Lectures

TOPIC 1.1 INTRODUCTION TO MICROECONOMICS

# What is Microeconomics?

## The term micro has been derived from Greek word “mikros”, which means small.

## Microeconomics is the study of the economy at the level of the individual.

## It also analyze the behavior of individual household, industries, markets, labor unions or trade associations.

## One goal of microeconomics is to analyze the market mechanisms that establish relative prices among goods and services and allocate limited resources among alternative uses.

## Microeconomics also analyzes market failure, where markets fail to produce efficient results, and describes the theoretical conditions needed for perfect competition.

# Traditional Microeconomics

## Rationality & Maximisation also imply that individuals will make the decisions that they think are best for them

## Thus, the theory generally predicts negative consequences if, for example, government policy restricts or alters the choices available to individuals

# Features of Microeconomics

## It is concerned with the behavior of individual economics entities such as household, firms, market etc.

## It analyses economics phenomena under the ceteris paribus assumption and hence is a method of partial equilibrium analysis.

## It is also called “price theory” or “value theory”

## It’s objective is to analyze the process by which scare resources are allocated among alternative uses.

# Methodology: Positive v. Normative Economics

## Positive econ. -- Studies the way the world is.

### How much will a new gasoline tax raise the price of gasoline?

### Will an increase in the minimum wage increase unemployment?

### Why is the price of corn $4.20 per bushel?

### How much will a drought in the corn belt raise the price of corn? Of wheat?

### What will be the effect on Byron Brown’s pizza consumption if we take $1000 away from Tom Izzo and give it to Brown?

## Normative econ. -- Studies the way the world should be.

### Should there be a new tax on gasoline?

### Should there be an increase in the minimum wage?

### Should $1000 be taken from M. Peter McPherson and given to Byron Brown?

### What should the price of corn be?

# MODEL SUMMARY

## Three ways to describe models

### Graphs

### Tables of values

### Mathematical functions (equations)

## Important concepts

### Dependent and independent variables

### Linear function, intercept and slope

# Marginal Analysis

## - An examination of the effects of additions to or subtractions from a current situation

# Micro Static

## Micro static is the study of static relationship between different microeconomic variables.

## It deals with the final position of the equilibrium of these variables at particular point of time.

## i.e micro static analyses the condition of equilibrium price of a commodity at a particular point of time.

# Comparative Micro Static

## Is concerned with a comparative study of different equilibrium positions at different points of time.

## It does not deals with the transitional period involved in the movement from one equilibrium position to the other.

# Micro Dynamics

## Micro dynamics analyses the process by which the system moves from one equilibrium point to another.

## It explains the happening in the market during the period of transitions from one equilibrium point to another.

TOPIC 1.2 ELASTICITY AND ITS MEASUREMENT

# The elasticity concept

## An elasticity measures the responsiveness of one variable to changes in another variable.

# Price Elasticity of Demand

## The law of demand establishes that quantity demanded changes inversely with changes in price, ceteris paribus.

## But how much does quantity demanded change?

## This is what the price elasticity of demand is designed to answer.

#  Price Elasticity of Demand

## The price elasticity of demand measures how responsive consumer behavior (quantity demanded) is due to an incentive (price) change.

## The price elasticity of demand is defined as the percentage change in quantity demanded divided by the percentage change in price.

## Price elasticity is almost always negative, although analysts tend to ignore the sign even though this can lead to ambiguity

## If the own price elasticity of demand for a product is -2, for instance, we know that a 10 percent increase in the product’s price leads to a 20 percent decline in the quantity demanded of the good, since -20%/10% = -2

## │Ed │ = 2

# Computing the Price Elasticity of Demand

## Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand would be calculated as:

# The Midpoint Method

## The midpoint formula is preferable when calculating the price elasticity of demand because it gives the same answer regardless of the direction of the price change.

# The Midpoint Method: A Example

## Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand, using the midpoint formula, would be calculated as:

#  The Midpoint Method

## Demand is elastic if the absolute value of the own price elasticity is greater than 1.

## Demand is inelastic if the absolute value of the own price elasticity is less than 1.

## Demand is unitary elastic if the absolute value of the own price elasticity is equal to .

## The demand curve for a firm automatically determines its revenue function, since revenue is simply price multiplied by quantity.

## Total revenue = Price × Quantity Sold

## TR = P ×Q

# Elasticity and Total Revenue

#  Income Elasticity of Demand

## It measures the relationship between a change in quantity demanded and a change in income.

## Computing Income Elasticity

# Income Elasticity

# Income Elasticity of Demand:

## Normal Good – demand rises as income rises and vice versa

## Inferior Good – demand falls as income rises and vice versa

## NORMAL GOODS

##  Normal goods have a positive income elasticity of demand so as income rise more is demand at each price level.

## Normal goods are of two:-Normal Necessities and Normal Luxuries (both have a positive coefficient of income elasticity).

##  Necessities have an income elasticity of demand of between 0 and +1. Demand rises with income. If the income elasticity is less than one, it is called a necessity.

##

## Luxuries on the other hand are said to have an income elasticity of demand more than +1. (Demand rises more than proportionate to a change in income).

## If the income elasticity of good is greater than one, it is called luxury.

## INFERIOR GOODS

##  Inferior goods have a negative income elasticity .Demand falls as income rises.

## Ed < 0

##  Zero income elasticity

##  When the change in income do not bring about any changes in quantity demanded, that is quantity demanded remains same, it is said to be zero income elasticity. Income elasticity co-efficient is

##  Ed = 0

## Eg : Salt, Matches

## Income elasticity less than one

##  When the percentage change in quantity demanded is less than percentage changes in income , the income elasticity is said to be less than one. Thus income elasticity co-efficient is Ed <1

##  Eg : Food grains

## Income elasticity equal to one

##  If the percentage change in quantity demanded is equal to percentage change in income, it said to be unitary income elastic. Income elasticity co-efficient is

## Ed =1

##  Eg : Fruits , Vegetables.

## Income elasticity greater than one

##  The percentage change in quantity demanded is greater than the percentage change in income, the income elasticity is said to be greater than one. The income elasticity co-efficient is Ed > 1

## Eg : Cars, Luxury goods

# An Engel curve describes how household expenditure on a particular good or service varies with household income

## E1 - Normal goods

## E2 – Luxury goods

## E3 – Inferior goods

# Income Per Capita and Airline Travel by Country

# Cross-price elasticity of demand

### Cross-price elasticity of demand

### A measure of how much the quantity demanded of one good responds to a change in the price of another good, computed as the percentage change in quantity demanded of the first good divided by the percentage change in the price of the second good

## Ed AB = % change in quantity demanded of the product A

##  % change in the price of product B

# Cross-price Elasticity of Demand

## Substitutes have EdAB > 0.

### E.g., Coke demand and Pepsi prices.

## Complements have EdAB < 0.

### E.g., Coke demand and Fritos prices.

## Independent goods have EdAB = 0.

### E.g., Coke demand and car prices.

# Importance of Cross-price elasticity of demand for businesses

## Firms can use CED estimates to predict:

##  The impact of a rival’s pricing strategies on demand for their own products.

## Pricing strategies for complementary goods:

###  If firms have a reliable estimate for CED they can estimate the effect, say, of a two-for-one cinema ticket offer on the demand for popcorn

###  Price Elasticity of Supply

## According to the law of supply, there is a positive relationship between price and quantity supplied, ceteris paribus.

## But by how much does quantity supplied change as price changes?

## The price elasticity of supply measures how responsive the quantity sellers are willing to sell is to changes in the price.

# Price Elasticity of Supply

## In other words, price elasticity of supply measures the relative change in the quantity supplied that results from a change in price.

## The price elasticity of supply (Es) is defined at the percentage change in the quantity supplied divided by the percentage change in price.

# 5.3 Price Elasticity of Supply

# Price Elasticity of Supply

## Goods with a supply elasticity that is greater than 1 (Es > 1 ) are relatively elastic in supply.

## With that, a 1 percent change in price will result in a greater than 1 percent change in quantity supplied.

## The extreme case is perfectly elastic supply, where Es = infinity.

# Price Elasticity of Supply

## Goods with a supply elasticity that is less than 1 (Es < 1) are relatively inelastic in supply.

## This means that a 1 percent change in the price of these goods will induce a proportionately smaller change in the quantity supplied.

## The extreme case is perfectly inelastic supply, where Es = 0.

## Time is usually critical in supply elasticities because it is more costly for producers to bring forth and release resources in shorter periods of time.

