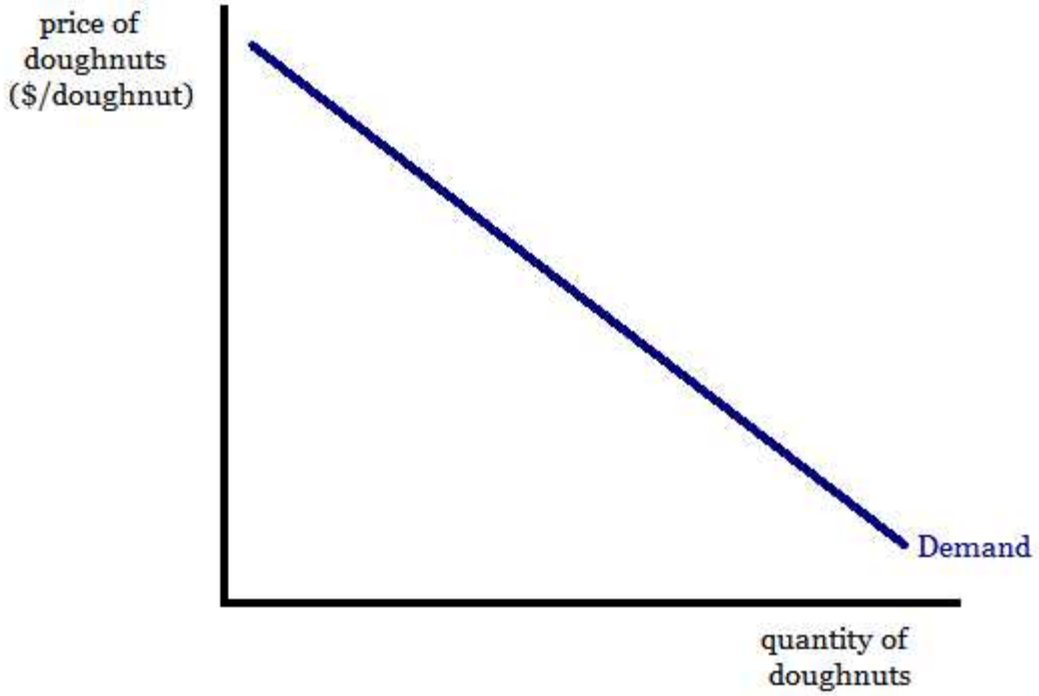
Guns	Butter
200	0
175	75
130	125
70	150
0	160

- What it shows: the maximum combinations of two goods an economy can produce with its existing resources and technology; an economy can produce at points on or inside its PPF but points outside the curve are unattainable
- full employment: points inside the PPF are inefficient and represent large scale unemployment because the economy could produce more of both goods while points on the PPC are efficient and consistent with full-employment of resources
- Shape: the PPF is concave or bowed out away from the origin because of increasing opportunity costs resulting from specialized resources (resources are not equally suited to producing all products)

Opportunity costs are equal to the amount given up divided by the amount gained.

Guns	Butter	Opportunity Cost of Producing Butter
200	0	-
175	75	1/3
130	125	9/10
70	150	2 2/5
0	160	7

A demand curve is a graph of the demand schedule.



Supply

Supply is willingness and ability of firm to offer goods for sale in a market. A supply schedule is a list ofthe amounts firm are willing to offer for sale at each of the possible prices.

Price ($/doughnut)	Quantity supplied (number of doughnuts)
$10	16
8	12
6	6
4	4
2	1

Businesses are in business to make profits. When the price of a good rises it becomes more profitable to produce that good. So, firms will devote more resources to the production of a good whose price has risen. There is a direct, positive relationship between price and quantity supplied.

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Lecture 8: Supply and Demand, Part 3

things that shift the demand curve (continued)
changes in supply
things that shift the supply curve

Things that Shift the Demand Curve (continued)

A change in the price of a good causes a movement along the demand curve for that good. The quantity demanded changes but demand there is no change in demand. A change in anything else that effects the demand for the good causes the demand curve to shift.

