

## **Chapter 1: Introduction**

### **Ten Principles of Economics**

#### Microeconomics

1. People face tradeoffs
2. The cost of something is what you give up to get it.
3. Rational people think at the margin
4. People respond to incentives
5. Trade can make everyone better off.
6. Markets are usually a good way to organize economic activity
7. Governments can sometimes improve economic outcomes.

#### Macroeconomics

8. The standard of living depends on a country's production
9. Prices rise when the government prints too much money
10. Society faces a short-run tradeoff between inflation and unemployment

### **Principle #1: People Face Tradeoffs.**

- To get something, we usually have to give up something else.
- Making decisions requires trading off one goal against another.

#### Efficiency v. Equity

- Efficiency -- society gets the most it can from its scarce resources
- Equity -- the benefits of those resources are distributed fairly among the members of society

### **Principle #2: The Cost of Something is What You Give Up to Get It.**

- Decisions require comparing costs and benefits of alternatives.
- Opportunity cost of an item is what you give up to obtain that item.

### **Principle #3: Rational People Think at the Margin**

- Marginal changes -- small, incremental adjustments to an existing plan of action.
- People make decisions by comparing costs and benefits at the margin

### **Principle #4: People Respond to Incentives**

- Marginal changes in costs or benefits motivate people to respond.
- The decision to choose one alternative over another occurs when that alternative's marginal benefits exceed its marginal costs!

### **Principle #5: Trade Can Make Everyone Better Off**

- People gain from their ability to trade with one another.
- Competition results in gains from trading
- Trade allows people to specialize in what they do best.

### **Principle #6: Markets Are Usually a Good Way to Organize Economic Activity.**

- Market economy: an economy that allocates resources through the decentralized decisions of many firms and households as they interact in markets for goods and services.
- Households: decide what to buy and who to work for
- Firms: decide who to hire and what to produce
- Adam Smith made the observation that households and firms interacting in markets act as if guided by an “invisible hand.”
  - Because households and firms look at prices when deciding what to buy and sell, they unknowingly take into account the social costs of their actions.
  - As a result, prices guide decision makers to reach outcomes that tend to maximize the welfare of society as a whole.

### **Principle 7: Governments Can Sometimes Improve Market Outcomes**

- Market Failure: occurs when the market fails to allocate resources efficiently.
  - May be caused by:
    - an externality, which is the impact of one person or firm’s actions on the well-being of a bystander
    - market power, which is the ability of a single person or firm to unduly influence market prices.
- When the market fails (breaks down) government can intervene to promote efficiency and equity.

## **Chapter 2: Thinking Like An Economist**

### **Economists as Scientists**

1. Make positive statements
  - describe the world as it is
  - these statements can be confirmed or refuted.
2. Employ the scientific method to develop and test theories about how the world works.

### **The Economist as Policy Advisor**

- Make normative statements
  - prescribe how the world should be
  - these statements cannot be confirmed or refuted
  - Governments employ many economist for policy advice

### **Why Economists Disagree**

- Economists may
  - disagree about the validity of alternative positive theories about the world.
  - have different values -> different normative views about what policy should try to accomplish
- Yet, there are many propositions about which most economists agree.

### **Assumptions Models**

- Assumptions

- simplify the complex world to make it easier to understand
- yield useful insights about the more complicated real world.
- Economists use models to study economic issues.

### The Circular-Flow Diagram: Our First Model

- A visual model of the economy -- shows how dollars flow through markets among households and firms
- Includes two types of “actors”: households, firms
- Includes two markets: goods and services; factors of production

### Factors of Production

- The resources that the economy uses to produce goods & services include:
  1. labour
  2. land
  3. capital
  4. entrepreneurship

### Second Model: The Production Possibilities Frontier (PPF)

- Shows the combinations of two goods the economy can possibly produce given the available production factors of production and the available production technology.
- Example:
  - Two goods: computers and wheat
  - One resource: labour in hours
  - Economy has 50,000 labour hours per month available for production

	Labour Hours		Production	
	Computer	Wheat	Computer	Wheat
A	50000	0	500	0
B	40000	10000	400	1000
C	25000	25000	250	2500
D	10000	40000	100	4000
E	0	50000	0	5000

### The PPF and Opportunity Cost

- Opportunity Cost: what must be given up to obtain something
- Moving along a PPF involves shifting resources from the production of one good to the other
- Society faces a tradeoff: getting more of one good requires sacrificing some of the other.
- The slope of the PPF tells you the opportunity cost of one good in terms of the other.

## **Economic Growth and the PPF**

With additional resources or an improvement in technology, the economy can produce more computers, more wheat or any other combination of wheat and computers.

## **The Shape of PPF**

- The PPF could be a straight line, or bow-shaped
- Depends on what happens to opportunity cost as the economy shifts resources from one industry to the other.
- If the opportunity cost remains constant, the PPF is a straight line.
- If opportunity cost of a good rises as the economy produces more of the goods, which is more likely the case, then the PPF is bow-shaped.

## **Why the PPF might be bow-shape**

- As the economy shifts resources from beer to mountain bikes the PPF becomes more and more steep and the opportunity cost of an extra mountain bike increases.
- So, PPF is bow-shaped when different workers have different skills, which results in different opportunity costs of producing one good in terms of the other.
- The PPF would also be bow-shaped when there is some other resource, or mix of resources with varying opportunity costs.

## **The PPF: a Summary**

- The PPF shows all combinations of two goods that an economy can possibly produce, given its resources and technology.
- The PPF illustrates the concepts of tradeoff and opportunity cost, efficiency and inefficiency, unemployment and economic growth

## **Lecture #2**

### **Normative and Positive Statements**

In Economics we only deal with positive statements.  
Normative are opinionated whereas positive are facts.

### **Markets and Competition**

- A market is a group of buyers and sellers of a particular good or service
- A competitive market is one in which there are so many buyers and so many sellers that each has a negligible impact on the market price.
- A perfectly competitive market is all goods are exactly the same and buyers and sellers are so numerous that no one can affect the market price

### **Demand**

- Demand comes from the behaviour of buyers
- The quantity demanded of any good is the amount of the good that buyers are willing and able to purchase
- Law of demand: the claim that, other things equal, the quantity demanded of a good falls when the price of the good rises

- Demand schedule: a table that shows the relationship between the price of a good and the quantity demanded.
- Market demand is the sum of the quantities demanded by all buyers at each price.
- The distance from the line to the x-axis is called the Willingness to Pay, which represents a maximum that a buyer is willing to pay for a good.

### **Demand Curve Shifters**

- The demand curve shows how price affects quantity demanded, other things being equal.
- These other things are non-price determinants of demand (changes in the number of buyers, income, prices of related goods, tastes or preferences, and expectations)

#### **Demand Curve Shifters: Income**

- Demand for a normal good is positively related to income, an increase in income causes increase in quantity demanded at each price, shifting the D curve to the right.
- Demand for an inferior good is negatively related to income. An increase in income shifts D curves for inferior goods to the left.

### **Demand Curve Shifters: Prices of Related goods**

- Two goods are substitutes if an increase in the price of one causes an increase in demand for the other, example hotdogs and hamburgers
- Two goods are compliments if an increase in the price of one leads to a fall in demand for the other, example ice cream and cones

### **Supply**

- Supply comes from the behaviour of sellers
- The quantity supplied of any good is the amount that sellers are willing to sell.
- Law of supply: the claim that, other things equal, the quantity supplied of a good rises when the price of the good rises.
- Supply schedule: a table that shows the relationship between the price of a good and the quantity supplied.
- Market Supply is the sum of the quantities supplied by all sellers at each price.
- The distance from the line to the y-axis is called the willingness to accept, which represents a minimum that a seller will sell a good.

### **Supply Curve Shifters:**

#### **Prices of productive resources**

- If resource (labour, capital, land) prices increase, the minimum price that a supplier is WTA for producing each quantity of that good increases -> shifts the supply curve leftward.

#### **Prices of related goods produced**

- Substitutes in production: goods that can be produced using the same resources
- Complements in production: goods that must be produced together

## Different Shift possibilities

$\Delta$ Demand	$\Delta$ Supply	Pe	Qe	Example
up	-----	increase	increase	Coffee is good for health
down	-----	decrease	decrease	Coffee is bad for health
-----	up	decrease	increase	Productivity increases
-----	down	increase	decrease	Wages decreases
up	up	ambiguous	increase	Coffee is good and increases in productivity
up	down	increase	ambiguous	Coffee is good and wages decreases
down	up	decrease	ambiguous	Coffee is bad and increase in productivity
down	down	ambiguous	decrease	Coffee is bad and wages decrease

Watch out for wages! It is relevant to whether the product being compared is an inferior or normal good. This table shows it for a normal good being coffee.

## Lecture #3

### Elasticity

Measures how much one variable responds to changes in another variable.

- One type of elasticity measures how much the quantity demanded for your websites will fall if you raise your price.
- Elasticity: a numerical measure of the responsiveness of Qd or Qs to one of their determinants

### Price Elasticity of Demand

Price of elasticity of demand =  $\% \Delta$  in Qd /  $\% \Delta$  in P

- The elasticity of demand measures how much Qd or Qs respond to a change in one of their determinants.
- For example, it measures the price sensitivity of buyers to a change in the price
- Example if price rises by 10% and quantity falls by 15% then the price elasticity of demand equals 1.5, technically -1.5 but we always express in absolute terms

When calculating Percentage changes always use the midpoint method because standard method can give you different answers based on where you start from.

Example	find $\% \Delta$ in P	$(\$250 - \$200) / \$225 = 22.2\%$
	find $\% \Delta$ in Q	$(12 - 8) / 10 = 40\%$
	find price elasticity	$40 / 22.2 = 1.8$

What determines price elasticity?

To learn the determinants of price elasticity, we look at a series of examples which compare two goods.

### **Example 1: Rice Krispies vs. Sunscreen**

The prices of both goods rise by 20%. For which good does Qd drop the most? Why?