## Hence, supply tends to be more elastic in the long run than the short run.

# Exhibit 2: Short-run and Long-run Supply Curves

#  Price Elasticity of Supply

## The relative elasticity of supply and demand determines the distribution of the tax burden for a good.

## If demand has a lower elasticity than supply in the relevant tax region, the largest portion of the tax is paid by the consumer.

#  Price Elasticity of Supply

## However, if demand is relatively more elastic than supply in the relevant indirect tax, the largest portion of the tax is paid by the producer.

## In general, the tax burden falls on the side of the market that is less elastic, which has nothing to do with who actually pays the tax at the time of the purchase.

# Elasticity and the Burden of Taxation

 1.3 THE THEORY OF CONSUMER BEHAVIOR

## Rational consumer. Cardinalist approach to consumer behavior

## Ordinalist approach to consumer behavior. Indifferent curve

## Budget line. Consumer optimization

## Price Consumption Curve (PCC) and individual demand curve

## Income Consumption Curve (ICC) and Engel’s curves

## Price effect, substitution effects, income effect

# Utility

## The value a consumer places on a unit of a good or service depends on the pleasure or satisfaction he or she expects to derive form having or consuming it at the point of making a consumption (consumer) choice

## In economics the satisfaction or pleasure consumers derive from the consumption of consumer goods is called “utility”.

## Within the limits of their incomes, consumers make their consumption choices by evaluating and comparing consumer goods with regard to their “utilities.”

# Cardinalist approach

## Measuring utility in “utils” (Cardinal)

## Total utility is the total utility a consumer derives from the consumption of all of the units of a good or a combination of goods over a given consumption period, ceteris paribus.

## Marginal utility is the utility a consumer derives from the last unit of a consumer good she or he consumes (during a given consumption period), ceteris paribus.

##  MUn = TUn – TUn-1

##  MU =∆TU/∆Q

## Total utility = Sum of marginal utilities

# Shape of TU

## Positive slope

### Consumer only purchases a good if gets some positive amount of utility (rational behavior)

## Slope gets flatter as Q increases

#### Law of diminishing marginal utility

# Shape of MU

## Eventually downward sloping

### Law of diminishing marginal utility

## Positive always

### Rational behavior

#### Consumer only purchases a good if they get some positive utility from it.

# The Law of Diminishing Marginal Utility

## Over a given consumption period, the more of a good a consumer has, or has consumed, the less marginal utility an additional unit contributes to his or her overall satisfaction (total utility).

## Alternatively, we could say: over a given consumption period, as more and more of a good is consumed by a consumer, beyond a certain point, the marginal utility of additional units begins to fall.

# Choice without prices and budget limits

# Choice with prices and budget limits

# Choice with prices and budget limits

# Law of Equal-Marginal UtilityThe total utility gained from a given budget will be maximized where the budget is all spent and marginal utility per dollar spent is equalized across all goods

## Rule for a utility maximum:

##  MUx/Px = MUy/Py or

##  MUx/MUy = Px/Py

# Consumer Equilibrium

## In summary, you need to convert marginal utility to marginal utility per dollar

## Then compare MU/P for the two goods and buy the one that gives the greatest MU/P

## Subtract the price from your budget

## Compare the next available units of both goods and repeat the process until you are out of money.

# Utility Maximization under An Income constraint

## Consumers’ spending on consumer goods is constrained by their incomes:

## Income = Px Qx + Py Qy + Pw Ow + ….+Pz Qz

## While the consumer tries to equalize MUx/Px , MUy/ Py, MUw/Pw,………. and MUz/Pz , to maximize her utility her total spending cannot exceed her income.

##

# Choice with prices and budget limits

## The Substitution Effect

### The tendency of people to substitute cheaper commodities for more expensive commodities

## Real-Income Effect

### The change in people’s purchasing power that occurs when, other things being constant, the price of one good that they purchase changes

### When that price goes up (down), real income, or purchasing power, falls (increases).

# An Optimal Change

##  Recall that to maximize utility a consumer would set:

##  (MUx/Px) = (MUy/Py)

##  If Py decreases this equality would be disturbed: (MUx/Px) < (MUy/Py)

##  To return to equality the consumer must adjust his/her consumption. (Have in mind that the consumer cannot change prices, and he/she has an income constraint.)

##

# Ordinalist theory

## Ordinalist approach: Utility can not be measured , but can only ranked in order of preference.

## Measuring utility by comparison (Ordinal):

##  • Jill prefers a burger to a slice of pizza and a slice of pizza to a hotdog.

# Assumptions of the Ordinal Theory:

## Utility can be ordinally measured: The consumer can rank various commodites or combination of commdoties in accordance with the satisfaction that he derives from them.

## The consumer is rational: Given the market prices and his income, a consumer will attempt to maximise his satisfaction when he undertakes consumption.

## Additive Utilities: The quantities of the commodities that is consumed determines the total utility of the consumer.

## Consistency of choices:The choice of the consumer is consistent in the sense that if he chooses combination A over B in one period, he will not choose B over A in another period.Symbolically : if A > B, then B < A.

## Transitivity of consumer choice: If a consumer prefers combination A to B, and prefers B to C, then, it can be concluded that he prefers A to C.Symbolically : If A > B, and B > C, then A > C.

# Axioms of rational choice

## Completeness

### if A and B are any two situations, an individual can always specify exactly one of these possibilities:

#### A is preferred to B

#### B is preferred to A

#### A and B are equally attractive

# Axioms of rational choice

## Transitivity

### if A is preferred to B, and B is preferred to C, then A is preferred to C

### assumes that the individual’s choices are internally consistent

# Axioms of rational choice

## Continuity

### if A is preferred to B, then situations suitably “close to” A must also be preferred to B

### used to analyze individuals’ responses to relatively small changes in income and prices

# Market baskets give the same satisfaction

##  A 1 20

##  B 2 12

##  D 3 7

##  E 4 4

##  G 5 2

##  H 6 1

# Consumer Preferences

## Indifference curve represent all combinations of two goods that provide the same level of total utility (satisfaction) to a person.

## Indifference Curves

### Indifference curves for two goods slope downward to the right.

##### If it sloped upward it would violate the assumption that more of any commodity is preferred to less. (The assumption that more of any commodity is preferred to less)

### Indifference curves are convex because as more of one good is consumed, a consumer would prefer to give up fewer units of a second good to get additional units of the first one.

# Consumer Preferences

# Indifference Maps

## An indifference map is a set of indifference curves that describes a person’s preferences for all combinations of two commodities.

### Each indifference curve in the map shows the market baskets among which the person is indifferent.

## Indifference Curves

### Finally, indifference curves cannot cross.

#### This would violate the assumption that more is preferred to less.

# Consumer Preferences

# MRS

## A 1 20

## B 2 12

## D 3 7

## E 4 4

## G 5 2

## H 6 1

## The marginal rate of substitution (MRS) quantifies the amount of one good a consumer will give up to obtain more of another good.

### It is measured by the slope of the indifference curve.

# MRS

# Consumer Preferences

# Consumer Preferences

## Perfect Substitutes and Perfect Complements

### Two goods are perfect substitutes when the marginal rate of substitution of one good for the other is constant.

# Consumer Preferences

# Consumer Preferences

## Perfect Substitutes and Perfect Complements

### Two goods are perfect complements when the indifference curves for the goods are shaped as right angles.

# Consumer Preferences

# Budget Constraints

## Preferences do not explain all of consumer behavior.

## Budget constraints also limit an individual’s ability to consume in light of the prices they must pay for various goods and services.

# Budget Constraints

##  A 0 50 $5

##  B 10 30 $5

##  D 15 20 $5

##  E 20 10 $5

##  G 25 0 $5

# Budget Constraints

# Budget Constraints

## The Budget Line

### As consumption moves along a budget line from the intercept, the consumer spends less on one item and more on the other.

### The slope of the line measures the relative cost of two goods

### The slope is the negative of the ratio of the prices of the two goods.

# Budget Constraints

## The Budget Line

### The slope indicates the rate at which the two goods can be substituted without changing the amount of money spent.

# Budget Constraints

## The Effects of Changes in Income and Prices

### Income Changes

#### An increase in income causes the budget line to shift outward, parallel to the original line (holding prices constant).

# Budget Constraints

## The Effects of Changes in Income and Prices

### Income Changes

#### A decrease in income causes the budget line to shift inward, parallel to the original line (holding prices constant).

# Budget Constraints

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### If the price of one good increases, the budget line shifts inward, pivoting from the other good’s intercept.

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### If the price of one good decreases, the budget line shifts outward, pivoting from the other good’s intercept.

# Budget Constraints

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### If the two goods increase in price, but the ratio of the two prices is unchanged, the slope will not change.