- changes in tastes/preferences
- changes in income
- changes in the prices of related goods
    1. substitutes - one good can take the place or function of another
        - price of good A demand for good B increases
        - price of good A demand for good B decreases
    2. complements - goods that are usually consumed together
        - price of good A demand for good B decreases
        - price of good A demand for good B increases
- changes in the number of potential buyers
    - more buyers demand increases
    - fewer buyers demand decreases

  changes in expectations of future prices
    - expect higher prices demand increases now
    - expect lower prices demand decreases now

Changes in Supply

An increase in the price of a good (due, say, to an increase in demand) has no effect on the supply curve. A change in the price of a good causes a movement along the supply curve. A change in anything else that effects supply causes the supply curve to shift.

When the amount firms are willing to offer for sale goes up at all possible prices, the supply curve shifts down to the right. This is an **increase in supply**.

When the amount firms are willing to offer for sale falls for all possible prices, the supply curve shifts up to the left. This is an **decrease in supply**.

Things that Shift the Supply Curve

A change in the price of a good causes a movement along the supply curve for that good. The quantity supplied changes but supply is unchanged. A change in anything else that effects the supply for the good causes the supply curve to shift.

- changes the costs of inputs
  - higher costs supply decreases
  - lower costs supply increases
- new technology
  - new technology supply increases
- weather and other "Acts of God"
  - adverse supply decreases
  - beneficial supply increases
- changes in the prices of related goods
  1. substitutes in production - firms can easily switch from producing one item to the other
     - price of good A supply of good B decreases
     - price of good A supply of good B increases
  2. oint products - goods that are normally produced together
     - price of good A supply of good B increases
     - price of good A supply of good B decreases

changes in expectations of future prices
- expect higher prices supply decreases now
- expect lower prices supply increases now

changes the number of sellers
- more sellers supply increases
- fewer sellers supply decreases

Lecture 11: Applications of Elasticity, Part 1

midpoint formula
determinants of price elasticity of demand
elasticity and total revenue

Midpoint Formula

Calculating the price elasticity of demand with the formula

$$\text{price elasticity of demand} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

gives a different answer depending on whether price increases or decreases.

The midpoint formula gives the same elasticity value regardless of whether price has increased or decreased.

$$\frac{\text{New Quantity} - \text{Old Quantity}}{\text{Old Quantity} + \text{New Quantity}} \times \frac{\text{Old Price} + \text{New Price}}{\text{New Price} - \text{Old Price}}$$

The price elasticity of demand declines as we move down a straight line demand curve.

Determinants of Price Elasticity of Demand

1. existence of substitutes: the more substitutes, the more elastic the demand
2. importance of the product in the consumer's total budget: the greater the portion of the consumer's budget, the more elastic the demand
3. time period under consideration: the longer the time period, the more elastic
4. luxury or a necessity: the demand for luxuries is relatively elastic
5. definition of the market: the more broadly defined the market, the more inelastic the demand, e.g. food vs. chicken