- Rice Krispies has lots of close substitutes (e.g., Cap'n Crunch, Count Chocula), so buyers can easily switch if the price rises.
- Sunscreen has no close substitutes, so consumers would probably not buy much less if its price rose.

Conclusion: Price elasticity is higher when close substitutes are available

### **Example 2: Blue Jeans vs. Clothing**

The prices of both goods rise by 20%. For which good does Qd drop the most? Why?

- For a narrowly defined good such as blue jeans, there are many substitutes
- There are fewer substitutes available for broadly defined goods.
- Lesson: Price elasticity is higher for narrowly defined goods than broadly defined ones.

### **Example 3: Insulin vs. Caribbean Cruises**

The prices of both goods rise by 20%. For which good does Qd drop the most? Why?

- To millions of diabetics, insulin is a necessity. A rise in its price would cause little or no decrease in demand.
- A cruise is a luxury. If the price rises, some people will forego it.
- Lesson: Price elasticity is higher for luxuries than for necessities.

### **Example 4: Gasoline in the Short Run vs. the Long Run**

The price of gasoline rises by 20%, which Qd drops more? Why?

- There's not much people can do in the short run, other than ride the bus or carpool
- In the long run, people can buy smaller cars, or live closer to where they work
- Lesson: Price elasticity is higher in the long run than the short run.

### **The Determinants of Price Elasticity: A Summary**

The price elasticity of demand depends on:

1. The extent to which close substitutes are available
2. whether the good is a necessity or a luxury
3. how broadly or narrowly the good is defined
4. the time horizon: elasticity is higher in the long run than in the short run.

### **The Variety of Demand Curves**

- Economists classify demand curves according to their elasticity
- The price elasticity of demand is closely related to the slope of the demand curve.
- Rule of thumb:

- 1. the flatter the curve, the bigger the elasticity.
- 2. the steeper the curve, the smaller the elasticity.

### **Perfectly inelastic demand (extreme case)**

Where price elasticity of demand is 0

D curve is vertical

Consumers' price sensitivity: 0

### **Inelastic Demand**

Where price elasticity of demand is  $< 1$

D curve relatively steep

Consumers' price sensitivity: relatively low

### **Unit elastic demand**

where price elasticity of demand is 1

D curve: intermediate slope

Consumers' price sensitivity: intermediate

### **Elastic Demand**

where price elasticity of demand is  $> 1$

D curve: relatively flat

Consumers' price sensitivity: relatively high

### **Perfectly Elastic Demand (extreme case)**

where price elasticity of demand = infinity

D curve: horizontal

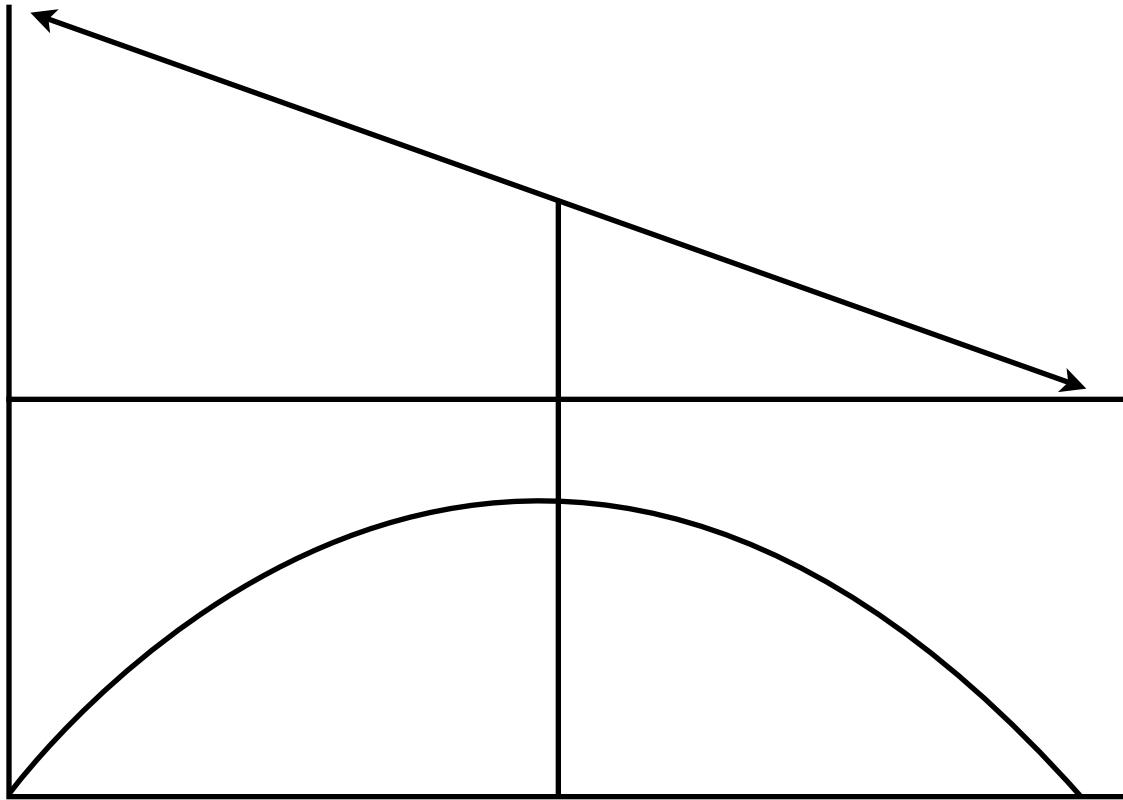
Consumers' price sensitivity: extreme

Elasticity of a linear demand curve

The slope of a linear demand curve is constant but its elasticity is not.

Price elasticity and total revenue

- If you raise your price from \$200 to \$250, would your revenue rise or fall?
- Revenue =  $P \times Q$
- A price increase has two effects on revenue:
  - Higher P means more revenue on each unit you sell.
  - But you sell fewer units (lower Q), due to the Law of Demand
- Which of these two effects is bigger? It depends on the price elasticity on demand



### Price elasticity and Total Revenue

$$PEoD = \% \Delta \text{ in } Q / \% \Delta \text{ in } P$$

$$\text{Total Rev} = P \times Q$$

If Demand is elastic, then price elasticity of demand  $> 1$

$$\% \Delta \text{ in } Q > \% \Delta \text{ in } P$$

- The fall in revenue from lower Q is greater than the increase in revenue from higher P, so revenue falls.

If Demand is inelastic, then price elasticity of demand  $< 1$

$$\% \Delta \text{ in } Q < \% \Delta \text{ in } P$$

- The fall in revenue from lower Q is smaller than the increase in revenue from higher P, so revenue rises.

### Elasticity and expenditure / revenue

Pharmacies raise the price of insulin by 10%. Does total expenditure on insulin rise or fall?

$$\text{Expenditure} = P \times Q$$

Since demand is inelastic, Q will fall less than 10%

-> expenditure rise.

A fare war decreases the price of a luxury cruise by 20%. What happens to the total revenues of luxury cruise companies?

$$\text{Total Revenue} = P \times Q$$

The decrease in P reduces revenues but the increase in Q increases total revenues. Which effect is bigger?  
 Since demand is elastic, Q will increase more than 20% causing total revenues to increase.

Supply or Demand	Price Elasticity	Price Change	ΔRevenues (R) or ΔExpenses (E)		
			Increase	Decrease	None
Demand	Inelastic	Up	$\Delta E > \$0$		
Demand	Elastic	Down	$\Delta E < \$0$		
Demand	Unitary	Up			$\Delta E = \$0$
Supply	Elastic	Down		$\Delta R < \$0$	
Supply	Inelastic	Up	$\Delta R > \$0$		

Application: Does Drug interdiction Increase or Decrease Drug-Related Crime?

- One side effect of illegal drug use is crime: Users often turn to crime to finance their habit
- We examine two policies designed to reduce illegal drug use and see what effects they have on drug-related crime.
- For simplicity, we assume the total dollar value of drug-related crime equals total expenditure on drugs.
- Demand for illegal drugs is inelastic, due to addiction issues.

Policy 1: Interdiction

Interdiction reduces the supply of drugs. Since demand for drugs is inelastic, p rises proportionally more than Q falls.

Result: an increase in total spending on drugs, and in drug-related crime.

Policy 2: Education

Education reduces the demand for drugs.

P and Q fall

Result: a Decrease in total spending on drugs, and in drug-related crime

Price Elasticity of Supply

Price elasticity of supply = Percentage change in Qs/ %Δ in P

Price elasticity of supply measures how much Qs responds to a change in P

Loosely speaking, it measures the price-sensitivity of sellers' supply

Again, use the midpoint to compute the percentage changes.

A range of supply curves

- Economists classify supply curves according to their elasticity.
- The slope of the supply curve is closely related to price elasticity of supply.
- Rule of thumb:
  - 1. The flatter the curve the bigger the elasticity
  - 2. the steeper the curve the smaller the elasticity

#### Perfectly inelastic

when price of elasticity of supply is 0

S curve: vertical

Sellers' price sensitivity: 0

#### Inelastic

when price of elasticity of supply is  $< 1$

S curve: relatively steep

Sellers' price sensitivity: relatively low

#### Unit elastic

when price of elasticity of supply is 1

S curve: intermediate slope

Sellers' price sensitivity: intermediate

#### elastic

when price of elasticity of supply is  $> 1$

S curve: relatively flat

Sellers' price sensitivity: relatively high

#### Perfectly elastic

when price of elasticity of supply is infinity

S curve: horizontal

Sellers' price sensitivity: extreme

#### The Determinants of Supply elasticity

- The more easily sellers can change the quantity they produce, the greater the price elasticity of supply.
- Example: Supply of beachfront property is harder to vary and thus less elastic than supply of new cars.
- For many goods, price elasticity of supply is greater in the long run than in the short run, because firms can build new factories, or new firms may be able to enter the market.

#### Elasticity and changes in equilibrium

- The supply of beachfront property is inelastic while the supply of new cars is elastic.
  - Suppose population growth causes demand for both goods to double ( at each price,  $Q_d$  doubles).
1. For which product will P change the most?

- Beachfront property, when supply is inelastic, an increase in demand has a bigger impact on price than on quantity.