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### However, the budget line will shift inward to a point parallel to the original budget line.

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### If the two goods decrease in price, but the ratio of the two prices is unchanged, the slope will not change.

# Budget Constraints

## The Effects of Changes in Income and Prices

### Price Changes

#### However, the budget line will shift outward to a point parallel to the original budget line.

# Consumer Choice

## Consumers choose a combination of goods that will maximize the satisfaction they can achieve, given the limited budget available to them.

# Consumer Choice

## The maximizing market basket must satisfy two conditions:

##  1) It must be located on the budget line.

##  2) Must give the consumer the most preferred combination of goods and services.

# Point of Tangency—The Consumer’s Optimal

# Consumer Optimization

## The optimum occurs where the budget line is tangent to indifference curve I1, at point C.

### To maximize satisfaction, the consumer must acquire the most preferred attainable bundle, that is, reach the highest indifference curve that can be reached with a given level of income.

### The highest curve that can be reached is the one to which the budget line is tangent, at point A.

## A given price line should be tangent to an indifference curve or marginal rate of satisfaction of good X for good Y (MRSxy) must be equal to the price ratio of the two goods. i.e.

##  MRSxy = Px / Py

##  Slop of IC = Slop of Budget Line

## MUx/Px = MUy/Py

# Changes in the Budget Line

## The tangency relationship between the budget line and the indifference curve indicates the optimal amounts of each of the two goods the consumer will purchase, given

### the prices of both goods and

### the consumer’s total available income for expenditures.

# Changes in the Budget Line

## At different possible prices for one of the goods, given the price of the other and given total income, a consumer would optimally purchase different quantities of the two goods.

## A change in the price of one of the goods will alter the slope of the budget line because a different amount of the good can be purchased with a given level of income.

# The Price Consumption Curve

# Normal goods

## If both x and y increase as income rises, x and y are normal goods

# What is an inferior Good?

## A good xi for which ∂xi/∂I < 0 over some range of income is an inferior good in that range

# Inferior good

## If x decreases as income rises, x is an inferior good

# Changes in the Budget Line

## Price-consumption curve (PCC): a curve consisting of the various optimum combinations of two goods as the relative price of one good changes

## The price-consumption curve (PCC) may be drawn through these points of tangency, indicating the optimum quantities at various possible prices of food (given the price of clothing).

# Changes in the Budget Line

## From this price-consumption curve can be derived the usual demand curve for the good.

## Essentially, the demand curve is made up of various price and quantity optimum points.

# Price effect

## How will changes in prices and income influence influence consumer’s optimal choices?

## We have already seen how to obtain consumer’s optimal choice

## Consumer’s optimal choice was computed Max consumer’s utility subject to the budget constraint

# Changes in a Good’s Price

## A change in the price of a good alters the slope of the budget constraint (px/py)

### Consequently, it changes the MRS at the consumer’s utility-maximizing choices

## When a price changes, we can decompose consumer’s reaction in two effects:

### substitution effect

### income effect

# Substitution and Income effects

## Even if the individual remained on the same indifference curve when the price changes, his optimal choice will change because the MRS must equal the new price ratio

### the substitution effect

## The price change alters the individual’s real income and therefore he must move to a new indifference curve

### the income effect

# Changes in the optimal choice when a price decreases

# Substitution effect when a price decreases

# Income effect when the price decreases

# Subs and income effects when a price increases

# Price Changes forNormal Goods

## If a good is normal, substitution and income effects reinforce one another

### when price falls, both effects lead to a rise in quantity demanded

### when price rises, both effects lead to a drop in quantity demanded

# Price Changes for Inferior Goods

## If a good is inferior, substitution and income effects move in opposite directions

## The combined effect is indeterminate

### when price rises, the substitution effect leads to a drop in quantity demanded, but the income effect is opposite

### when price falls, the substitution effect leads to a rise in quantity demanded, but the income effect is opposite

# A Summary

## Utility maximization implies that (for normal goods) a fall in price leads to an increase in quantity demanded

### the substitution effect causes more to be purchased as the individual moves along an indifference curve

### the income effect causes more to be purchased because the resulting rise in purchasing power allows the individual to move to a higher indifference curve

## Obvious relation hold for a rise in price…

# A Summary

## Utility maximization implies that (for inferior goods) no definite prediction can be made for changes in price

### the substitution effect and income effect move in opposite directions

TOPIC 1.4 COSTS AND THE THEORY OF FIRMS CHOICE

## Classification of costs

## Cost in short-run period

## Cost in in long run period. Scale effect

## Income and profit

## Profit maximization rule

## Cost is a metric that is totaling up as a result of a process or as a differential for the result of a decision

## Costs of a firm is incurred to establish the production unit and to purchase different factors of production.

# Opportunity costs

## Opportunity cost can be defined as the cost of any decision measured in terms of the next best alternative, which has been sacrificed.

## It is the comparison between the benefit that was chosen and the benefit that was rejected.

## Recall that costs exist because resources are scarce and have competing uses⎯to produce more of one good means forgoing the production of another good.

## The cost of producing a good is measured by the worth of the most valuable alternative that was given up to obtain the resource⎯the opportunity cost.

## Explicit costs are input costs that require a monetary payment.

## They are out-of-pocket expenses, such as wages, which are relatively easy to measure by the money spent on the resources used.

## Implicit costs do not represent an explicit outlay of money, but they are still real, representing the implicit opportunity costs of alternatives that must be forgone.

### Example: The opportunity cost of using one’s own land, labor, or capital.

# Sunk Costs

# Transaction cost theory

## Search costs

## Bargaining costs

## Contracting costs

## Motivation costs

# Decision making in different time periods

### Short run for the firms and very short run for the industry.

### Long run for the firms and short run for the industry.

### Very long run for the firms and long run for the industry.

# SHORT RUN PERIOD

# Types of Cost:

## Total cost (TC)

## Total fixed costs (TFC)

## Average fixed costs (AFC)

## Total variable costs (TVC)

## Average variable cost (AVC)

## Average total cost (ATC)

## Marginal cost (MC)

# Theory of costs

## Total cost of a firm (TC) is classified into two broad categories - Fixed cost (TFC) and Variable cost (TVC).

##  i.e. TC = TFC + TVC

## However, nothing is fixed in the long run.

## Fixed costs

##  Fixed costs are expenses that does not change in proportion to the activity of a business.

## TFC

##  Fixed costs include overheads (rent, insurance-premium, interests), and also direct costs such as payroll (particularly salaries).

##  Variable costs

##  Variable costs change in direct proportion to the activity of a business such as sales or production volume. In retail, the cost of goods is almost entirely variable. In manufacturing, direct material costs, wages, fuel costs are examples of variable costs.

## TVC

# Theory of costs

## For example, a manufacturing firm pays for raw materials. When activity is decreased, less raw material is used, and so the spending for raw materials falls. When activity is increased, more raw material is used and spending therefore rises.

## Although tax usually varies with profit, which in turn varies with sales volume, it is not normally considered a variable cost.

# Average fixed cost

## Average fixed cost (AFC) = TFC/Q

##  where TFC = fixed cost, Q = total number of units produced.

## Unit fixed costs decline along with volume, following a rectangular hyperbola. As a result, the total unit cost of a product will decline as volume increases.

# Average Fixed costs

##

## Average variable cost

## Average variable cost (AVC) is the TVC of a firm divided by the total units of output (Q).

## AVC = TVC/Q

## Average cost (ATC) is the TC of a firm divided by the total units of output (Q).

## ATC = TC/Q = AFC + AVC

# Marginal Cost

## The additional cost incurred to produce one additional unit of output is called the Marginal Cost (MC).

# Marginal Cost

## The marginal cost curve is U-shaped. Marginal cost is relatively high at small quantities of output - then as production increases, it declines - then reaches a minimum value - then rises.

## This shape of the marginal cost curve is directly attributable to increasing, then decreasing marginal returns (the law of diminishing marginal returns).

# Average and marginal costs

# A Summary of the Short-Run Concepts

# LONG RUN PERIOD

# Long run cost curves

## The Long run average cost (LRAC or LAC) curve illustrates - for a given quantity of production - the average cost per unit which a firm faces in the long run (i.e. when no factors of production is fixed).

# LRAC

## LRAC curve is derived from a series of short run average cost curves.

## It is also called the ‘Envelope curve' since it envelops all the short run average cost curve.

## The curve is created as an envelope of an infinite number of short-run average total cost curves.

# Envelope Curve

## The envelope curve is based on the point of each short-run ATC curve that provides the lowest possible average cost for each quantity of output.