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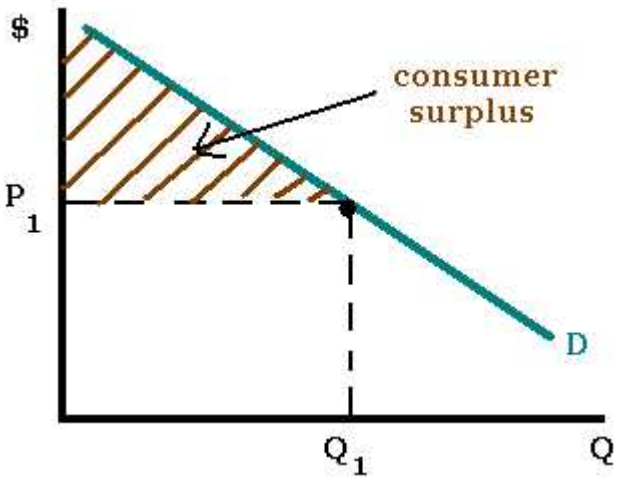
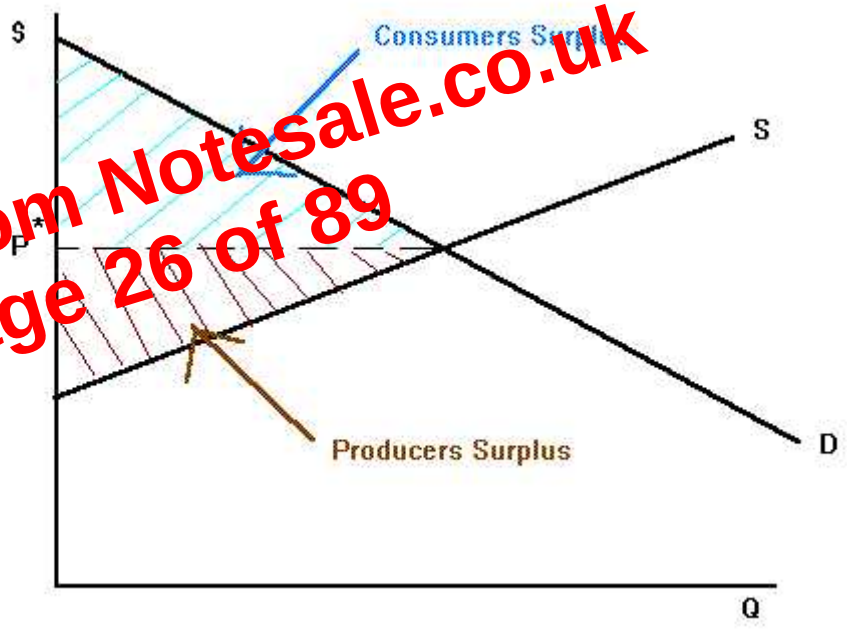
Graphically, consumer surplus is the area below the demand curve above the market price.



producer surplus

the difference between the market price and the lowest price the firm is willing to accept

Graphically, producer surplus is the area above the supply curve below the market price.



Lecture 15 - Consumer Choice

indifference analysis
budget line
consumer equilibrium

Indifference Analysis

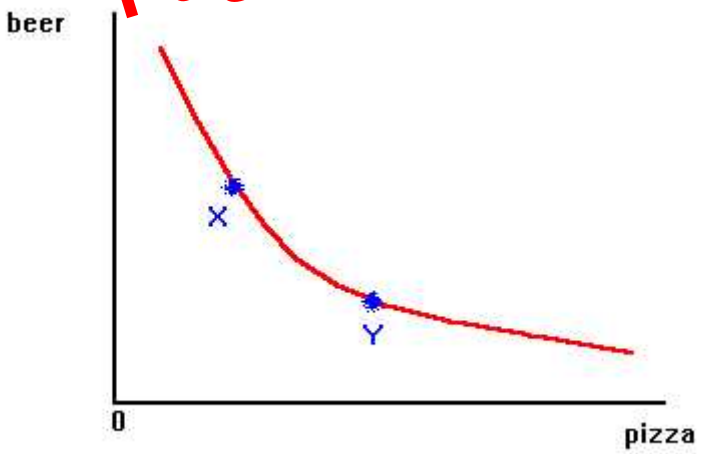
Consider a consumer with a given money income, all of which she spends on only two goods: pizza and beer. The combinations of pizza and beer are called bundles.

X = (2 slices of pizza, 3 bottles of beer)
Y = (3 slices of pizza, 2 bottles of beer)

Assume that the consumer can tell us whether

1. X is preferred to Y
2. Y is preferred to X
3. she is indifferent between X and Y: she likes bundles X and Y equally well

Suppose she is indifferent between X and Y. Connecting the points gives an indifference curve. An indifference curve shows all combinations of pizza and beer that the consumer is indifferent among. Indifference curves are used to represent consumer preferences.



- Indifference curves are downward sloping.
- The indifference curve bows in towards to origin because the more slices of pizza you've already eaten, the less willing you are to trade a bottle of beer for more pizza.
- Indifference curves cannot cross.

Here's an example of making these calculations:

number of workers	TPP	MPP	APP
0	0		
1	15	15	15
2	34	19	17
3	48	14	16
4	60	12	15
5	62	2	12.4
6	60	-2	10

The table above exhibits the **law of diminishing returns**: if more of one resource is employed while all other resource are held constant, eventually the MPP of that one resource must fall.