2. For which product will Q change the most?

- New cars, when supply is elastic, an increase in demand has a bigger impact on quantity than on price.

How the price elasticity of supply can vary

- Supply often becomes less elastic as Q rises, due to capacity limits.

Other Elasticity concepts

- The income elasticity of demand measures the response of Qd to a change in consumer income.

Income elasticity of demand =  $\% \Delta$  in Qd /  $\% \Delta$  in income

For a normal good, an increase in income causes an increase in its demand.

- Hence for normal goods, income elasticity  $> 0$

- For inferior goods, income elasticity  $< 0$

Other Elasticity Concepts

- The cross-price elasticity of demand measures the response of demand for one good to changes in the price of another good.

Cross-price elasticity of Demand =  $\% \Delta$  in Qd for good 1 /  $\% \Delta$  in price of good 2

- For substitutes, cross-price elasticity  $> 0$  - an increase in price of beef causes an increase in demand for chicken.

- For complements, cross-price elasticity  $< 0$  - an increase in price of computers causes decrease in demand for software.

Lecture #4

- A Perfect market is when neither seller nor buyer can influence the price of a good.

- Perfect markets don't have government (no indirect taxes; subsidies)

- No externalities (a third party other than the buyer and the seller) such as costs towards pollution

- No market structures; monopoly, oligopoly, monopolistic competition (all about advertising)

- Does not have asymmetric information, which is when the seller has more/different information than the buyer does.

- All of these are called market failures and cause inefficiency.

1. Consumer Surplus = a

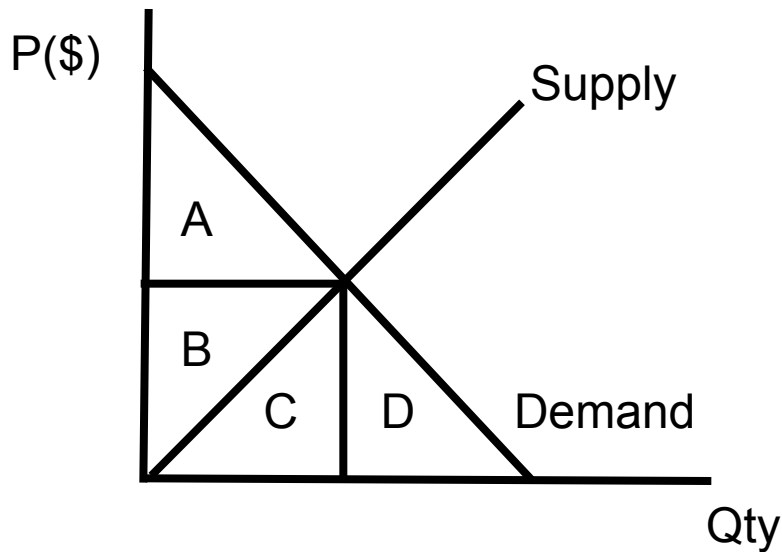
2. Producer Surplus = b

3. Total Surplus = ab

4. Cost of Production = ?

5. Consumer Expenditures (\$) = ?

6. Producer Expenditures (\$) = ?



### Welfare Economics

- the study of how the allocation of resources affects economic well-being

The allocation of resources refers to:

- how much of each good is produced
- which producers produce it
- which consumers consume it

### Willingness to Pay (WTP)

- A buyer's WTP for a good is the maximum amount the buyer will pay for that good. WTP measures how much the buyer values the good.
- If the price of a good is \$200, who will buy that good, and what is the quantity demanded?
- The demand curve is technically a staircase shape curve although in a competitive market there is a huge number of buyers therefore the staircase looks more like a line.

### Consumer Surplus (CS)

- The amount a buyer is willing to pay minus what the buyer actually pays:
- $CS = WTP - Price$
- The lesson: total CS equals the area under the demand curve above the price, from 0 to Q.
- Consumer Surplus with lots of buyers means that:
- $CS = b \times h \times 1/2$

### Cost and the Supply Curve

- Cost is the value of everything a seller must give up to produce a good (opportunity cost).
- Includes cost of all resources used to produce good, including value of the seller's time.
- Cost is a measure of willingness to sell.
- Producer Surplus (PS): the amount a seller is paid for a good minus the seller's cost.

- Total PS equals the area above the supply curve under the price, from 0 to Q.
- $PS = b \times h \times 1/2$

What do CS, PS , and Total Surplus Measure?

CS = (value to buyers) - (amount paid by buyers)

- measures the benefit buyers receive from participating in the market.

PS = (amount received by sellers) - (cost to sellers)

- measures the benefit sellers receive from participating in the market.

Total Surplus = CS + PS

- Measures the total gains from trade in a market.

The Market's Allocation of Resources

- In a market economy, the allocation of resources is decentralized, determined by the interactions of many self-interested buyers and sellers.
- Is the market's allocation of resources desirable? Or would a different allocation of resources make society better off?
- To answer this, we use total surplus as a measure of society's well-being

Market Efficiency

Total Surplus = Value to buyers - cost to sellers

An allocation of resources is efficient if it maximizes total surplus. Efficiency means:

- Raising or lowering the quantity of a good would not increase total surplus
- The goods are being produced by the producers with lowest cost.
- The goods are being consumed by the buyers who value them most highly.
- Efficiency means making the pie as big as possible
- Equity refers to whether the pie is divided fairly

Evaluating the Market Equilibrium: Summary

Is the "free" market equilibrium allocation of resources efficient? Does it maximize total surplus?

- A "free" equilibrium maximizes total surplus.
- Goods are produced at their lowest cost.
- Goods are consumed by buyers who value them most highly.

Three insights about free market outcomes:

1. Allocate the supply of goods to the buyers who value them most highly, as measured by their WTP
  2. Allocate the demand of goods to the sellers who can produce them at least cost
  3. Produce the quantity of goods that maximizes the sum of consumer and producer surplus
- Therefore, economic well-being cannot be increased by changing the allocation of consumption among buyers or the allocation of production among sellers.
  - The equilibrium of supply and demand maximizes the sum of consumer and producer surplus. It generates an efficient allocation of resources.
  - The government cannot improve on the market outcome. Laissez faire: the government should not interfere with the market.

### Why Non-Market Allocation are Usually Bad

- Suppose the allocation of resources were instead determined by a central planner (e.g., the communist leaders of the former Soviet Union.)
- To choose an efficient allocation, the planner would need to know every seller's cost and every buyer's WTP, for each of the thousands of goods produced in the economy.
- This is practically impossible, so centrally planned economies are never very efficient.

### Conclusion

1. This chapter used welfare economics to demonstrate one of the ten principles: markets are usually a good way to organize economic activity.
2. But we assumed markets are perfectly competitive
3. In the real world, sometimes there are market failures, when unregulated markets fail to allocate resources efficiently. Causes:
  - Market power - a single buyer or seller can influence the market price (monopoly)
  - Externalities - side effects of transaction, e.g. pollution
4. When markets fail, public policy may remedy the problem and increase efficiency
5. Welfare economics sheds light on market failures and government policies
6. Despite the possibility of market failure, the assumptions in this chapter work well in many markets, and the invisible hand remains extremely important.

### Lecture #5 Gains from Trade

#### Interdependence

- One of the Ten Principles of Economics: Trade can make everyone better off.

#### The Production Possibilities Frontier PPF

- Shows the combinations of two goods the economy can possibly produce given the available factors of production and the available production technology.

#### The PPF and Opportunity Cost

- Opportunity cost: what must be given up to obtain something
- Moving along a PPF involves shifting resources (e.g., labour) from the production of one good to the other.
- Society faces a tradeoff: getting more of one good requires sacrificing some of the other.
- The slope of the PPF tells you the opportunity cost of one good in terms of the other.

#### Economic Growth and the PPF

With additional resources or an improvement in technology, the economy can produce more computers, more wheat or any other combination of wheat and computers.

#### The Shape of PPF

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- As the economy shifts resources from beer to mountain bikes the PPF becomes more and more steep and the opportunity cost of an extra mountain bike increases.
- So, PPF is bow-shaped when different workers have different skills, which results in different opportunity costs of producing one good in terms of the other.
- The PPF would also be bow-shaped when there is some other resource, or mix of resources with varying opportunity costs.

#### The PPF: a Summary

- The PPF shows all combinations of two goods that an economy can possibly produce, given its resources and technology.
- The PPF illustrates the concepts of tradeoff and opportunity cost, efficiency and inefficiency, unemployment and economic growth

#### Where do the gains from trade come from?

- Absolute Advantage: is the ability to produce a good using fewer inputs than another producer.
- The US has an absolute advantage in the production of wheat: producing a ton of wheat uses 10 labour hours in the US vs. 25 labour hours in Japan.
- If each country has an absolute advantage in one good and specializes in that good, then both countries can gain from trade.

#### Two Measures of the Cost of a Good

Two countries can gain from trade when each specializes in the good it produces at lowest cost.

1. Absolute advantage measures the cost of a good in terms of the inputs required to produce it.
2. Another is opportunity cost

#### Classical Theory: Absolute Advantage

Adam Smith: Wealth of Nations (1776)

- Division of labour (specialization) -> reduces production costs -> increases national wealth

A country should:

- produce the goods and services for which its production is efficient
- import the goods for which its production is less efficient

The classical theory is counter to mercantilism principles (which is to maximize net exports to accumulate more gold...)

A person has an absolute advantage over another person if its productivity is superior in the production of a specific good.

#### Opportunity Cost and Comparative Advantage

Comparative advantage: is the ability to produce a good at a lower opportunity cost than another producer

David Ricardo (1817)

- A country has a comparative advantage over another country if its opportunity cost in the production of the good is lower.
- A country will specialize (completely or partially) in the production of the goods for which it has a comparative advantage.
- Specialization in production and trade provide benefits to trading partners

Hours of work required to produce one unit of wine or unit of soap

Country	Wine	Soap
A ( $80W = 80S$ or $W = S$ )	80	80
B ( $120W = 100S$ or $W = 1.2S$ )	120	100

Country A has an absolute advantage in the production of both products

Country A has a comparative advantage in the production of wine

Country B has a comparative advantage in the production of soap

Comparative Advantage and Trade

- Differences in opportunity cost and comparative advantage create the gains from trade.
- When each country specializes in the good(s) in which it has a comparative advantage, total production in all countries is higher, the world's economic pie is bigger, and all countries can gain from trade.
- The same applies to individual producers specializing in different goods and trading with each other.