# Deriving a long-run average cost curve: choice of factory size

# Deriving long-run average cost curves: plants of fixed size

## The LRAC curve is U-shaped, reflecting economies of scale when it is negatively-sloped and diseconomies of scale when it is positively sloped.

## In perfect competition, the LRAC curve is flat at the point of equilibrium – in this stage the firm is enjoying constant returns to scale.

# Economies of Scale:

## Economies of scale are the cost advantages that a firm obtains due to expansion. Diseconomies is the opposite.

# LAC

## In some industries, the LRAC is L-shaped, and economies of scale increase indefinitely. This means that the largest firm tends to have a cost advantage, and the industry tends naturally to become a monopoly, and hence is called a natural monopoly. Natural monopolies tend to exist in industries with high capital costs in relation to variable costs, such as water supply and electricity supply.

# Long-run average cost curves

# Long-run Costs

## Long-run average costs

### assumptions behind the curve

#### factor prices are give

#### state of technology and factor quality are given

#### firms choose least-cost combination of factors

# A typical long-run average cost curve

# Long-run Costs

## Long-run average costs

### assumptions behind the curve

#### factor prices are give

#### state of technology and factor quality are given

#### firms choose least-cost combination of factors

### shape of the LRAC curve

### a typical LRAC curve

### long-run average and marginal cost curves

# Long-run average and marginal costs

# Long-run Costs

## Long-run average costs

### assumptions behind the curve

#### factor prices are given.

#### state of technology and factor quality are given.

#### firms choose least-cost combination of factors.

## Real Economies of Scale:

##  Refers to reduction in physical quantities of input , per unit of output when the size of the firm increases, as a result input cost minimized.

## Internal Economies: It is a condition which brings about a decrease in LRAC of the firm because of changes happening within the firm.

## External Economies:

##  It is a condition which brings about a decrease in LRAC of the firm because of changes happening outside the firm.

## E.g. Taxation policies of Gov…

## Controllable cost :

## It is one which is controlled by the executive on whom the responsibility of the cost is wasted.

## Noncontrollable cost :

## An allocated cost is noncontrollble.It varies with the formula adopted for allocation and is independent of the action of business personnel

# The Revenue Structure of the Competitive Business Firm

## The perfectly competitive firm is a price-taking firm. This means that the firm takes the price from the market.

## As long as the market remains in equilibrium, the firm faces only one price—the equilibrium market price.

# Computing the Total Revenue of a Price-taker

# 8.1 Profits: Total Revenues Minus Total Costs

## Profits are the difference between the total revenues (TR) of a firm and its total costs (TC).

## Accounting profits equal actual revenues minus actual expenditures of cash (explicit costs), and do not include implicit costs.

## Economic profits equal actual revenues minus all explicit and implicit costs.

# Accounting Profits Versus Economic Profits

# 8.1 Profits: Total Revenues Minus Total Costs

## Economists consider a zero economic profit a normal profit because it means that the firm is covering both implicit and explicit costs⎯the total opportunity cost of its resources.

## This is clearly different from earning zero accounting profits.

# 8.1 Profits: Total Revenues Minus Total Costs

## Economists generally assume that the ultimate goal of the firm is to maximize profits.

## In other words, firms try to maximize the difference between what they receive for their goods and services⎯their total revenue⎯and what they give up for their inputs—their total costs (explicit and implicit).

# The Totals Approach to Profit Maximization

## To maximize profit, a producer finds the largest gap between total revenue and total cost.

# The Marginal Approach

## The other way to decide how much output to produce involves the marginal principle.

# Marginal Revenue

## The benefit of producing and selling rakes is the revenue the firm collects. If the firm sells one more rake, total revenue increases by $25.

## Marginal benefit = marginal revenue

# The Marginal Rule for Profit Maximization

## A firm maximizes profit in accordance with the marginal principle—by setting marginal revenue (or market price) equal to marginal cost.

TOPIC 1.5 THE MARKET BEHAVIOR OF COMPETITIVE FIRMS

##  Equilibrium of the perfect competitor firm in the short term (maximization of profit)

## Equilibrium of the perfect competitor firm in the short term (minimization of losses)

## Marginal cost and supply curve of the firm in the short term

## Equilibrium of the perfect competitor firm in the long term. Paradox of profit.

# Features of a Perfectly Competitive Market

## There are many firms.

## The product is standardized, or homogeneous.

## Firms can freely enter or leave the market in the long run.

## Each firm takes the market price as given.

# The Short-run Output Decision

## The firm’s objective is to produce the level of output that will maximize profit.

## Economic profit = total revenue minus total economic cost.

### Total revenue = price c quantity sold TR= PxQ.

### The cost structure of the business firm is the same as the one we studied earlier.

# The Firm’s Total Cost Structure (Reviewed)

# The Revenue Structure of the Competitive Business Firm

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## A firm maximizes profit in accordance with the marginal principle—by setting marginal revenue (or market price) equal to marginal cost.

# Profit Maximization Using the Marginal Approach

# Economic Profit

## Profit per unit equals revenue per unit (or price) minus cost per unit (or average total cost).($25 - $14) = 11

# Shut-down Decision

## The firm should continue to operate if the benefit of operating (total revenue) exceeds the cost of operating, or total variable cost.

# The Shut-down Decision

## When price drops to $9, the firm adjusts output down to 6 rakes per minute to maintain P=SMC.

# The Shut-down Decision

## The firm’s shut- down price is the price at which the firm is indifferent between operating and shutting down.

# Short-run Supply Curve

## For any price above the shut-down price, the firm adjusts output along its marginal cost curve as the price level changes.

# Short-run Supply Curve

# Short-run Supply Curve

## The firm’s short-run supply curve shows the relationship between the market price and the quantity supplied by the firm over a period of time during which one input—the production facility—cannot be changed.

# The Market Supply Curve

## The short-run market supply curve shows the relationship between the market price and the quantity supplied by all firms in the short run.

# A Market in Long-run Equilibrium

## The quantity of the product supplied equals the quantity demanded

## Each firm in the market maximizes its profit, given the market price

## Each firm in the market earns zero economic profit, so there is no incentive for other firms to enter the market

# A Market in Long-run Equilibrium

## In long-run equilibrium, price equals marginal cost (the profit-maximizing rule), and price equals short-run average total cost (zero economic profit).

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TOPIC 1.6 PURE MONOPOLY

## The main features of pure monopoly. Monopsony.

## The demand for the product and marginal revenue of a monopoly.

## Determination of price and output in pure monopoly in the short and long term

## Price discrimination: conditions, forms, effects

## Economic and social effectiveness of monopoly. The indicators of monopoly power. Antitrust law.

## A monopoly is a firm that is the sole seller of a product without close substitutes.

## The key difference: A monopoly firm has market power, the ability to influence the market price of the product it sells. A competitive firm has no market power.

# Acquiring market power

## Economies of scale

## Product differentiation and brand loyalty

## Ownership of, or control over, key factor and/or wholesale or retail outlets

## Consumer lock in- high search, switching and initiation cost

## Legal protection

## Network externalities – product’s value rises as more consumers use it.

## Aggressive tactics

# Why Monopolies Arise

## The main cause of monopolies is barriers to entry – other firms cannot enter the market.

## Three sources of barriers to entry:

### 1. A single firm owns a key resource.

###  E.g., DeBeers owns most of the world’s diamond mines

### 2. The goverment gives a single firm the exclusive right to produce the good.

###  E.g., patents, copyright laws

# Monopoly and the public interest

## Disadvantages – Higher price and lower output, possibility of higher cost due to lack of competition, unequal distribution of income

## Advantages – Economies of scale, lower cost, competition for corporate control, innovation and new products

# Why Monopolies Arise

### 3. Natural monopoly: a single firm can produce the entire market Q at lower ATC than could several firms.

# Monopoly vs. Competition: Demand Curves

## In a competitive market, the market demand curve slopes downward.

## but the demand curve for any individual firm’s product is horizontal at the market price.

## The firm can increase Q without lowering P,

## so MR = P for the competitive firm.

# Monopoly vs. Competition: Demand Curves

## A monopolist is the only seller, so it faces the market demand curve.

## To sell a larger Q, the firm must reduce P.

## Thus, MR ≠ P.

##  Increasing Q has two effects on revenue:

### The output effect:More output is sold, which raises revenue

### The price effect:The price falls, which lowers revenue

## To sell a larger Q, the monopolist must reduce the price on all the units it sells.

## Hence, MR < P

## MR could even be negative if the price effect exceeds the output effect (e.g., when Q from 5 to 6).

# Profit-Maximization

## Like a competitive firm, a monopolist maximizes profit by producing the quantity where MR = MC.

## Once the monopolist identifies this quantity, it sets the highest price consumers are willing to pay for that quantity.

