

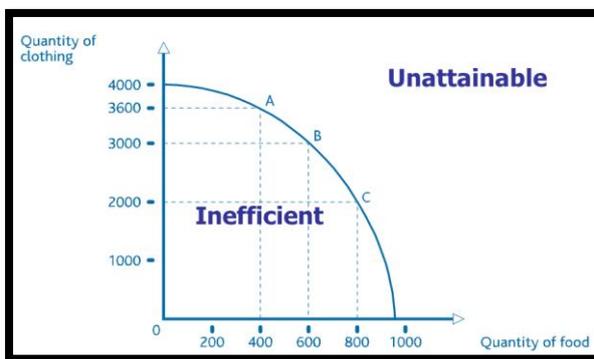
LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Opportunity cost

- The best alternative forgone when we make a choice
- OPC arises because time and resources are scarce
- OPC can be measured in terms of dollars and time

Production possibility frontier

- Graph illustrating the attainable choices to a firm or economy assuming a given level of resources and state of technology
- Illustrates concepts of scarcity, choice and OPC
- Provides shorthand method of illustrating economic problem: what to produce, how to produce and for whom to produce
- Shows the limit of resources available in an economy at a given point in time
- Shows the level of technology available in an economy at a given point in time



Shape of PPF

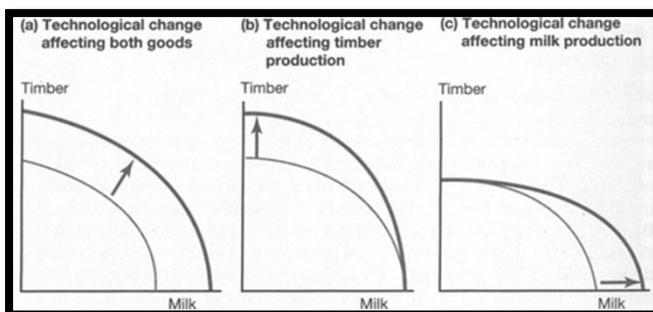
- As production expands OPC of producing extra units increases

Principal of increasing cost

- Resources are specialised or specific
- Difficult or impossible to transfer from one user to another

To push PPF out

- Discover new resources
- Improved technology



Marginalism

- In weighing the costs and benefits of a decision it's important to weigh only costs and benefits that arise from the decision
- Marginal benefit > marginal cost to make the choice
- When deciding whether to produce additional output a firm considers only additional costs not any costs

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Sunk costs

- Costs that cannot be avoided regardless of what is done in the future because they have already been incurred
- They are the expenditures which we have already committed

Efficient markets

- One which profit opportunities are eliminated almost instantaneously

Market

- Group of buyers and sellers of a particular g/s

Law of diminishing marginal utility

- Only produce up until marginal utility = price

Law of demand

- There is an inverse relationship between price and quantity demanded
- As price increases quantity demanded decreases

Market demand

- The sum of all individual demands for a g/s
- Individual demand curves are summed horizontally to obtain market demand curve

Ceteris paribus

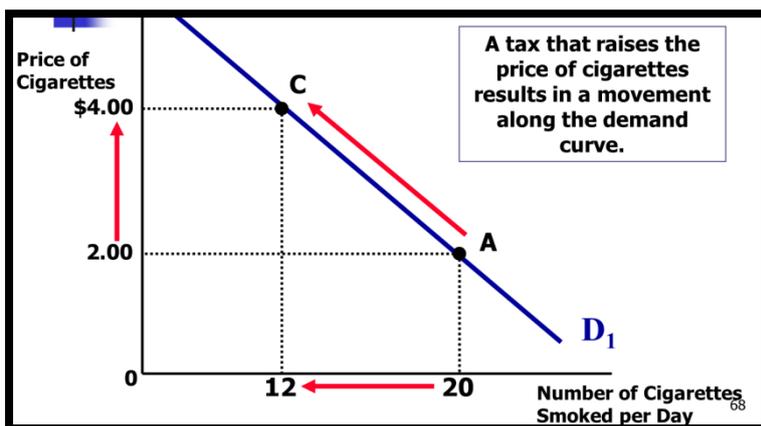
- All variables other than the ones being studied are assumed to be constant

Determinants/shifts of demand

- Taste
- Fashion
- Price of complements and substitutes
- Size and nature of population
- Price isn't a determinant of demand only quantity demanded