Benefits From Specialization and Trade

1. Specialization

- scarce production resources are allocated to the most efficient productions
- Export products for which production is efficient and import products for which production is not efficient

2. Economies of Scale (decreasing average production costs)

- Improved production techniques
- Better management, inventory control
- Division of labour, better financial terms

Shortcomings of specialization

International trade is more complex than described by the principle of specialization

- Creates a dependency for developing countries, they export agricultural products and import manufactured goods
- Markets do not always distribute the gains from specialization equally, developing countries specialize in the export of primary goods for which profit margins are small and import manufactured goods for which profit margins are significant.

## Comparative advantage and Specialization

Persons and countries can improve their wellbeing by specializing in the production of goods for which they have a comparative advantage and in trading among themselves.

### Terms of Trade

- Opportunity costs of wheat farmer:  $1 W = 1 B$
- Opportunity costs of beef farmer:  $1 W = 4 B$
- Boundaries of terms of Trade:  $1B < 1W < 4B$
- These terms of trade are advantageous to both procurers.

### Goods Traded

Assume that the two farmers agree to the following terms of trade:

5 units of wheat for 10 units of beef

Thus the official terms of trade are  $1W = 2B$

## **Lecture #6 - International Trade**

### Comparative Advantage (from Chapter 3)

- A country has a comparative advantage in a good if it produces the good at lower opportunity cost than other countries.
- Countries can gain from trade if each exports the goods in which it has a comparative advantage.
- Now we apply the tools of welfare economics to see where these gains come from and who gets them.

### The World Price and Comparative Advantage

- $P_w$  = the world price of a good, the price that prevails in world markets.
- $P_d$  = domestic price without trade.
- If  $P_d < P_w$ ,
  - A country has a comparative advantage in the good
  - Under free trade, a country exports the good
- If  $P_d > P_w$ ,
  - A country does not have a comparative advantage
  - Under free trade, a country imports the good

### The Small Economy Assumption

- Price Taker
- A small economy whose actions have no effect on  $P_w$ .
- Not always true -- especially for the US -- but simplifies the analysis without changing its lessons.
- When a small economy engages in free trade,  $P_w$  is the only relevant price:
  - No seller would accept less than  $P_w$ , because she could sell the good for  $P_w$  in world markets.
  - No buyer would pay more than  $P_w$ , because he could buy the good for  $P_w$  in world markets.

## Summary: the Welfare Effects of Trade

	$P_D < P_W$	$P_D > P_W$
1. Direction of Trade	exports	imports
2. Consumer Surplus	falls	rises
3. Producer Surplus	rises	falls
4. Total Surplus	rises	rises

Whether a good is imported or exported, trade creates winners and losers with the gains exceeding the losses.

### Other Benefits of International Trade

- Consumers enjoy increased variety of goods.
- Producers sell to a larger market and may achieve lower costs through economies of scale
- Competition from abroad may reduce market power of some firms, which would increase total welfare.
- Trade enhances the flow of ideas, facilitates the spread of technology around the world.

### Then Why all the Opposition to Trade???

- Trade can make everyone better off
- The winners from trade could compensate the losers and still be better off.
- Yet, such compensation rarely occurs.
- The losses are often highly concentrated among a small group of people, who feel them acutely.
- The gains are often spread thinly over many people, who may not see how trade benefits them.
- Hence, the losers have more incentive to organize and lobby for restrictions on trade.

### Tariff: A trade restriction

- Tariff: a tax on imports
- Tariff (T) = \$10/shirt
- Consumers must pay \$30 for an imported shirt.
- So, domestic producers can charge \$30 per shirt.
- In general, the price facing domestic buyers & sellers equals  $(P_W + T)$

On the Next graph

### Free Trade

$$CS = A+B+C+D+E+F$$

$$PS = G$$

Total = A+B+C+D+E+F+G

With Tariff

CS = A+B

PS = C+G

Tax Revenue = E

Total = A+B+C+E+G

D = Deadweight loss from the overproduction of shirts

F = Deadweight loss from the under-consumption of shirts

Import Quotas: Another way to restrict trade

- Import Quota: a quantitative limit on imports of a good.

Has, mostly, the same effects as a tariff:

- raises the domestic price of the good

- reduces imports

- reduces buyers' welfare

- increases sellers' welfare

- causes deadweight losses

A tariff creates revenue for the government; a quota generates profits for import licensees.

If a fee is charged for the import license, import quotas and tariffs have the same effects.

## Arguments for Restricting Trade

1. The jobs argument: Trade destroys jobs in the industries that compete against imports.

- Economists's Response:

Total unemployment does not rise as imports rise, because job losses from imports are offset by job gains in export industries. Even if all goods could be produced more cheaply abroad, the country need only have a comparative advantage to have a viable export industry and to gain from trade.

2. The national security argument: An industry vital to national security should be protected from foreign competition, to prevent dependence on imports that could be disrupted during wartime.

- Economists' response

Fine, as long as we base policy on true security needs. But producers may exaggerate their own importance to national security to obtain protection from foreign competition.

3. The infant-industry argument: a new industry argues for temporary protection until it is mature and can compete with foreign firms.

- Economists' response:

Difficult for governments to determine which industries will eventually be able to compete, and whether benefits of establishing these industries exceed cost to consumers of restricting imports.

Besides, if a firm will be profitable in the long run, it should be willing to incur temporary losses.

4. The unfair-competition argument: Producers argue their competition in another country have an unfair advantage, e.g., due to government subsidies.

- Economists' Response:

Great! Then we can import extra-cheap products subsidized by the other country's taxpayers.

The gains to our consumers will exceed the losses to our producers.

5. The protection-as-bargaining-chip argument

Example: in the mid- to late 1990s, Canada threatened to limit the import of certain Australian products (e.g., fruits, wine, lamb, and beef) in retaliation of Australia's prohibition of imports of fresh salmon from Canada.

- Economists' Response:

Suppose Australia refuses. Then Canada must choose between two bad options:

a) Restrict imports from Australia, which reduces welfare in Canada.

b) Don't restrict imports, lose face and lose credibility.

### Trade Agreements

A country can liberalize trade with

- unilateral reductions in trade restriction
- multilateral agreements with other nations

Examples of trade agreements:

- North American Free Trade Agreement (NAFTA), 1993

- General Agreement on Tariffs and Trade (GATT), ongoing

World Trade Organization (WTO) est. 1995, enforces trade agreements, resolves disputes

## **Lecture #7 - Externalities**

One of the Ten Principles from Chapter 1

- Markets are usually a good way to organize economic activity.

Lesson from chapter 7

- in the absence of market failures, the outcome of a competitive market is efficient

-> maximizes total surplus

### Externality

- Impact of a consumption or production activity on a 3rd party

- Impact can be positive or negative from consumption or production

- Self-interested buyers and sellers neglect the external effects of their actions, so the market outcome is not efficient

- As a result, externalities can over or underestimate real project benefits and costs.
- a Negative externality has an adverse effect on bystanders who are neither the producers nor the buyers of a good or service
- A positive externality has a beneficial effect on bystanders who are neither the producers nor the buyers of a good or service.

#### Negative Production Externalities

- Marginal Private cost: the cost of producing an additional unit of a good or service that is borne by the producer of that good or service.
- Marginal external cost: the cost of producing an additional unit of a good or service that falls on people other than the producer.
- Marginal social cost: the marginal cost incurred by the entire society -- by the producer and by everyone else on whom the cost falls. It is the sum of marginal private and external cost
- $MSC = MPC + MEC$

#### Negative Production Externalities Graph

- normal supply/demand graph
- supply = private cost
- Demand = private benefit
- negative externality causes an increase in the supply curve causing private cost to become social cost.
- Market Excess Production

#### Examples of Negative Consumption Externalities

- The neighbor's barking dog
- Loud music
- Noise pollution
- texting while driving
- second hand smoke

#### Negative Consumption Externalities Graph

- decrease in demand curve turning the private benefit curve into social benefit
- Market Excess Production

#### Positive Externalities

- In the presence of a positive externality, the social value of a good includes:
  - private value -- the direct value to buyers
  - external benefit -- the value of the positive impact on bystanders

#### The Socially optimal Q maximizes welfare:

- At any lower Q, the social value of additional units exceeds their cost
- At any higher Q, the cost of the last unit exceeds its social value
- Marginal private benefit: the benefit of an additional unit of a good or service that the consumer of that good or service receives.

- Marginal external benefit: the benefit of an additional unit of a good or service that people other than the consumer of the good or service enjoy.
- Marginal social benefit: the marginal benefit enjoyed by society -- by the consumers of a good or service and by everyone else who benefits from it. It is the sum of marginal private benefit and marginal external benefit
- $MSB = MB + \text{Marginal external benefit}$

#### Positive Consumption Externalities from Education

1. Lower Crime Rates
  2. better government
  3. lower unemployment
  4. better international competitiveness
  5. improved economic efficiency and productivity
- People do not consider these external benefits when deciding how much education to "purchase"
  - As a result, free markets would produce an insufficient level of education
  - How can governments improve the market outcome? By subsidizing education

#### Production Externalities:

- Positive shifts the supply curve to the right
- Negative shifts the supply curve to the left

#### Consumption Externalities:

- Positive shifts the demand curve to the right
- Negative shifts the demand curve to the left

#### Externalities: A summary

- If negative externality, the markets produce a larger quantity than is socially desirable
- If positive externality, the markets produce a smaller quantity than is socially desirable
- To remedy the problem:
  1. "internalize the externality"
- Altering incentives so that people take account of the external effects of their actions
  2. tax goods with negative externalities
  3. subsidize goods with positive externalities

#### Private solutions to Externalities

1. Moral codes and sanctions
2. charities
3. relying on the self-interest of relevant parties
4. contracts between market participants and the affected bystanders

#### The Coase Theorem

- If private parties can bargain without cost over the allocation of resources, they can solve the externalities problem on their own.