## It finds this price from the D curve.

# Profit-Maximization

## 1. The profit-maximizing Q is where MR = MC.

## 2. Find P from the demand curve at this Q.

# The Monopolist’s Profit

## As with a competitive firm, the monopolist’s profit equals

##  (P – ATC) x Q

## A competitive firm

### takes P as given

### has a supply curve that shows how its Q depends on P

## A monopoly firm

### is a “price-maker,” not a “price-taker”

### Q does not depend on P; rather, Q and P are jointly determined by MC, MR, and the demand curve.

## So there is no supply curve for monopoly.

# Case Study: Monopoly vs. Generic Drugs

## Patents on new drugs give a temporary monopoly to the seller.

## When the patent expires, the market becomes competitive, generics appear.

# The Welfare Cost of Monopoly

## Recall: In a competitive market equilibrium, P = MC and total surplus is maximized.

## In the monopoly P > MR = MC

### The value to buyers of an additional unit (P)exceeds the cost of the resources needed to produce that unit (MC).

### The monopoly Q is too low – could increase total surplus with a larger Q.

### Thus, monopoly results in a deadweight loss.

# The Welfare Cost of Monopoly

## Competitive eq’m:

### quantity = QE

### P = MC

### total surplus is maximized

## Monopoly eq’m:

### quantity = QM

### P > MC

### deadweight loss

# Public Policy Toward Monopolies

## Increasing competition with antitrust laws

### Examples: Sherman Antitrust Act (1890), Clayton Act (1914)

### Antitrust laws ban certain anticompetitive practices, allow government to break up monopolies.

## Regulation

### Government agencies set the monopolist’s price

### Regulators might subsidize the monopolist or set P = ATC for zero economic profit.

# Public Policy Toward Monopolies

## Public ownership

### Example: U.S. Postal Service

### Problem: Public ownership is usually less efficient since no profit motive to minimize costs

## Doing nothing

### The foregoing policies all have drawbacks, so the best policy may be no policy.

# Perfect Price Discrimination vs. Single Price Monopoly

## Here, the monopolist charges the same price (PM) to all buyers.

## A deadweight loss results.

# Perfect Price Discrimination vs. Single Price Monopoly

## Here, the monopolist produces the competitive quantity, but charges each buyer his or her WTP (Willingness to Pay).

## This is called perfect price discrimination.

# Price discrimination

## Meaning

## Changing different prices for the same product

## Charging same price for different products when costs differ.

## Possibility of differences in

## financial status

## educational status

## age of the customer

## time of purchase

# First degree price discrimination (unit wise)

##  Meaning

## Charging each consumer one maximum price, he or she is willing to pay for each unit. Extracting all consumer surplus and earning maximum profit.

##  Requirement - full information regarding consumers

##  Application - service related business - mechanics, doctors, lawyers, professionals etc.

# Second degree price discrimination (Lot wise)

## A practice of posting a discrete schedule of declining prices for different ranges of quantities. Extracting part of the surplus, lower profit.

# Third degree discrimination (Market wise)

## Charging different groups of consumers different prices for the same product.

## Essential conditions

## Different elasticity of demand - students’ discount, senior citizen discount

## Information regarding elasticity of demand

## Separate markets

# Examples of Price Discrimination

## Movie ticketsDiscounts for seniors, students, and people who can attend during weekday afternoons. They are all more likely to have lower WTP than people who pay full price on Friday night.

## Airline pricesDiscounts for Saturday-night stayovers help distinguish business travelers, who usually have higher WTP, from more price-sensitive leisure travelers.

# Examples of Price Discrimination

## Discount couponsPeople who have time to clip and organize coupons are more likely to have lower income and lower WTP than others.

## Quantity discountsA buyer’s WTP often declines with additional units, so firms charge less per unit for large quantities than small ones.

##  Example: A movie theater charges $4 for a small popcorn and $5 for a large one that’s twice as big.

##

## Productive inefficiency

## Monopolies may be productively inefficient because there are no direct competitors a monopolist has no incentive to reduce average costs to a minimum, with the result that they are likely to be productively inefficient.

## Allocative inefficiency

## Monopolies may also be allocatively inefficient – it is not necessary for the monopolist to set price equal to the marginal cost of supply. In competitive markets firms are forced to ‘take’ their price from the industry itself, but a monopolist can set (make) their own price. This means that price can be set well above marginal cost.

## Net welfare loss

## Welfare loss is the loss of community benefit, in terms of consumer and producer surplus, that occurs when a market is supplied by a monopolist rather than a large number of competitive firms.

# Lerner Index

## The Lerner index, formalized in 1934 by Abba Lerner, describes a firm's market power. It is defined by:

## The index ranges from a high of 1 to a low of 0, with higher numbers implying greater market power. For a perfectly competitive firm (where P=MC), L=0; such a firm has no market power.

# Lerner Index

## The main problem with this measure, however, is that it is almost impossible to gather the necessary information on prices and particularly costs.

## The Lerner Index is equivalent to the negative inverse of the formula  for price elasticity of demand facing the firm, when the price, P, chosen is that which maximizes profits available because of the existence of market power.

#  Herfindahl index (Herfindahl–Hirschman Index, or HHI)

## It is defined as the sum of the squares of the market shares of the firms within the industry (sometimes limited to the 50 largest firms), where the market shares are expressed as fractions

#  Herfindahl index (Herfindahl–Hirschman Index, or HHI)

## The major benefit of the Herfindahl index in relationship to such measures as the concentration ratio is that it gives more weight to larger firms.

#  Herfindahl index (Herfindahl–Hirschman Index, or HHI)

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**TOPIC 1.7 MONOPOLISTIC COMPETITION**

## Product differentiation leads to preferences among buyers to deal with particular sellers or to purchase the products of particular sellers.

## Sources of differentiation

### physical differences

### prestige considerations

### location

### service considerations

# Monopolistic Competition

## Entry in monopolistic competition is relatively unrestricted:

### New firms may easily start the production of close substitutes for existing products.

### Economic profits tend to be eliminated in the long run, as is the case in perfect competition.

# Price and Output Determination in Monopolistic Competition

## In perfect competition, each firm’s demand curve was horizontal because each firm, one of a great many sellers, sold the same homogenous product.

# Price and Output Determination in Monopolistic Competition

## Monopolistically competitive sellers are price searchers; they do not regard price as a given by market conditions.

## Because each firm sells a slightly different product, each firm’s demand curve is downward sloping, but quite flat (elastic) because of many close substitutes.

# Short-Run Equilibrium in Monopolistic Competition

# 11.2 Price and Output Determination in Monopolistic Competition

## Long‑run equilibrium will occur when demand is equal to average total cost for each firm at a level of output at which each firms’ demand curve is just tangent to its ATC curve.

# Market Entry and Exit in the Long Run

# Long-Run Equilibrium for a Monopolistically Competitive Firm

# Monopolistic Competition Versus Perfect Competition

## Because of the downward slope of the demand curve, its point of tangency with ATC will not and cannot be at the lowest level of average cost.

## Therefore, even when long-run adjustments are complete, firms will not be operating at a level that permits the lowest average cost of production⎯the efficient scale of the firm.

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TOPIC 1.8 OLIGOPOLY

## Oligopolies exist where relatively few firms control all or most of the production and sale of a product (oligopoly = few sellers).

### The products may be homogeneous or differentiated,

### but the barriers to entry are often very high, which makes it very difficult for firms to enter into the industry.

#  Oligopoly

## Firms in the industry may earn long-run economic profits.

#### commercial airplanes,

#### oil,

#### automobiles,

#### steel,

#### breakfast cereals,

#### computers,

#### cigarettes,

#### tobacco, and

#### sports drinks.

#  Oligopoly

## Oligopoly is characterized by mutual interdependence among firms; each firm shapes its policy with an eye to the policies of competing firms.

## Oligopolists must strategize, much like good chess or bridge players, constantly observing and anticipating the moves of their rivals.

#  Oligopoly

## With mutual interdependence, an oligopolist generally faces considerable uncertainty as to the shape of its demand and marginal revenue curves because in order to know anything about its demand curve, a firm must know how other firms will react to its prices and other policies.

#  Collusion and Cartels

## The uncertainties of pricing decisions are substantial in oligopoly, so the implications of misjudging the behavior of competitors could prove to be disastrous.

## Because of this uncertainty, some believe that oligopolists change their prices less frequently than perfect competitors, whose prices may change almost continuously.

#  Collusion and Cartels

## Because the actions and profits of oligopolists are so dominated by mutual interdependence, the temptation is great for firms to collude⎯to get together and agree to act jointly in pricing and other matters.

