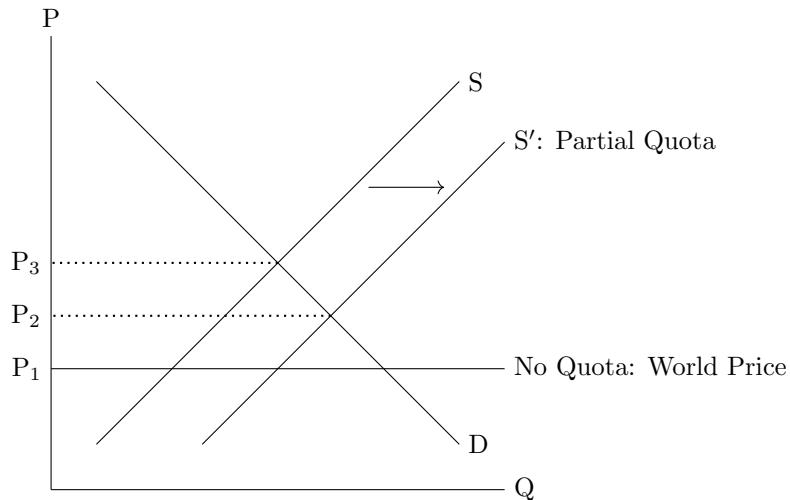


Figure 12.1: Quota.

From a purely economic point of view, restricting trade does not do any good. The theory of comparative advantage holds that if economies can specialize in production, all countries can consume beyond the frontier of production possibilities.

12.3 Balance of Payments (BOP)

(1) Balance of trade includes only goods and services, but balance of payments considers all international transactions.

The BOP is a broader measure of international trade.

(2) The balance of payments is made up of two accounts, the current account (CA) and the capital and financial account (CFA).

(3) Current account (CA):

(A) The current account records net exports, net income from abroad, and the net unilateral transfers.

(B) The CA is not always balanced; a nation's balance of trade (i.e. net exports) is part of the current account and may also show a surplus or deficit.

(4) Capital and financial account (CFA):

(A) CFA records financial capital transfers and purchases and sales of assets between countries.

All investments belong to the CFA.

(B) The CFA is not always balanced; it may show a surplus (financial capital inflow) or a deficit (financial capital outflow).

(5) BOP is an accounting system that records a country's international transactions for a particular time period.

(6) Any transactions that cause money to flow into a country is a credit to its BOP account, and those that cause money to flow out is a debit. The sum of all credit entries should match the sum of all debit entries.

$$\text{CA} + \text{CFA} = 0 \quad (12.4)$$

E.g. U.S. income increases relative to other countries. Does the balance of payments show a deficit of a surplus?

When U.S. citizens have more income, they will have money to buy more imports. So, the net exports will decrease. Therefore, the current account balance would move toward a deficit.

12.4 Exchange Rates

(1) For international trades, there are different national currencies.

(2) Each country must be paid in its own currency. The buyers (importer) must exchange their currency for that of the sellers (exporter).

(3) Depreciation: “weaker”

(A) Depreciation is the loss of value of a country’s currency with respect to a foreign currency.

(B) More units of dollars are needed to buy a single unit of the other currency.

(4) Appreciation: “stronger”

(A) Appreciation is the increase of value of a country’s currency with respect to a foreign currency.

(B) Fewer units of dollars are needed to buy a single unit of the other currency.

12.5 Foreign Exchange Market

The foreign exchange market refers to a trading place that engages in foreign exchange trading internationally and adjusts the supply and demand of foreign exchange. Its function is to deal in monetary commodities, that is, the currencies of different countries.

Consider the exchange market for Indian Rupee and Dollars.

Price of Rupees in Dollars

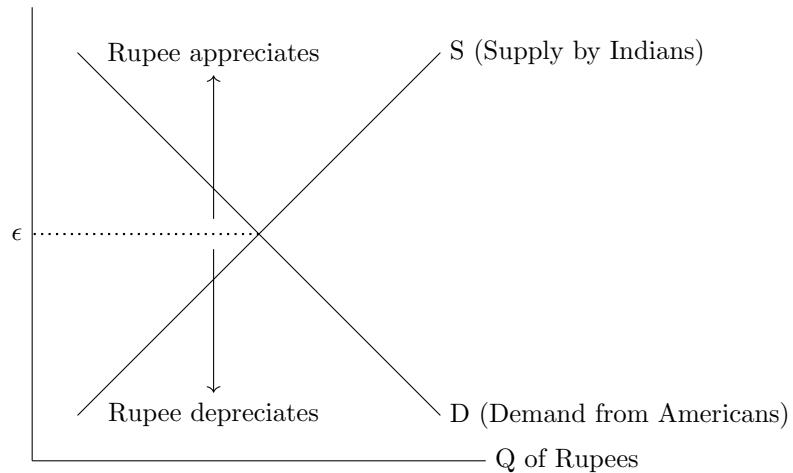


Figure 12.2: The foreign exchange market of Indian Rupees.

Due to international trade, investment, tourism and other economic exchanges, there will always be a relationship between currency receipts and payments. However, the currency systems of various countries are different. If you want to pay abroad, you must first purchase foreign currency with your own currency; This creates the problem of exchanging domestic currency with foreign currency.

The parity between the currencies of the two countries is called the exchange rate or exchange rate.

12.5.1 Factors that Influence Supply

- (1) Import (+);
- (2) Foreign real interest rate (+);
- (3) Real GDP (income) (+);
- (4) Domestic inflation rate (+);
- (5) Buy foreign reserve (+).

12.5.2 Factors that Influence Demand

- (1) Export (+);
- (2) Domestic real interest rate (+);
- (3) Sell foreign reserve (+);
- (4) Buy domestic currency (+).