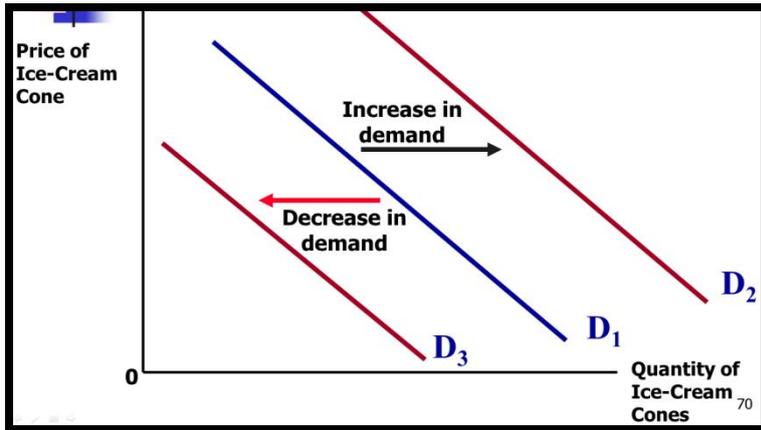
Change in quantity demanded

- Movement along demand curve caused by a change in price of a product



Change in demand

- Shift in demand curve caused by a change in determinant other than price



Change in income

- If demand for good is positively related to income it's called a normal good
- Demand increases when income increases
- Demand decreases when income falls
- If demand for good is inversely related to income it's called inferior good

Substitutes and compliments

- Two goods are substitutes if a rise in price of one increases demand for the other
- Two goods are compliments if rise in price of one decreases demand for the other

Supply

- Quantity supplied is amount of a good sellers are willing and able to sell at every price

Supply schedule

- Table showing the relationship between price and quantity supplied

Supply curve

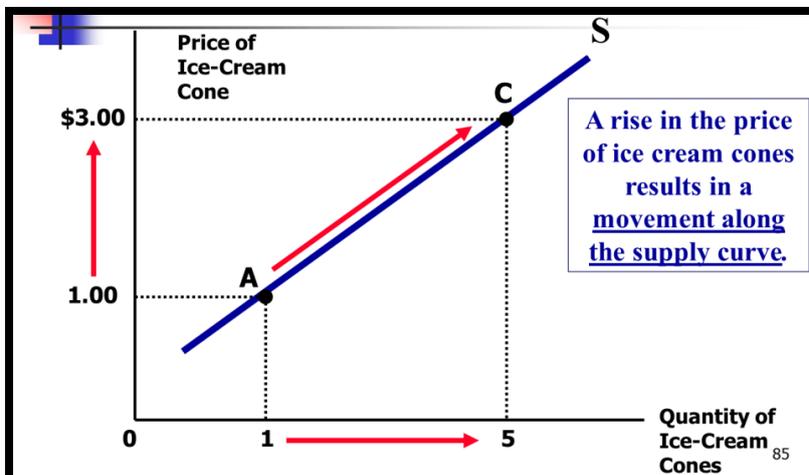
- Upward sloping line relating to price and quantity supplied

Law of supply

- States a direct positive relationship between price and quantity supplied

Market supply

- The sum of all individual supplies for all sellers of a g/s
- Individual supply curves are summed horizontally to obtain market supply curve



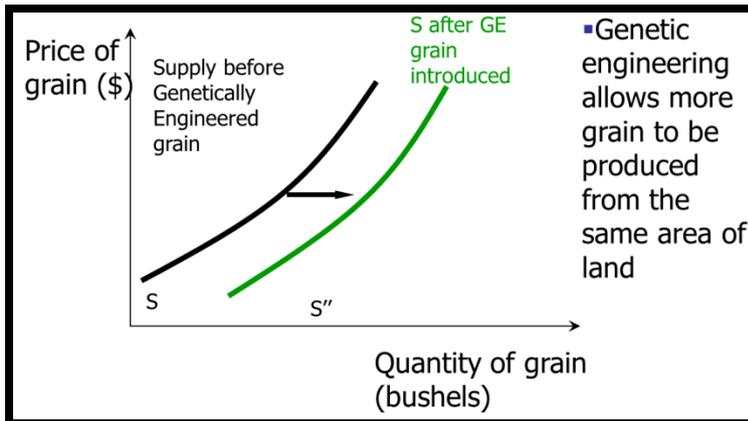
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Determinants of supply

- Cost of production
- Number of suppliers
- Technology
- Climate
- Price of good is not a determinant of supply only quantity supplied