#  Collusion and Cartels

## If firms believe they can increase their prices by coordinating their actions, they will be tempted to collude.

## Collusion reduces uncertainty and increases the potential for monopoly profits.

# Collusion and Cartels

## From society’s point of view, collusion has the same disadvantages monopoly does.

### Goods are overpriced.

### Goods are underproduced.

### Consumers lose out from a misallocation of resources.

# Collusion and Cartels

## A truly collusive oligopoly that involves all firms in an industry could act as the equivalent of one firm with several “plants” from the standpoint of pricing and output decisions.

## Acting in this matter, the economic effect of the collusive oligopolist is exactly the same as a monopolist; a single demand curve exists for the group of companies.

# Collusion and Cartels

## Agreements between firms on sale, pricing, and other decisions are usually called cartels.

## Cartels may lead to joint profit maximization, which requires the determination of price on the basis of the marginal revenue function derived from the total (or market) demand schedule for the product and the marginal cost schedules of the various firms.

# Collusion in Oligopoly

# 12.2 Collusion and Cartels

## Firms with low costs and large supply capability will obtain the largest profits because they have great bargaining power. With outright collusion, firms may agree upon market shares and the division of profits.

# Cournot model

## Cournot model A model of a two-firm industry (duopoly) in which a series of output adjustment decisions leads to a final level of output between the output that would prevail if the market were organized competitively and the output that would be set by a monopoly

# Cournot’s Model

## Augustin Cournot illustrated with an example of two firms engaged in the production and sale of mineral water.

## Each firm owns a spring of mineral water, which is available free from nature.

## Assumptions

### Each firm maximizes profit.

### Cost of production is nil because the springs are available free from nature, i.e. MC=0.

### Market demand is linear; hence the demand curve is a downward sloping straight line.

### Each firm decides on its price assuming that the other firm’s output is given (i.e. the other firm will continue to produce and sell the same amount of output in next period).

### Firms sell their entire profit maximizing output at the price determined by their demand curves.

# Cournot’s Model

## Period 1: Firm A: ½ (1) = ½

##  Firm B: ½ (1/2)= 1/4

## Period 2: Firm A: ½ (1-1/4)= 3/8

##  Firm B: ½ (1-3/8) =5/16

## Period 3: Firm A: ½ (1-5/16)=11/32

##  Firm B: ½ (1-11/32)= 21/64

## Period 4: Firm A: ½ (1-21/64) = 43/128

##  Firm B: ½ (1-43/128)=85/256 ………

##  Period N: Firm A: ½ (1-1/3) =1/3

##  Firm B: ½ (1-1/3) = 1/3

## Thus A’s output is declining progressively (with ratio=1/4), whereas B’s output is increasing at a declining rate.

## A’s equilibrium output=1/3

## B’s equilibrium output=1/3

# The Kinked Demand Curve Model

## kinked demand curve model A model of oligopoly in which the demand curve facing each individual firm has a “kink”

## in it. The kink results from the assumption that competitor firms will follow if a single firm cuts price but will not follow if a single

## firm raises price.

# Game Theory and Economics

## Therefore, it also affects the profits of other firms.

##  Each firm knows that its profit depends not only on how much it produced but also on how much the other firms produce.

# What makes a Game?

## Elements in a Game

## One or more players – participants, each may be an individual, a group or organisation, a machine, and so on.

## One or more moves (or choices) – where a move is an action carried out during the game, including chance moves (when “nature plays a hand”) as in the toss of a coin.

## A set of outcomes – where an outcome is the result of the completion of one or more moves [e.g. game of chess may end in checkmate or a draw]

## Payoff – an amount received for a given outcome.

## Finally, a set of rules which specify the conditions for the players, moves, outcomes and payoffs.

# Strategy

## How should one play the game?

## Definition: A strategy is a plan of action by which a player has a decision rule to determine their set of moves for every possible situation in a game.

## A strategy is said to be pure if it at every stage in the game it specifies a particular move with complete certainty.

## A strategy is said to be mixed if it applies some randomisation to at least one of the moves.

## For each game, there are typically multiple pure strategies. Note that the randomisation is a set of fixed probabilities, where the sum of the probabilities is 1.

# History (1)

## The study of games is many centuries old. More systematic developments in Game Theory took place in the first half of the 20th Century.

## Main FoundersJohn Von Neumann (mathematician)

##

##  Oskar Morgenstern (economist)

# History (2)

## Main publication: von Neumann & Morgenstern: Theory of Games and Economic Behaviour. Princeton University Press, 1944.

## Goal:

## Application of mathematical methods to broadly analyse games

## A new scientific approach to the study of economics.

## Applications:

## Aided by computers, theory has been broadly applied in large-scale operations such as international trade.

# Game Theory is inter-disciplinary

# Types of Games (1): Co-operative vs. Non co-operative Games

## Cooperation generally may lead to higher payoffs.

## Further Examples:

## Countries cooperate on trade (reduced tariffs) leading to boost in exports

## Two leading national social networking sites share technical knowledge and keep out an overseas competitor.

## Cartel: formation of monopoly by multiple organisations.

# Types of Games (2): Perfect vs. Imperfection Information

## A game is said to have perfect Information if all the moves of the game are known to the players when they make their move. Otherwise, the game has imperfect information.

## A large class of games of imperfect information are simultaneous games - games in which all players make their moves at the same time without knowing what the others will play. (The decisions may be made beforehand, but are not communicated).

# Zero vs. Non-Zero-Sum Games

## One of the most important classifications .

## A game is said to be zero-sum if wealth is neither created nor destroyed among the players.

## A game is said to be non-zero-sum if wealth may be created or destroyed among the players (i.e. the total wealth can increase or decrease).

## All examples above are zero-sum because they are competitive leisure games. However, most real-life situations are non-zero-sum (as indicated, for example, by how economies can grow).

# Normal Form: example of 2\*2 game

## In the following example, we treat the special case where each player has 2 moves.

## Each row or column of payoffs is called an imputation.

## Player A has two moves: A1 and A2.

## Player B has two moves: B1 and B2.

## The payoff for a game is given by the intersection. Thus if the moves are respectively A1 and B2, then the payoff is zero.

# The Concept of Equilibrium (Pure Strategies) 1/2

## So what strategies may yield optimal payoffs for both?

## Key concept: In an equilibrium, each player of the game has adopted a strategy that cannot improve his outcome, given the others' strategy. The method for this is:

## Player A considers each imputation and what is the least payoff value that may be gained by choosing that imputation.

## Similarly, Player B considers each imputation and what is the greatest payoff value that may be gained by choosing that imputation.

# The Concept of Equilibrium (Pure Strategies) 2/2

##

# The Concept of Equilibrium (Pure Strategies) 2/2

##

# Dominant Firm Game

## Two firms, one large and one small

## Either firm can announce an output level (lead) or else wait to see what the rival does and then produce an amount that does not saturate the market.

## Conclusion:

## Subordinate firm will always follow, because dominant firm will always lead.

# The Prisoner’s Dilemma

#### Description: Two men suspected of committing a bank robbery together and are arrested by the police. They are placed in separate cells, so cannot communicate.

## Each suspect may either confess or remain silent. They know the consequences of their actions. Suppose we call them Player A and Player B:

## If A confesses, but B remains silent, then A “turns Queens Evidence” [UK] and goes free, whilst the other goes to prison for 10 years

## If both A and B confess, then they go to prison for 5 years.

## If both A and B remain silent, then they go to prison for 1 year for carrying concealed weapons.

# The Prisoner’s Dilemma: Payoff Matrix

## For the Prisoner’s Dilemma, a 2-person game, we have pairs of payoffs.

## If A1 denotes ‘Player A remains silent’, A2 denotes ‘Player A confesses’ (similarly for B), then we can represent the problem by the following matrix:

##

##

# The Prisoner’s Dilemma: Strategy

## Player A reasons as follows:

## If Player B chooses B1, then I am better off choosing A2 (because O > -1).

## If Player B chooses B2, then I am better off choosing A2 (because -5 > -10).

## Similarly, for player B. Hence A2,B2 are selected.

## In fact, this reflects accepted theory: John Nash extended the minimax result of zero-sum games to non-zero-sum games. Informally, it states that a pair of mixed strategies is in Nash equilibrium, if it means that any unilateral (one-sided) deviation for either player would yield a payoff that was no more than the value of the pair.

## (A2,B2) are in equilibrium. Payoffs are (-5.-5)

# The Prisoner’s Dilemma: Paradox

## Paradox: both players confess and spend 5 years in prison, whereas if they had remained silent they would have spent 1 year each in prison!