#### Why Private Solutions do not always work

- Transaction costs: the costs that parties incur in the process of agreeing to and following through on a bargain
- Sometimes when a beneficial agreement is possible, each party may hold out for a better deal
- Coordination problems & costs when the number of parties is very large.

#### Internalizing the Externality

- Altering incentives so that people take account of the external effects of their actions
- Taxes that internalize negative externalities are called Pigovian Taxes.

#### Negative Externalities and Government Actions

- Role of Governments in achieving a more efficient allocation of resources in the presence of external costs:
  1. Emission charges
  2. Marketable permits
  3. Taxes

#### Positive Externalities and Government Actions

- Public Provision: The production of a good by a public authority that receives the bulk of its revenue from the government
- Subsidy: A payment that the government makes to private producers that depends on the level of output
- Voucher: a token that the government provides to households that can be used to buy specified goods or services.
- Intellectual property rights: The property rights of the creators of knowledge and other discoveries
- Patent or copyright: A government-sanctioned exclusive right granted to the inventor of a good, service or productive process to produce, use, and sell the invention for a given number of years.

#### Market-Based Policy #1: Pigovian Taxes & subsidies

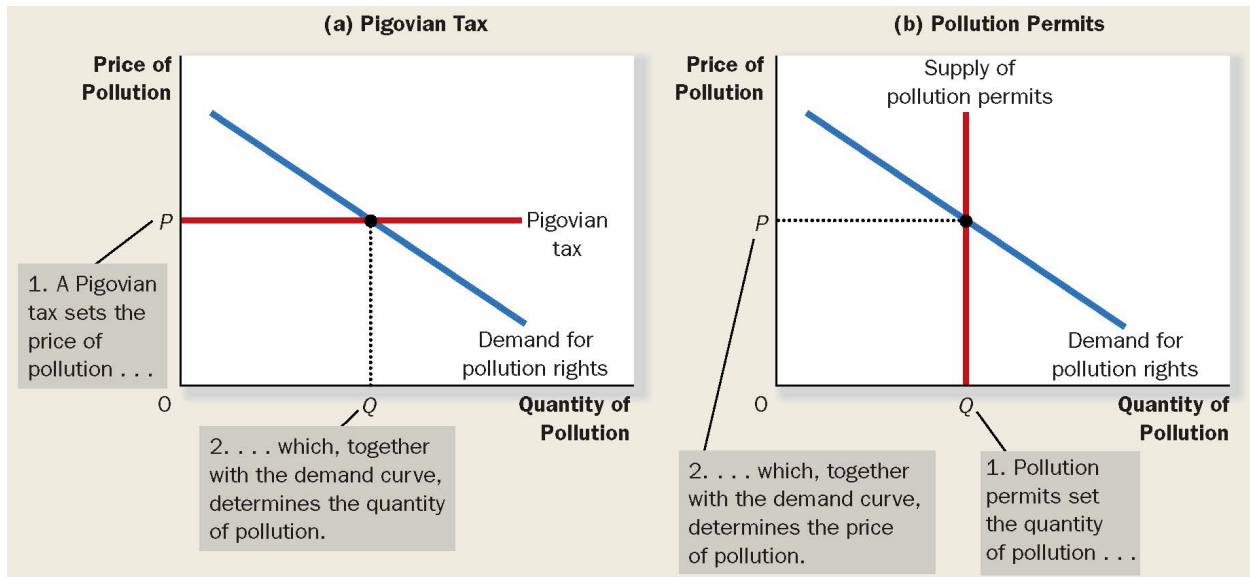
- Instead of regulating behavior in response to an externality, the government can use market-based policies to align private incentives with social efficiency.
- Pigovian Tax: a tax designed to induce private decision-makers to take account of the social costs that arise from a negative externality
- The ideal corrective tax = external cost
- For activities with positive externalities, ideal corrective subsidy = external benefit

#### Market-Based Policy #2: Tradable Pollution Permits

- Achieves the goal at a lower cost than regulation
- Firms with lower cost of reducing pollution sell whatever permits they can
- Firms with higher cost of reducing pollution buy permits
- Result: Pollution reduction is concentrated among those firms with lowest costs.
- With a free market for pollution rights, the final allocation will be efficient whatever the initial allocation.

## Pigovian vs. Tradable Permits

- Like most demand curves, firms' demand for the ability to pollute is a downward-sloping function of the "price" of polluting
- A corrective tax raises this price and thus reduces the quantity of pollution firms demand
- A tradable permit system restricts the supply of pollution rights, has the same effect as the tax
- When policymakers do not know the position of this demand curve, the permits system achieves pollution reduction targets more precisely



## Lecture #8 - Public Goods and Common Resources

- We consume many goods without paying: parks, national defense, clean air & water
- When goods are free, the market forces that normally allocate resources are absent
- In the absence of prices,
- the allocation of these goods may be socially inefficient
- "Governments can sometimes improve market outcomes." Ten principles

### Rival In Use

A good, service, or resource is

- Rival if its consumption by one person decreases its consumption by other people. e.g., food, seats at a game
- Nonrival if its consumption by one person does not decrease its consumption by others. e.g., police, television signals

### Excludable in Use

a good, service or resource is

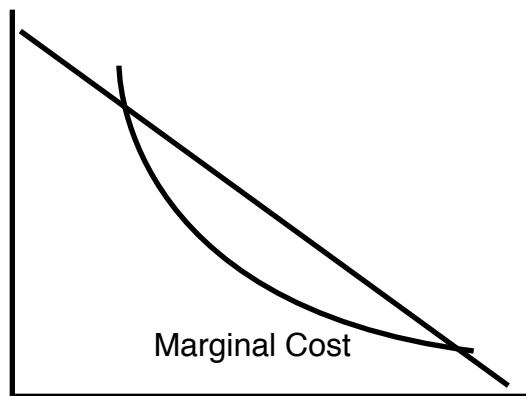
- excludable if it is possible to prevent a person from enjoying its benefits (haircuts, concerts)
- nonexcludable if it is impossible to prevent a person from enjoying its benefits. (TV, national defense)

Fourfold Classification of Goods

1. Private good: can be consumed by only one person at a time and only by those people who have bought it or own it.
2. Public good: can be consumed simultaneously by everyone and from which no one can be excluded.
3. Common resource: nonexcludable and rival
  - can be used only once but no one can be prevented from using what is available.
4. Natural monopoly: nonrival but excludable.

		Rival in Use?	
		yes	no
Excludable in use?	yes	1. Pure Private Goods - Food - Clothing - Highly congested toll highways	2. Natural monopolies - Fire Protection - Cable TV - Uncongested Toll Highways
	no	3. Common Resources - Fish in the sea - Environment - Highly Congested Free Highways	4. Pure Public Goods - National Defense - Knowledge - Uncongested free highways

Natural Monopoly



## Your Turn: Categorizing Roads

A Road is which of the four kinds of goods?

The answer depends on whether the road is congested or not, and whether it's a toll road or not.

- Rival in consumption? only if congested
- Excludable? Only if a toll road

## The Different Kinds of Goods

- This chapter focuses on public goods and common resources (goods that are not excludable).
- For both, externalities arise because something of value has no price attached to it.
- So, private decision about consumption and production can lead to an inefficient outcome.
- Public policy can potentially raise economic well-being.

## Public Goods

- Public goods are difficult for private markets to provide because of the free-rider problem.
- Free-rider: a person who receives the benefit of a good but avoids paying for it. If good is not excludable, people have incentive to be free-riders, because firms cannot prevent non-payers from consuming the good.
- Result: The good is not produced, even if buyers collectively value the good higher than the cost of providing it.
- If the benefit of a public good exceeds the cost of providing it, governments should provide the good and pay for it with a tax on people who benefit.
- Problem: Measuring the benefit is usually difficult.
- Cost-benefit Analysis (CBA): studies that compare the costs and benefits of providing a public good.
- Not precise -> the efficient provision of public goods is more difficult than that of private goods.
- Examples: National defense, knowledge through research, fighting poverty

## Free-rider Problem

### Private Provision

- There is no incentive to buy one's share of a service (National Defense) -> free-rider problem.
- So a private firm would not supply national defense.

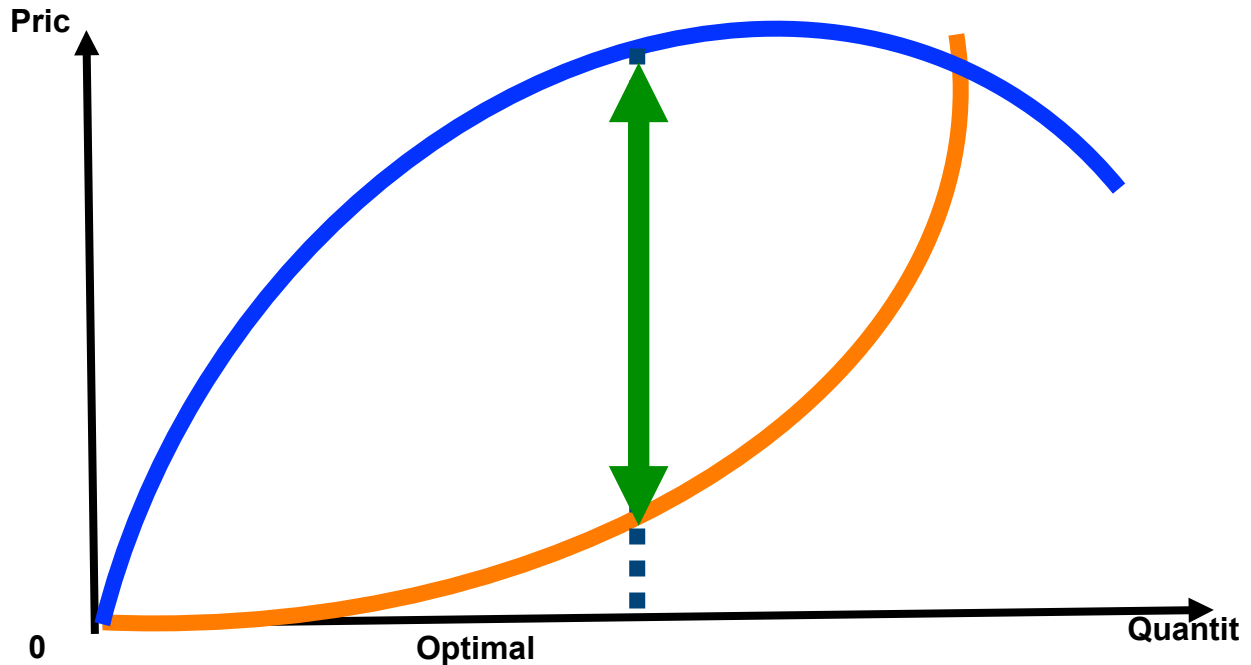
### Public Provision

- The political process determines the quantity of a public good provided.