Notice that whenever MPP > APP, APP is rising and when MPP < APP, APP is falling. This is strictly a mathematical result. Whenever the marginal is greater than the average, we are adding in numbers that are greater than the current average. So, the average must rise. When marginal is less than average, we are adding in numbers that are less than the current average. Therefore, the average must fall.

Here's an example. Suppose your first exam score was 80. Then your average exam score is 80. Then, you get a 100 on the second exam. Your marginal test grade is 100. Your marginal score, 100, is greater than your old average score, 80, so your average exam score rises to 90. Suppose you get a 30 on the next exam. Since your marginal score, 30, is less than your average of 90, the average must fall. Now your average exam score is 70. If you do better than a 70 on the fourth exam, your average will rise, if you do worse your average falls. If your marginal exam score, the grade on the fourth exam, equals 70, then your average exam score does not change.

Lecture 18: Costs in the Short Run

costs in the short run

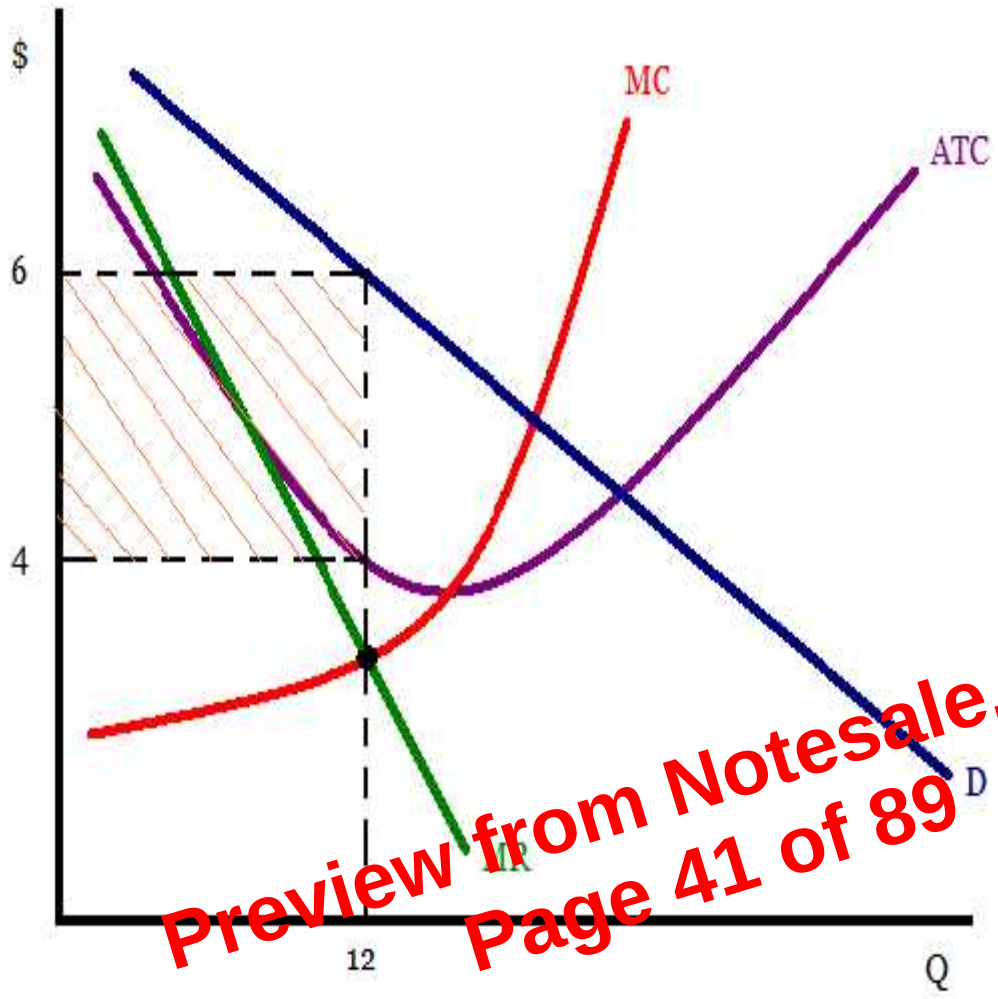
Costs in the Short Run

Firms face two types of costs in the short-run:

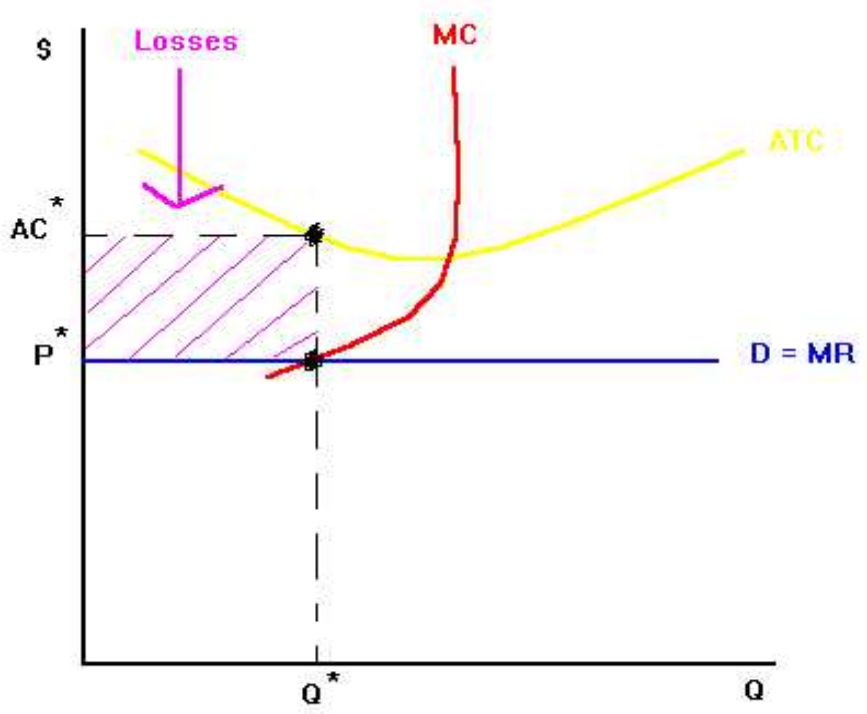
1. fixed costs: those costs that do not change as output increases and are incurred even if no output is produced at all, e.g. interest, depreciation, fire insurance
2. variable costs: those costs that do increase as output increases

Total Costs (TC) = Total Fixed Costs (TFC) + Total Variable Costs (TVC)

Finding the Profit Maximizing Level of Output Graphically



When the firm can produce fractional units of the good, profits are maximized at the quantity at which **MR = MC**. Graphically, this occurs where the marginal revenue and marginal cost curves intersect. Drop straight down from the point of intersection to find the profit maximizing quantity of output, $Q^* = 12$. To find the profit maximizing price, follow Q^* up to the demand curve and over to the vertical axis, $P^* = \$6$. The average cost of producing Q^* are found on the ATC curve. $AC^* = \$4$. The firm sells each unit of output for \$6; it costs the firm \$4 to produce each unit of output. Profits per unit of output are the price, \$6, minus the average cost of \$4, which equals \$2. Multiply the per unit profits of \$2 by the profit maximizing quantity of output, 12, to get total profits of \$24. Graphically, profits are equal to the cross-hatched area.



Lecture 23: Perfect Competition in the Long Run

the shutdown decision
firm's short-run supply curve zero long run profits
consumer surplus
producer surplus

The Shutdown Decision

In the short-run, certain costs, such as rent on land and equipment, must be paid whether or not any output is produced. These are the firm's fixed costs. When the firm is deciding whether or not to produce any output at all (the level of output is given by MR=P=MC), the firm looks only at its variable costs. The firm will produce if it can earn sufficient revenue to pay the variable costs.

- produce if TR > TVC (if P > AVC)
- shutdown if TR < TVC (if P < AVC)

Lecture 28: The Labor Market

resource demand
monopsony
supply and demand for labor
wage differentials

Resource Demand

Firms demand resources. Resources are wanted for what they can produce. They have value because they can be used to make something of value.

shifts in resource demand: MRP = MPP x MR

1. changes in the price of the product it is used to produce
2. changes in technology
3. changes in the number of buyers of the resource
4. changes in the price of substitute resources

Monopsony

A monopsony is a single buyer of a resource. A monopsonist faces an upward sloping resource supply curve. Therefore, in order to obtain more of a resource, the firm must offer a higher price. For a monopsonist in the labor market, the wage is not equal to marginal resource cost.