## Diagnosis: the unilateral view is not optimal. A bilateral (two-sided) view – involving cooperation – would suggest the other move for both players.

## This is covered by the notion of strategies being pareto optimal – when there is no other strategy in which both players are at least as well off.

# Prisoners' Dilemma : Application to other areas

## Nuclear arms races.

## Corruption/political contributions between contractors and politicians.

## Can you think of other applications?

# Closed-bag exchange

## Two people meet and exchange closed bags, with the understanding that one of them contains money, and the other contains a purchase.

## Either player can choose to honor the deal by putting into his or her bag what he or she agreed, or he or she can defect by handing over an empty bag.

# How to win in the repeated game

## You should be..

## 1. Honest

## 2. Vindictive

## 3. Forgiven

## 4. Don’t be jealous

# Ultimatum game

## The ultimatum game is a game in economic experiments.

## The first player (the proposer) receives a sum of money and proposes how to divide the sum between the proposer and the other player.

## The second player (the responder) chooses to either accept or reject this proposal.

## If the second player accepts, the money is split according to the proposal. If the second player rejects, neither player receives any money.

TOPIC 1.9 THE FMARKET OF THE FACTORS OF PRODUCTION

## Resource demand

## Labor market

## Capital market

## The market for raw materials (of land)

# Definition

##  Resources must be used in the production process to produce goods and services. Resources are also called factors of production. The major factors are: labor, capital, land and entrepreneurship.

##  The first three factors listed are traded in the factor market where the Equilibrium Quantity Of the factor and the factor price are determined. The entrepreneurship factor creates firms and hires the other factors. Most factor markets are competitive, that is, there are many buyers and sellers.

## Factor market refers to markets where services of the factors of production (not the actual factors of production) are bought and sold, such as the labor markets, the capital market, the market for raw materials, and the market for management or entrepreneurial resources.

## The interaction between product and factor markets involves the principle of derived demand.

## Derived demand refers to the demand for productive resources, which is derived from the demand for final goods and services or output.

## Each firm must decide how much labor to hire to maximize its profits.

## The decision is made through marginal analysis. The firm will hire a worker if the marginal benefits exceed the marginal costs

# Marginal Revenue of Product (MRP)

## The marginal revenue product, is the additional revenue generated by employing an additional unit of a factor.

## MRP = change in total revenue / change in the quantity of the factor

##  Since   change in total revenue/ change in quantity of output = Marginal revenue (MR);

##  and change in the quantity of output/change in quantity of a factor (labour) = Marginal product (MP).

##  Then:

## MRP = MR X MP

##  marginal revenue product (of labor)  MRPL

## The MRPL is the MPL times marginal revenue MRL

## MRPL =MPL × MRL

## MRC –marginal cost of resource (labor)

## In the perfect competitive labor market

## MRCL = wage

##  Firm is maximizing profits since

## MRPL = MRCL

# Labor Supply Determinants

## Other wage rates

### If wages in other occupations rise (fall), then labor supply will fall (rise).

## Nonwage income

### If nonwage income rises (falls), then labor supply will fall (rise).

## Preferences for work versus leisure

### If preferences for work increase (decrease), then labor supply will increase (decrease).

# Labor Supply Determinants

## Nonwage aspects of job

### If the nonwage aspects of a job improve (worsen), then labor supply will increase (decrease).

## Number of qualified suppliers

### An increase (decrease) in the number of qualified workers will increase (decrease) labor supply.

# FACTOR MARKETS WITH MONOPSONY POWER

# The Capital Market

# Capital

## One of the most important concepts in all of economics is the concept of capital.

## Capital goods are those goods produced by the economic system that are used as inputs to produce other goods and services in the future.

# Physical Capital

## Physical, or tangible, capital refers to the material things used as inputs in the production of future goods and services.

## Major categories of physical capital:

### Durable equipment

### Residential structures

### Inventories

# Social Capital

## Social capital is capital that provides services to the public.

## Major categories of social capital:

### Public works (roads and bridges)

### Public services (police and fire protection)

# Intangible Capital

## Nonmaterial things that contribute to the output of future goods and services are known as intangible capital.

## For example, an advertising campaign to establish a brand name produces intangible capital called goodwill.

# Human Capital

## Human capital is a form of intangible capital that includes the skills and other knowledge that workers have or acquire through education and training.

## Human capital yields valuable services to a firm over time.

# The Capital Market

## The capital market is a market in which households supply their savings to firms that demand funds to buy capital goods.

# Bond Lending

## A bond is a contract between a borrower and a lender, in which the borrower agrees to pay the loan at some time in the future, along with interest payments along the way.

## In essence, households supply the capital demanded by a business firm. Presumably, the investment will generate added revenues that will facilitate the payment of interest to the household.

# The Financial Capital Market

## The financial capital market is the part of the capital market in which savers and investors interact through intermediaries.

## Capital income is income earned on savings that have been put to use through financial capital markets.

# Capital Income: Interest and Profit

## Interest is the payment made for the use of money. Interest is a reward for postponing consumption.

## Profit is the excess of revenues over cost in a given period. Profit is a reward for innovation and risk taking.

# Comparing Costs and Expected Return

## The expected rate of return is the annual rate of return that a firm expects to obtain through a capital investment.

# Determinants of theExpected Rate of Return

## The expected rate of return on an investment project depends on:

### the price of the investment,

### the expected length of time the project provides additional cost savings or revenue, and

### the expected amount of revenue attributable each year to the project.

# A Menu of Investment Choices and Expected Rates of Return

# A Menu of Investment Choices and Expected Rates of Return

## When the interest rate is low, firms are more likely to invest in new plant and equipment than when the interest rate is high.

## The interest rate determines the opportunity cost (alternative investment) of each project.

# Investment Demand

## The market demand curve for new capital is the sum of all the individual demand curves for new capital in the economy.

## In a sense, the investment demand schedule is a ranking of all the investment opportunities in the economy in order of expected yield.

# The Profit-MaximizingInvestment Decision

## A perfectly competitive profit-maximizing firm will keep investing in new capital up to the point at which the expected rate of return is equal to the interest rate.

## This is analogous to saying that the firm will continue investing up to the point at which the marginal revenue product of capital is equal to the price of capital.

# Net present value

## Net present value of the project being the sum of discounted net cash flows (DNCF), as follows:

# Net present value

## The cost of capital is used to discount the cash flows. It should now be clear that any project that has a positive NPV will automatically increase the value of the firm and therefore should be undertaken

## Likewise, any project that has a negative NPV will decrease the value of the firm and should not be undertaken.

## However, this simple rule only applies to independent project

# Internal rate of return (IRR)

## The IRR is defined as the discount rate that equates the present value of project’s expected net cash flows to zero . In mathematical terms it is the interest rate, i , that satisfies the following equation:

# LAND AND NATURAL RESOURCES

## The Market for Land (Renewable Natural Resources)

### The lower the rent, the greater is the quantity of land demanded.

### The supply of a particular block of land is perfectly inelastic.

### Figure 18.7 illustrates this market for land.

## Economic Rent and Opportunity Cost

### Economic rent

### The income received by any factor of production over and above the amount required to induce a given quantity of the factor to be supplied.

### The income that is required to induce the supply of a given quantity of a factor of production is its opportunity cost—the value of the factor of production in its next best use.

## Figure shows how the income of a factor of production divides between economic rent and opportunity cost.

## The Supply of a Nonrenewable Resource

### Over time, the quantity of a nonrenewable resource decreases as it is used up.

### But the known quantity of a natural resource increases because advances in technology enable ever less accessible sources of the resource to be discovered.

### Using a natural resource decreases its supply, which causes price to rise.

### New discoveries increase supply, which cause prices to fall.

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**TOPIC 1.10 THE THEORY OF EXTERNALIES**

## In economics, an externality is the cost or benefit that affects a party who did not choose to incur that cost or benefit.

## A negative externality (also called "external cost" or "external diseconomy") is an economic activity that imposes a negative effect on an unrelated third party. It can arise either during the production or the consumption of a good or service

# Negative production externalities

##  Air pollution from burning fossil fuels.

## Anthropogenic climate change

## Water pollution by industries that adds effluent, which harms plants, animals, and humans.

## Noise pollution during the production process, which may be mentally and psychologically disruptive.

# Negative consumption externalities

## Sleep deprivation due to a neighbor listening to loud music late at night.

## Antibiotic resistance, caused by increased usage of antibiotics.

## A positive externality (also called "external benefit" or "external economy" or "beneficial externality") is the positive effect an activity imposes on an unrelated third party.