Blue line = Total Benefits

Green line = Maximum Benefit

Orange line = Total Production Cost



#### Common resources

- like public goods, common resources are not excludable.
- cannot prevent free riders from using the good or service
- little incentive for firms to provide
- government role: provide good or service.

Additional problem with common resources: rival in consumption

- each person's use reduces others' ability to use
- government role: ensure that they are not overused.

Examples: clean air and water, congested roads, fish, etc..

#### The Tragedy of commons

- The problem of the commons is the absence of incentives to prevent the overuse and depletion of a commonly owned resource.
- Examples include the Atlantic ocean cod stocks and the quality of the atmosphere.
- The traditional example from which the term derives is the common grazing land surrounding middle-age villages.
- A parable that illustrates why common resources get used more than is socially desirable.
- Setting: a medieval town, where sheep graze on the surrounding public land, called Town Common.
- Sheep flocks grow as the population grows.
- As the quantity land is fixed, the grass begins to disappear from overgrazing.
- The private incentives (using land for free) outweigh the social incentives (using it carefully)
- Result: People can no longer raise sheep and feed them.

### Cause of the “tragedy”?

- Social and private incentives differ
- Families have no incentive to reduce the size of their flock because grazing is free.

The tragedy is due to an externality

- Allowing one’s flock to graze on the common land reduces the quantity/quality of grazing for the flocks of other families.

People neglect this external cost, resulting in overuse of the land.

Result: As the grass disappears, flocks dwindle and families leave the area.

### Efficient Use of the Common Resources

- the quantity of fish caught by each boat decreases as the number of boats increases.
- But no one has an incentive to take this fact into account when deciding whether to fish.
- The efficient use of a common resource requires marginal cost to equal marginal social benefit ( $MSC = MSB$ )

### Conclusion: The importance of property Rights

- We have seen that some goods are not efficiently provided by markets.
- Public goods tend to be under-provided, while common resources tend to be over-consumed.
- Common theme: the market fails to allocate resources efficiently because property rights are not well defined
- Nobody owns the air, so no one can charge polluters. Result: too much pollution
- Nobody can charge people who benefit from N defense. Result: too little defense.
- The absence of property rights causes market failure.
- Governments can potentially solve the problem by
  1. Regulating (command and control)
  2. Distributing access permits
  3. Providing the good or service on a fee basis
- A well planned and implemented policy can improve the allocation of resources and raise economic well-being.

### Chapter Summary

1. A good is excludable if someone can be prevented from using it. A good is rival in consumption if one person’s use reduces others’ ability to use the same unit of the good.
2. Markets work best for private goods, which are excludable and rival in consumption. Markets do not work well for other types of goods.
3. Public goods, such as national defense and fundamental knowledge, are neither excludable nor rival in consumption
4. Because people do not have to pay to use them, they have an incentive to free ride, and firms have no incentive to provide them.
5. Governments provide public goods, using cost-benefit analysis to determine how much to provide.

6. Common resources are rival in consumption but not excludable. Examples include common grazing land, clean air, and congested roads.
7. People can use common resources without paying, so they tend to overuse them. Therefore, governments try to limit the use of common resources.

## **Lecture #9 - Cost of Production**

### Total Revenue, Total Cost, Profit

- We assume that the firm's goal is to maximize profit.
- Profit = Total Revenue - Total Cost
- Total Revenue: the amount a firm receives from the sale of its output
- Total Cost: the market value of the inputs a firm uses in production

### Costs: Explicit vs. Implicit

- Explicit costs: require an outlay of money (e.g. paying wages to workers)
- Implicit costs: do not require a cash outlay (e.g. the opportunity cost of the owner's time)
- Remember one of the Ten Principles: The cost of something is what you give up to get it.
- This is true whether the costs are implicit or explicit. Both matter for firms' decisions.

### Example

You need \$100,000 to start your business.

The interest rate is 5%

Case 1: borrow \$100,000

- explicit cost = \$5,000 interest on loan

Case 2: use \$40,000 of your savings and borrow the other \$60,000

- explicit cost = \$3,000 interest on the loan
- implicit cost = \$2,000 foregone interest you could have earned on your \$40,000.

In both cases, total (explicit and implicit) costs are \$5,000.

### Economic Profit vs. Accounting Profit

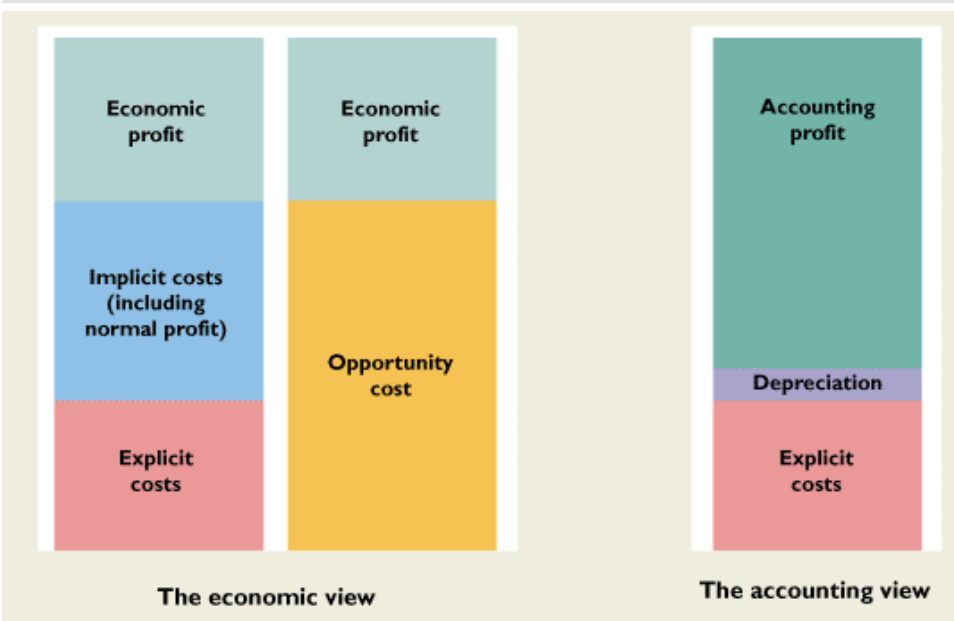
- Accounting profit: total revenue minus total explicit costs
- Economic profit: total revenue minus total costs (explicit and implicit)
- Accounting profit ignores implicit costs, so it's higher than economic profit.
- Accountants keep track of how much money flows into and out of the firm, so they ignore implicit costs.
- Economists study the pricing and production decisions of firm, which are affected by implicit as well as explicit costs.

	<b>Competition</b>	<b>Monopoly</b>
Similarities		

	<b>Competition</b>	<b>Monopoly</b>
Goal of Firms	Maximize Profits	Maximize Profits
Rule for Maximizing	$MR = MC$	$MR = MC$
Can earn economic profits in the short run?	Yes	Yes
Differences		
Number of Firms	Many	One
Marginal Revenue	$MR = P$	$MR < P$
Price	$P = MC$	$P > MC$
Produces welfare-maximizing level of output?	Yes	No
Entry in long run	Yes	No
Can earn economic profits in the long run?	No	Yes
Price Discrimination possible?	No	Yes

**TABLE 12.1**  
Economic Accounting

Item		
<b>Total Revenue</b>		<b>\$150,000</b>
<b>Explicit Costs</b>		
Cost of fruit, yogurt, and honey	\$20,000	
Wages	\$22,000	
Interest	\$3,000	
<b>Implicit Costs</b>		
Samantha's forgone wages	\$34,000	
Samantha's forgone interest	\$1,000	
Economic depreciation	\$4,000	
Normal profit	\$16,000	
<b>Opportunity Cost</b>		<b>\$100,000</b>
<b>Economic Profit</b>		<b>\$50,000</b>



### Short Run Production

- To increase output with a fixed plant, a firm must increase the quantity of labour it uses.
- Three related concepts are used to describe the relationship between output and the quantity of labour:
  - Total product: the total quantity of a good produced in a given period

- increases as the quantity of labour employed increases.
- Marginal product: the change in total product that results from a one-unit increase in the quantity of labour employed.
- Average product: total product per unit of variable input

#### The Production Function

- Production function: shows the relationship between the quantity of inputs used to produce a good, and the quantity of output of that good.
- It can be represented by a table, equation or graph

# of workers	Bushels of wheat
0	0
1	1000
2	1800
3	2400
4	2800
5	3000

#### Marginal Product

- Marginal product of an input: the increase in output arising from an additional unit of that input, holding all other inputs constant.
- Example: hiring one more worker, the output rises by the marginal product of labour.
- $MPL = \Delta Q / \Delta L$

#### Average Product

Labour Units	Output	Average Product
1	4	4
2	10	5
3	13	4.33

#### Why is MPL important?

- Recall one of the Ten Principles: Rational people think at the margin
- When hiring an extra worker, the costs rise by the wage being paid to each worker and output rises by MPL
- Comparing them can help you decide whether it's beneficial to hire the worker.