Change in supply

- Shift in the supply curve caused by a change in determinant other than price

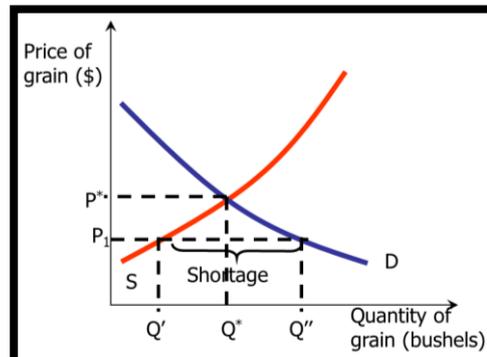
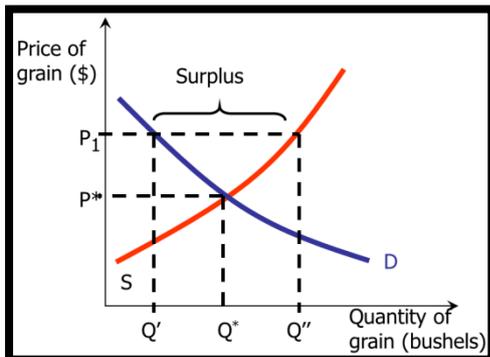


Equilibrium

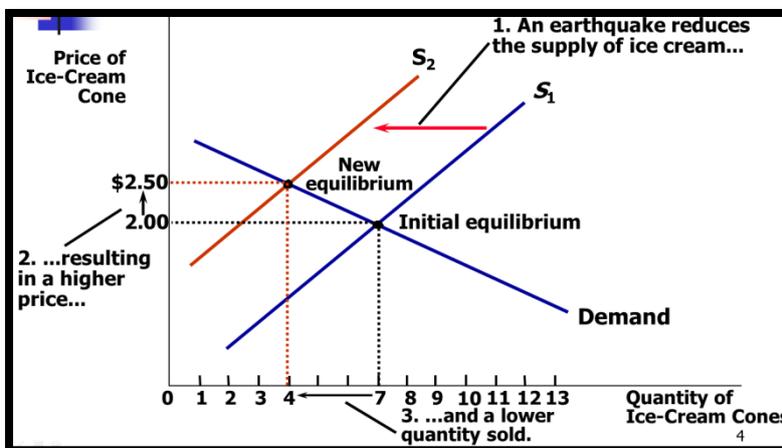
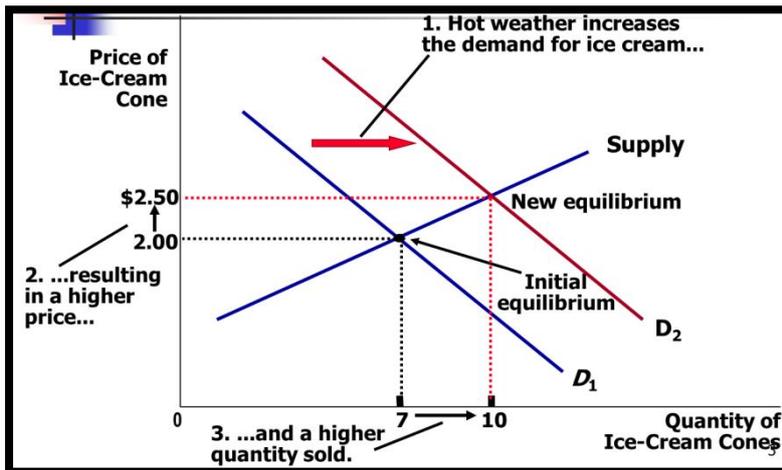
- Price and quantity that balances supply and demand, where supply and demand curve intersect

Disequilibrium

- Shortage of goods – excess demand
- Surplus of goods – excess supply



Changes in equilibrium



	No Change In Supply	An Increase In Supply	A Decrease In Supply
No Change In Demand	P same Q same	P down Q up	P up Q down
An Increase In Demand	P up Q up	P ambiguous Q up	P up Q ambiguous
A Decrease In Demand	P down Q down	P down Q ambiguous	P ambiguous Q down

Government interference on equilibrium

- Tax on goods
- Price floor
- Price ceiling

Price elasticity of demand

- Measure of responsiveness of quantity demanded to a change in the price of a good
- Helps predict what will happen to total revenue earned by supplier with price changes
- The larger the elasticity the more sensitivity quantity demanded is to price changes

$$PED = \frac{\text{percentage } \Delta \text{ quantity demanded}}{\text{percentage } \Delta \text{ price}}$$