# Positive production externalities

## A beekeeper who keeps the bees for their honey. A side effect or externality associated with such activity is the pollination of surrounding crops by the bees.

## The construction and operation of an airport. This will benefit local businesses, because of the increased accessibility.

## A foreign firm that demonstrates up-to-date technologies to local firms and improves their productivity

# Positive consumption externalities

## An individual who maintains an attractive house may confer benefits to neighbors in the form of increased market valuesfor their properties.

## An individual receiving a vaccination for a communicable disease not only decreases the likelihood of the individual's own infection, but also decreases the likelihood of others

## Driving an electric vehicle charged by electricity from a renewable source

## Increased education of individuals, as this can lead to broader society benefits in the form of greater economic productivity, a lower unemployment rate.

## An individual buying a product that is interconnected in a network

# Possible solutions

## Pigovian taxes or subsidies intended to redress economic injustices or imbalances.

## Regulation to limit activity that might cause negative externalities

## Government provision of services with positive externalities

## Lawsuits to compensate affected parties for negative externalities

## Mediation or negotiation between those affected by externalities and those causing them

## A Pigovian tax (also called Pigouvian tax, after economist Arthur C. Pigou) is a tax imposed that is equal in value to the negative externality. The result is that the market outcome would be reduced to the efficient amount.

# Coase theorem

## Ronald Coase argued that if all parties involved can easily organize payments so as to pay each other for their actions, then an efficient outcome can be reached without government intervention

## This result, often known as the Coase theorem, requires that:

## Property rights be well defined

## People act rationally

## Transaction costs be minimal

## If all of these conditions apply, the private parties can bargain to solve the problem of externalities.

TOPIC 1.11 PUBLIC GOODS AND PUBLIC CHOICE THEORY

## A private good is defined in economics as "an item that yields positive benefits to people“ that is excludable, rivalrous

## In economics, a good or service is called excludable if it is possible to prevent people (consumers) who have not paid for it from having access to it.

## A rival (subtractable) good is a good whose consumption by one consumer prevents simultaneous consumption by other consumers

## Public good is a good that is both non-excludable and non-rivalrous in that individuals cannot be effectively excluded from use and where use by one individual does not reduce availability to others

### Nonexcludable – preventing anyone from consuming the good is either very expensive or impossible

### Nonrival – once provided, the additional resource cost of another person consuming the good is zero

## A good that is rivalrous but non-excludable is sometimes called a common good

## Club goods are a type of good in economics, that are excludable but non-rivalrous, at least until reaching a point where congestion occurs

## Public goods problems are often closely related to the "free-rider" problem

## Free rider problem occurs when those who benefit from resources, goods, or services do not pay for them, which results in an under-provision of those goods or services

## The free rider problem depends on a conception of the human being as homo economicus: purely rational and also purely selfish—extremely individualistic, considering only those benefits and costs that directly affect him or her

## A common example of a free rider problem is defense spending. No one person can be excluded from being defended by a state's military forces, and thus free riders may refuse or avoid paying for being defended

## Free riding is considered an economic problem when it leads to the non-production or under-production of a public good, a situation known as a Pareto inefficiency, or when free riding leads to the excessive use of a common property resource

## The government may be able to overcome the free-rider problem by providing or financing the public good and imposing taxes to pay for it

# Efficient production levels of public goods

## The Pareto optimum provision of a public good in a society is at the level where the combined sum of the marginal rate of substitution between private goods and a given public good of all individuals is equal to the marginal rate of transformation.

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TOPIC 1.12 GENERAL EQUILIBRIUM AND SOCIAL WELFARE

## Efficiency in Exchange

## Efficiency in Production

## Output Efficiency

## Market fails

## Pareto efficiency, or Pareto optimality, is a state of allocation of resources in which it is impossible to make any one individual better off without making at least one individual worse off.

## Pareto improvement is defined to be a change to a different allocation that makes at least one individual better off without making any other individual worse off, given a certain initial allocation of goods among a set of individuals. An allocation is defined as "Pareto efficient" or "Pareto optimal" when no further Pareto improvements can be made.

## A production-possibility frontier is an example of a Pareto Efficient Frontier. The connected line of red points represents Pareto optimal choices of production before the addition of point N.

# Efficiency in Exchange

## Exchange increases efficiency until no one can be made better off without making someone else worse off (Pareto efficiency).

## The Advantages of Trade

### Trade between two parties is mutually beneficial.

## Exchange increases efficiency until no one can be made better off without making someone else worse off (Pareto efficiency).

## The Advantages of Trade

### Trade between two parties is mutually beneficial.

## Assumptions

### Two consumers (countries)

### Two goods

### Exchanging goods involves zero transaction costs

# Exchange in an Edgeworth Box

## Efficient Allocations

### Any move outside the shaded area will make one person worse off (closer to their origin).

### B is a mutually beneficial trade--higher indifference curve for each person.

### Trade may be beneficial but not efficient.

### MRS is equal when indifference curves are tangent and the allocation is efficient.

## The Contract Curve

### To find all possible efficient allocations of food and clothing consumers, we would look for all points of tangency between each of their indifference curves.

## Observations

##  1) All points of tangency between the indifference curves are efficient.

##  2) The contract curve shows all allocations that are Pareto efficient.

#### Pareto efficient allocation occurs when trade will make someone worse off.

# Competitive Equilibrium

# Competitive Equilibrium

# Efficiency in Exchange

## Observations concerning C:

##  1) Since the two indifference curves are tangent, the competitive equilibrium allocation is efficient.

##  2) The MRSCF is equal to the ratio of the prices, or MRSJFC = PC/PF = MRSKFC.

# Efficiency in Exchange

## Observations concerning C:

##  3) If the indifference curves were not tangent, trade would occur.

##  4) The competitive equilibrium is achieved without intervention.

# Efficiency in Exchange

## Observations concerning C:

##  5) In a competitive marketplace, all mutually beneficial trades will be completed and the resulting equilibrium allocation of resources will be economically efficient (the first theorem of welfare economics)

# Equity and Efficiency

## Second Theorem of Welfare Economics

### Consider the cost of programs to redistribute income and the trade off between equity and efficiency.

# Efficiency in Production

## Assume

### Fixed total supplies of two inputs; labor and capital

### Produce two products; food and clothing

### Many people own and sell inputs for income

### Income is distributed between food and clothing

# Efficiency in Production

## Observations

### Linkage between supply and demand (income and expenditures)

### Changes in the price of one input triggers changes in income and demand which establishes a feedback effect.

### Use general equilibrium analysis with feedback effects

# Efficiency in Production

## Production in the Edgeworth Box

### The Edgeworth box can be used to measure inputs to the production process.

# Efficiency in Production

## Production in the Edgeworth Box

### Each axis measures the quantity of an input

#### Horizontal: Labor, 50 hours

#### Vertical: Capital, 30 hours

### Origins measure output

#### OF = Food

#### OC = Clothing

# Efficiency in Production

## Producer Equilibrium in a Competitive Input Market

### Competitive markets create a point of efficient production.

# Efficiency in Production

## Competitive Market Observations

### The wage rate (w) and the price of capital (r) will be the same for all industries.

### Minimize production cost

#### MPL/MPK = w/r

#### w/r = MRTSLK

### MRTS = slope of the isoquant

### Competitive equilibrium is on the production contract curve.

### Competitive equilibrium is efficient.

# Efficiency in Production

## The Production Possibilities Frontier

### Shows the various combinations of food and clothing that can be produced with fixed inputs of labor and capital.

### Derived from the contract curve

# Production Possibilities Frontier

# Production Possibilities Frontier

# Efficiency in Production

## Output Efficiency

### Goods must be produced at minimum cost and must be produced in combinations that match people’s willingness to pay for them.

#### Efficient output and Pareto efficient allocation

#### Occurs where MRS = MRT

# Efficiency in Production

## Assume

### MRT = 1 and MRT = 2

### Consumers will give up 2 clothes for 1 food

### Cost of 1 food is 1 clothing

### Too little food is being produced

### Increase food production (MRS falls and MRT increases)

# Output Efficiency

# Competition and Output Efficiency

# Efficiency in Production

## Efficiency in Output Markets

### Consumer’s Budget Allocation

### Profit Maximizing Firm

###

# Why Markets Fail

## Market Power

### In a monopoly in a product market, MR < P

#### MC = MR

#### Lower output than a competitive market

#### Resources allocated to another market

#### Inefficient allocation

# Why Markets Fail

## Incomplete Information

### Lack of information creates a barrier to resource mobility.

## Externalities

### When consumption or production creates cost and benefits to third parties which changes the cost and benefits of decisions and create inefficiencies.