### Why MPL Diminishes

- Diminishing marginal product: the marginal product of an input declines as the quantity of the input increases (other things equal)
- If the amount of workers increase but not land, the average worker has less land to work with, so will be less productive.
- In general, MPL diminishes as L rises whether the fixed input is land or capital (equipment)

### Increasing Marginal Returns

Occur when

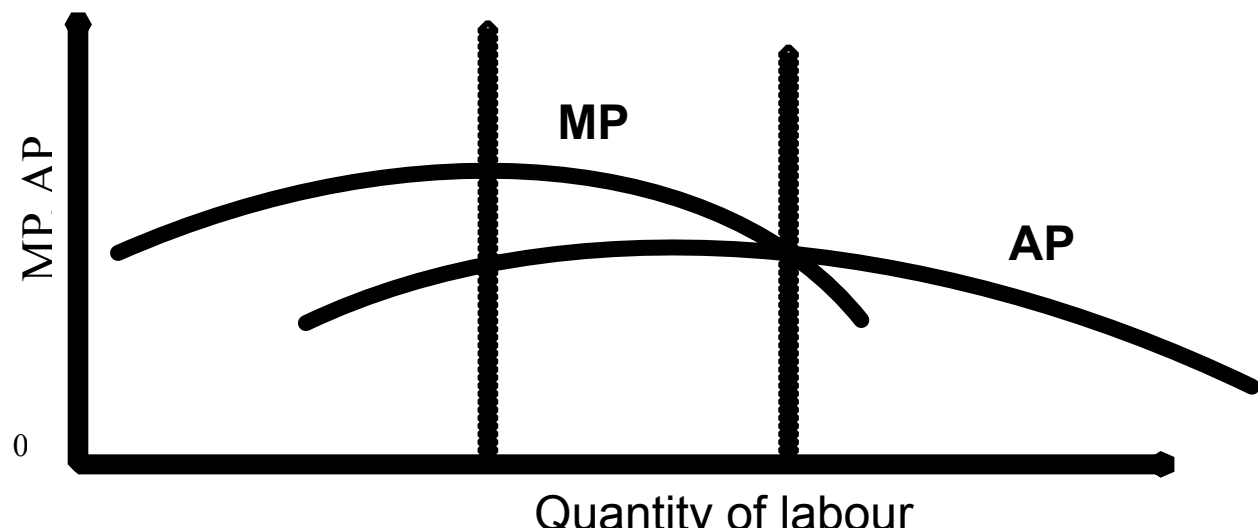
- the marginal product of an additional worker exceeds the marginal product of the previous worker.
- a small number of workers are employed and arise from increased specialization and division of labour in the production process.

### Decreasing Marginal Returns

Occur when

- the marginal product of an additional worker is less than the marginal product of the previous worker.
- Arise as more and more workers use the same equipment and work space
- As more workers are employed, there is less and less that is productive for the additional worker to do.

### Average and Marginal Product



### Short Run and Long Run

The Short Run: Fixed Plant

- The short run is a time frame in which the quantities of some resources are fixed.
- A firm can usually change the quantity of labour it uses but not the quantity of capital

The Long Run: Variable Plant

- The long run is a time frame in which the quantities of all resources can be changed.

### Short-Run Cost

- To produce more output in the short run, a firm employs more labour, which means it must increase its costs.
- We describe the relationship between output and cost using three cost concepts:
  - Total Cost: the cost of all the factors of production the firm uses.
  - Marginal Cost
  - Average Cost

### Short-Run Cost

- Total Cost the cost of all the factors of production the firm uses.
- Total cost divides into:
  - Total fixed cost (TFC): the cost of a firm's fixed factors of production used by a firm -- the cost of land, capital and entrepreneurship
  - Total Variable cost (TVC): the cost of the variable factor of production used by a firm -- the cost of labour.
- $TC = TFC + TVC$

### Example Farmer Jack's Costs

- Farmer Jack must pay \$1,000 per month for the land, regardless of how much wheat he grows.
- The market wage for a farm worker is \$2,000/month
- So Farmer Jack's costs are related to how much wheat he produces.

# of workers	Bushels of wheat	Cost of land	Cost of labour	Total Cost	Average Cost	Marginal Cost
0	0	\$1,000	\$0	\$1,000	0	0
1	1000	\$1,000	\$2000	\$3,000	\$3	\$2
2	1800	\$1,000	\$4000	\$5,000	\$2.78	\$2.5
3	2400	\$1,000	\$6000	\$7,000	\$2.92	\$3.33
4	2800	\$1,000	\$8000	\$9,000	\$3.21	\$5
5	3000	\$1,000	\$10,000	\$11,000	\$3.67	\$10

### Average Cost (Short-Run)

- Average fixed Cost (AFC): total fixed cost per unit of output
- Average variable cost (AVC): total variable cost per unit of output
- Average total Cost (ATC): total cost per unit of output
- $TC/Q = TFC/Q + TVC/Q$
- Or  $ATC = AFC + AVC$

Marginal Cost (MC): the increase in Total cost (TC) from producing one more unit:

-  $MC = \Delta TC / \Delta Q$

Why is Marginal Cost (MC) is important?

- Farmer Jack is rational and wants to maximize his profit. To increase profit, should he produce more wheat, or less?
- To find the answer, Farmer Jack needs to think at the margin
- If the cost of additional wheat (MC) is less than the revenue he would get from selling it, then Jack's profits rise if he produces more.

Fixed and Variable Costs

Fixed:

- do not vary with the quantity of output produced
- cost of equipment, loan payments, rent

Variable:

- vary with the quantity produced
- cost of materials, wages

My Turn: calculate the Missing Costs

Q	VC	TC	AFC	AVC	ATC	MC
0	0	50	n/a	n/a	n/a	n/a
1	10	60	50	10	60	10
2	30	80	25	15	40	20
3	60	110	16.67	20	36.67	30
4	100	150	12.50	25	37.50	40
5	150	200	10	30	40	50
6	210	360	8.33	35	43.33	60

Shape of the Average Cost Curve

The U shape of the average total cost curve arises from the influence of two opposing forces:

- Spreading total fixed cost over a larger output
- Decreasing marginal returns

## Why ATC is Usually U-shaped

As Q rises:

Initially, falling AFC pulls ATC down.

Eventually, rising AVC pulls ATC up.

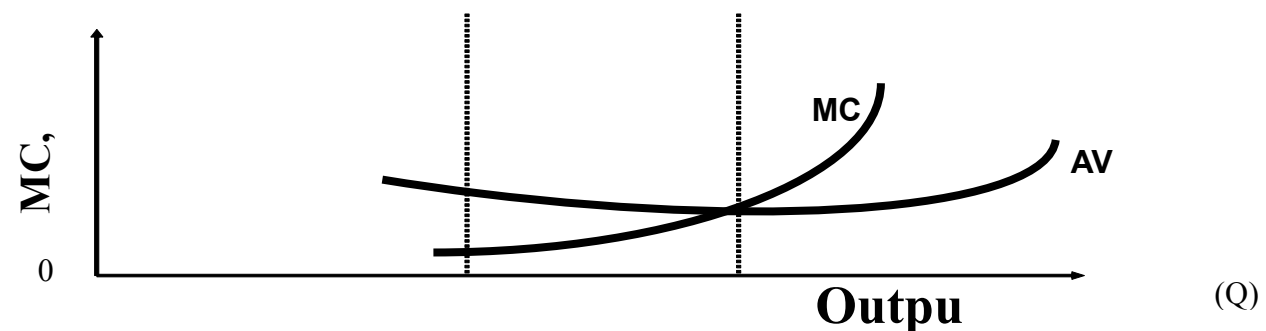
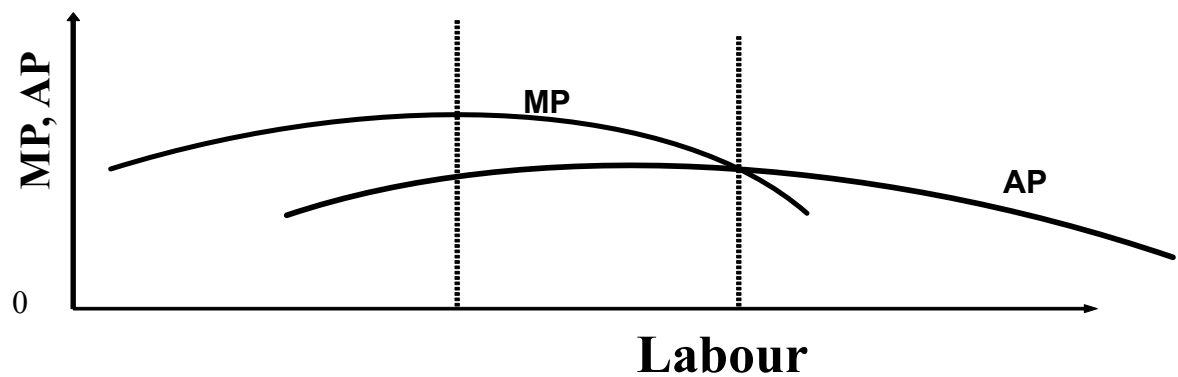
## Intersection of ATC and MC

- When  $MC < ATC$ , ATC is falling

- When  $MC > ATC$ , ATC is rising

- The MC curve crosses the ATC curve at the ATC curve's minimum.