# of accountants	MRP	wage	TRC	MRC
1	$100	$25	$25	$25
2	1300	50	100	75
3	600	100	300	200
4	400	150	600	300
5	200	200	1000	400
6	100	250	1500	500

compensating wage differentials

Compensating wage differentials make up for high risk or poor working conditions. Construction workers on skyscrapers receive a higher wage than construction workers renovating a house because of the greater risk of falling to your death.

human capital

Human capital is the knowledge, skills, education, training, and ability possessed by workers. Skilled workers are those with lots of human capital; unskilled workers possess little human capital. Skilled workers receive a higher wage than unskilled workers because (1) skilled workers have a higher MRP than unskilled workers and (2) the supply of skilled workers is smaller than the supply of unskilled workers. Attending college is an example of investment in human capital.

Lecture 29: The Market for Capital

production of capital
present value
demand for capital

Production of Capital

Capital is the physical tools of production: buidling, machinery, factories, and equipment. The production of capital goods requires the use of resources that could have been used to produce consumption goods. Current consumption must be sacrificed in order to accumulate capital with which more output can be produced in the future. This sacrifice is called saving.

Present Value

A profit maximizing firm will hire capital up to the point at which the marginal revenue product of capital is equal to the marginal resource cost of capital. The marginal revenue product of capital is the stream of revenues over time from that piece of capital. The problem is that dollars received in the future are not as valuable as today's dollars. The concept of present value is used to compare dollars amounts received/spent at different points in time.

Present value is the value today of some amount to be received in the future. If I put $100 in the bank and receive 5% interest, I will have $105 in 1 year. So, the present value of $105 to be received in 1 year is $100. Receiving $100 now is the same as getting $105 1 year from now because $100 will grow into $105 in a year.

$$\text{present value of \$1 to} = \frac{\$1}{\text{------------}}$$

excludability

a person can be prevented from using the good

rivalry

one person's use diminishes other people's use

Because people can enjoy a public good without paying for it, they have an incentive to be a free rider: to consume the public good without paying for it.

How Much Should the Government Spend on a Public Good?

number of streetlights	Marginal Benefit to:	Smith (50%)	Jones (30%)	Brown (20%)	Total
1		$450	$270	$180	$900
2		400	240	160	800
3		350	210	140	700
4		300	180	120	600
5		250	150	100	500
6		200	120	80	400

Assume that streetlights cost $500 each: MB=MC at 5 lights. So, the efficient quantity of streetlights is 5.

How Much Will Be Spent?

1. voluntary contributions

   none will be supplied since the MC of the first streetlight is greater than the MB for each person

2. costs shared in proportion to benefits received

   for each light: Smith pays $250, Jones pays $150, and Brown pays $100. They would unanimously vote for 5 streetlights. This outcome is efficient.

3. costs shared equally

   for each light: Smith pays $267, Jones pays $167, and Brown pays $167. They would unanimously vote for the first streetlight. Smith and Jones will vote for the second, third, and fourth lights. But, Jones and Brown will vote against the fifth. So, when costs are shared equally, governments spend less than the efficient amount.

	Production	Consumption
Harmful	acid rain damage from sulfur dioxide emissions from a coal burning power plant	noisy party
Beneficial	smell from a bakery	measles vaccination

Economists make a distinction between private costs and external costs. Private costs are borne by someone involved in the transaction that created the externality. External costs are borne by someone not involved in the transaction. The same distinction is made between private and external benefits.

Social costs = private costs + external costs

Social benefits = private benefits + external benefits

When there are external costs or benefits, a free market produces too much (in the case of a harmful externality) or too little (when the externality is beneficial) of the good.

Optimal Quantity of Pollution

Pollution is an example of an externality.

When firm discharge unprocessed waste into the environment it is costly because ituses up natural resources.

Reduction of the quantity of waste discharged into the environment is called **pollution abatement**. By polluting, firms avoid the costs of pollution abatement. So, polluters receive benefits from discharging wastes into the environment.