Perfectly inelastic demand

- Vertical demand curve
- Price elasticity is zero
- No substitutes
- E.g. Oxygen

Perfectly elastic demand

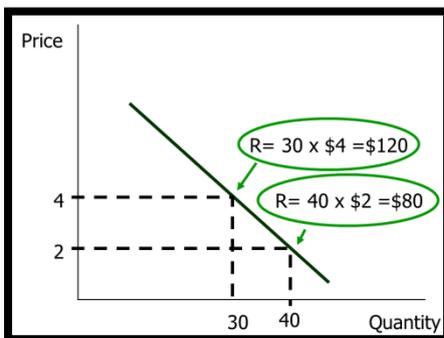
- Horizontal demand curve
- Price elasticity is infinite

Revenue and elasticity

- Price elasticity of market demand indicates whether an increase in price will be expected to increase or decrease producers revenues

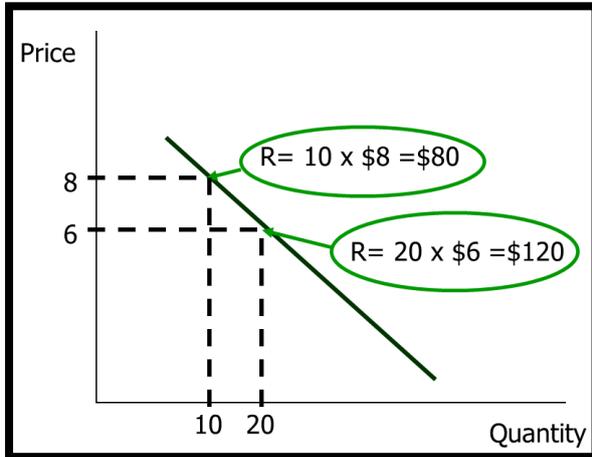
Effects on revenue with inelastic demand

- No satisfactory substitutes available
- Necessity
- A price increase causes total revenue to increase
- Price decrease causes total revenue to decrease
- E.g. petrol, health care



Effects on revenue with elastic demand

- Non-essential good with many satisfactory substitutes
- Increases in price causes total revenue to decrease
- Price decreases causes total revenue to rise
- E.g. cost of mobile phone calls



Determinants of price elasticity of demand

- Price at which its evaluated
- Fraction of income
- Availability of substitutes
- Nature of good (luxury/necessity)
- Time
- Attitude/advertising

Price elasticity of supply

- How responsive quantity supplied is to price changes
- Depends on: time period, whether there is an input fixed in quantity, price which elasticity is evaluated

$$PES = \frac{\text{percentage } \Delta \text{ quantity supplied}}{\text{percentage } \Delta \text{ price}}$$

Cross price elasticity of demand

- The responsiveness of quantity demanded of one product to a change in price of a related good

$$XPED = \frac{\text{percentage } \Delta \text{ quantity demanded of good x}}{\text{percentage } \Delta \text{ price of good y}}$$

Positive cross-price elasticity of demand

- Rise in price of Y results in a rise in quantity demanded of X
- Positive cross price elasticity shows goods are substitutes

Negative cross-price elasticity of demand

- Rise in price of Y causes quantity demanded of X to fall
- Negative cross-price elasticity shows goods are complimentary

Zero cross-price elasticity of demand

- Change in price of Y causes no change in the quantity demanded of X
- Zero cross price elasticity shows goods are unrelated

Income elasticity of demand

- Response of quantity demanded to changes in income

$$IED = \frac{\text{percentage } \Delta \text{ quantity demanded}}{\text{percentage } \Delta \text{ income}}$$