Linkages between production cost and product measures in the short run



MP = Marginal Product

AP = Average Product

AVC = Average Variable Cost

MC = Marginal Cost

## Costs in the Short Run and in the Long Run

### Short Run

- Some inputs are fixed (e.g., factories, land). The costs of these inputs are FC

### Long Run

- All inputs are variable (e.g., firms can build more factories, or sell existing ones)

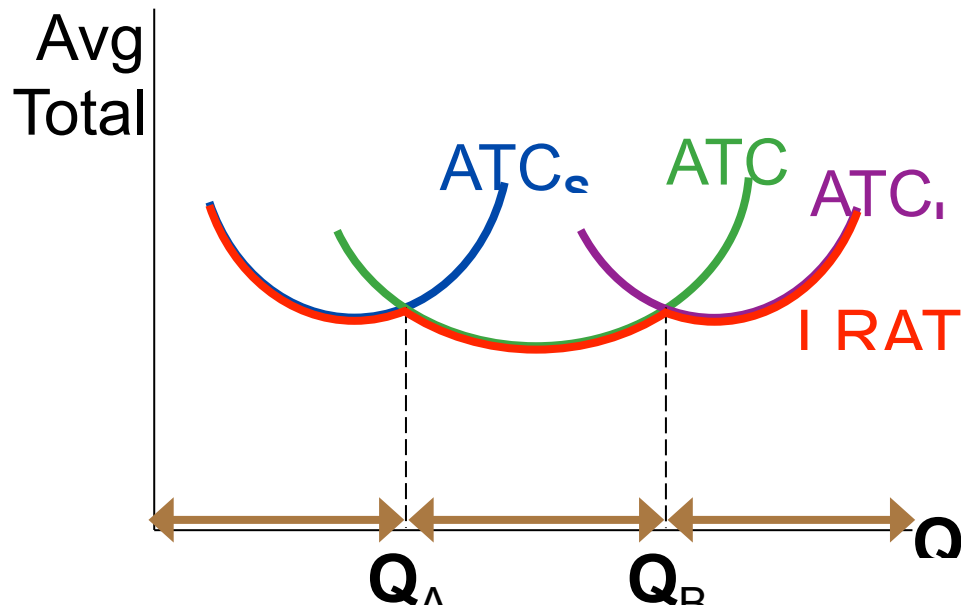
- ATC at any Q is cost per unit using the most efficient mix of inputs for that Q (e.g., the factory size with the lowest ATC).

## Long Run ATC with 3 Factory sizes

Firm can choose from 3 factory sizes: S, M, L

Each size has its own SRATC curve (u-shaped)

The firm can change to a different factory size in the long run but not in the short run.



How ATC changes as the scale of production changes

Economies of scale: ATC falls as Q increases.

Constant returns to scale: ATC stays the same as Q increases

Diseconomies of scale: ATC rises as Q increases

How ATC Changes as the Scale of Production Changes

- Economies of scale occur when increasing production allows greater specialization: workers more efficient when focusing on a narrow task. More common when Q is low.
- Diseconomies of scale are due to coordination problems in large organizations (e.g., management becomes stretched, can't control costs. More common when Q is high.

## Conclusion

1. Costs are critically important to many business decisions, including production, pricing, and hiring.
2. This chapter has introduced the various cost concepts
3. The following chapters will show how firms use these concepts to maximize profits in various market structures.

## Chapter Summary

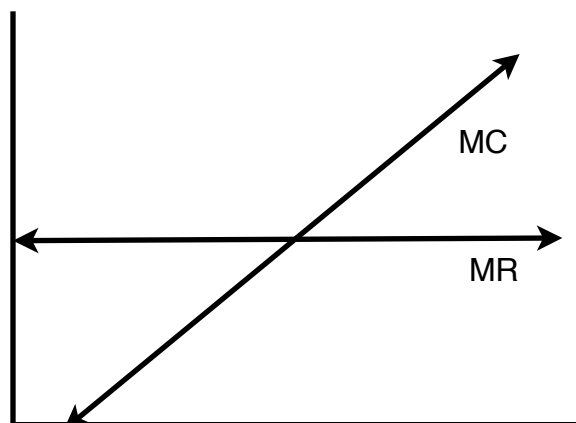
- Implicit costs do not involve a cash outlay, yet are just as important as explicit costs to firms' decision.
- Accounting profit is revenue minus explicit costs. Economic profit is revenue minus total costs.

- The production function shows the relationship between output and inputs.
- The marginal product of labour is the increase in output from a one-unit increase in labour, holding other inputs constant. The marginal products of other inputs are defined similarly.
- Marginal product usually diminishes as the input increases. Thus, as output rises, the production function becomes flatter, and the total cost curve becomes steeper.
- Variable costs vary with output; fixed costs do not.
- Marginal cost is the increase in total cost from an extra unit of production. The MC curve is usually upward-sloping.
- Average variable cost is  $VC/Q$
- Average fixed cost is  $FC/Q$ . AFC always falls as output increases.
- Average total cost is  $TC/Q$ . The ATC curve is usually U-shaped.
- The MC curve intersects the ATC curve at minimum ATC.
- When  $MC < ATC$ , ATC falls as Q rises
- When  $MC > ATC$ , ATC rises as Q rises.
- In the long run, all costs are variable.
- Economies of scale: ATC falls as Q rises.
- Diseconomies of scale: ATC rises as Q rises.
- Constant returns to scale: ATC remains constant as Q rises.

## Lecture #10 Firms in Competitive Markets

### Introduction: A scenario

- Three years after graduating, you run your own business
- Your decisions include: how much to produce, what price to charge, how many employees to hire? etc..
- What factors should affect these decisions? Your costs? how much competition you have?
- We begin by studying the behavior of firms in perfectly competitive markets.



Market Structures	Characteristics	Examples
Monopoly	- One seller - No close substitutes	- electricity - cable-tv
Oligopoly	- Few sellers - similar or identical products	- Banks - Gasoline
Monopolistic Competition	- Many sellers - Differentiated products	- Novels - Films
Perfect Competition	- many sellers and buyers - identical products	- Wheat - Milk

#### Seller's Short Term Decisions

##### 1. Produce goods and Services

- Decide on production level without the flexibility to adjust its production capacity

##### 2. Shutdown: stop producing goods

- Assume total fixed costs

Goal: maximize profits or minimize costs

#### Seller's Long Term Decisions

##### 1. Produce goods and services

- select production level for a given price level
- adjust production capacity to produce lowest cost possible

##### 2. Exit: stop production and leave industry

- no fixed costs

#### MR = P for a Competitive Firm

- A competitive firm can keep increasing its output without affecting the market price
- So, each one-unit increase in Q causes revenue to rise by P
- MR = P is only true for firms in competitive markets

#### Profit Maximization

- What Q maximizes the firm's profit?
- To find the answer "Think at the margin"
- If increase Q by one unit, revenue rises by MR, costs rises by MC.
- If  $MR > MC$ , then increase Q to raise profit, a firm can increase profit by producing more
- If  $MR < MC$ , then reduce Q to raise profit, a firm can increase profit by producing less.
- If  $MR = MC$ , profit is maximized

MC curve is the firm's supply curve and the MR curve is demand

### Shutdown vs. Exit

- Shutdown: a short-run decision not to produce anything because of market conditions
- Exit: a long-run decision to leave the market.
- A firm that shuts down temporarily must still pay its fixed costs
- A firm that exits the market does not have to pay any costs at all, fixed or variable.

### A Firm's Short-Run Decision to Shutdown

- If a firm shuts down temporarily: revenue falls by TR, costs fall by VC
- So, the firm should shut down if  $TR < VC$
- Divide both sides by Q:
- So we can write the firm's decision as: Shutdown if  $P < AVC$

### The Irrelevance of Sunk Costs

- Sunk costs:
  - that have already been committed and cannot be recovered
  - should be irrelevant to decisions; you must pay them regardless of your choice.
- Fixed costs are sunk costs as firms must pay them whether it produces or shuts down
- Fixed costs are irrelevant in the decision to shutdown

### A Firm's Long-Run Decision to Exit

- If firm exits the market, revenue falls by TR, costs fall by TC
- So, the firm should exit if  $TR < TC$
- Divide both sides by Q to write the firm's decision as: Exit if  $P < ATC$

### A New Firm's Decision to Enter the Market

- In the long run, a new firm will enter the market if it is profitable to do so: if  $TR > TC$

### Market Supply: Assumptions

1. All existing firms and potential entrants have identical costs
2. Each firm's costs do not change as other firms enter or exit the market
3. The number of firms in the market is fixed in the short run, variable in the long run

### The SR Market Supply Curve

- As long as  $P > AVC$ , each firm will produce its profit-maximizing quantity, where  $MR = MC$
- Recall from Chapter 4: At each price the market qty supplied is the sum of quantity supplied by each firm

### Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit
- If existing firms earn positive economic profit
  1. New firms enter
  2. SR market supply curve shifts right
  3. P falls, reducing firms' profits
  4. Entry stops when firms' economic profits have been driven to zero
- If existing firms incur losses
  1. Some will exit the market
  2. SR market supply curve shifts left
  3. P rises, reducing remaining firms' losses
  4. Exit stops when firms' economic losses have been driven to zero

### The Zero-Profit condition

- LR Equilibrium: the process of entry or exit is complete -- remaining firms earn zero economic profit
- This happens when  $P = ATC$
- Since Firms produce where  $P = MR = MC$ , the zero-profit condition is  $P = MC = ATC$
- Recall that MC intersects ATC at minimum ATC.
- Hence, in the LR,  $P = \text{minimum ATC}$

### Why the LR Supply Curve Might Slope Upward

- The LR market supply curve is horizontal if
  1. all firms have identical costs, and
  2. costs do not change as other firms enter or exit the market.
- If either of these assumptions is not true, then LR supply curve slopes upward.

#### 1. Firms Have Different Costs

- As P rises, firms with lower costs enter the market before those with higher costs
- Further increases in P make it worthwhile to higher-cost firms to enter the market, which increases market quantity supplied.
- Hence, LR market supply curve slopes upward.
- At any P,

For the marginal firm,

$P = \text{minimum ATC}$  and profit = 0

For the lower-cost firms, profit > 0

#### 2. Costs Rise as Firms Enter the Market

- In some industries, the supply of a key input is limited
- The entry of new firms increases demand for this input, causing its price to rise

- Hence, an increase in  $P$  is required to increase the market qty supplied, so the supply curve is upward-sloping

Conclusion: The Efficiency of a Competitive Market

1. Profit-Maximization:  $MC = MR$

2. Perfect Competition:  $P = MR$

3. So, in the competitive equation

- If markets are competitive, total surplus is maximized
- If markets are not competitive, total surplus is not maximized.