Positive income elasticity of demand

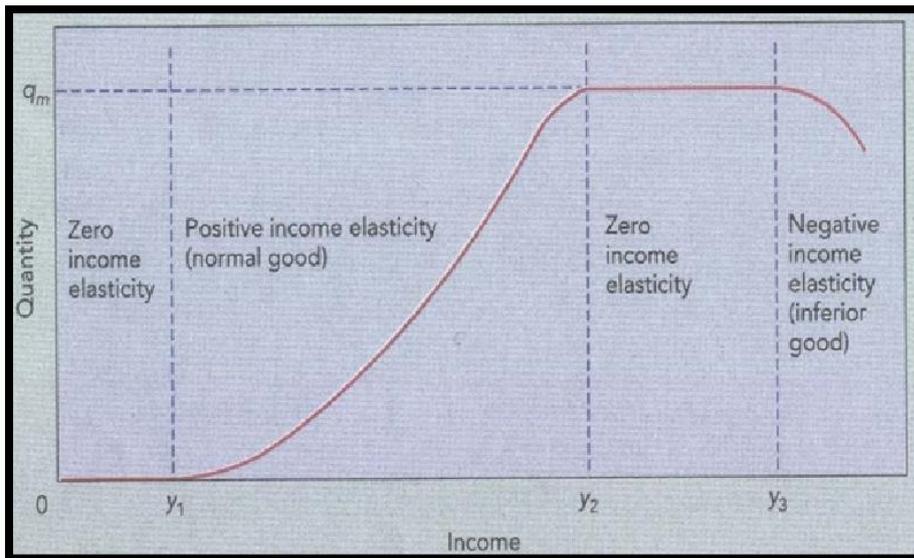
- As income rises quantity demanded of normal goods increases so a rightward shift of demand curve

Negative income elasticity of demand

- As income rises quantity demanded for inferior goods falls so a leftward shift of the demand curve

Zero income elasticity of demand

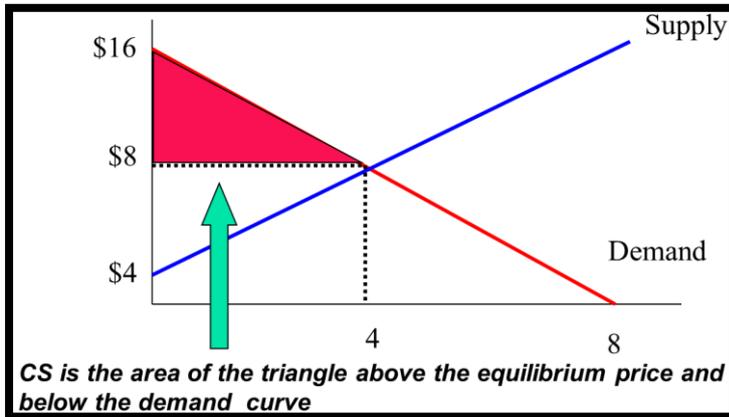
- A rise in income leaves quantity demanded unchanged



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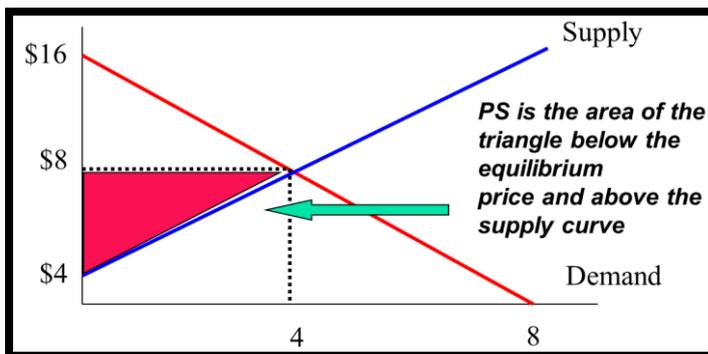
Consumer surplus

- Difference between the price a consumer is willing to pay and the price he actually paid
- Govts use consumer surplus as a measure of welfare impact



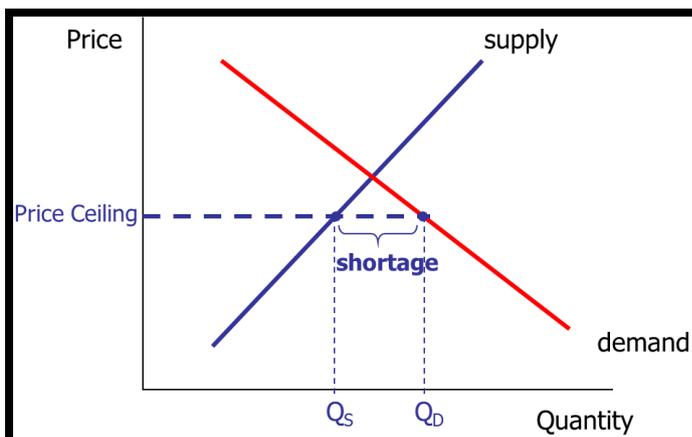
Producer surplus

- Difference between the price a producer is willing to accept and the price he actually gets
- Sum of all individual producer surpluses gives us aggregate producer surplus for the market



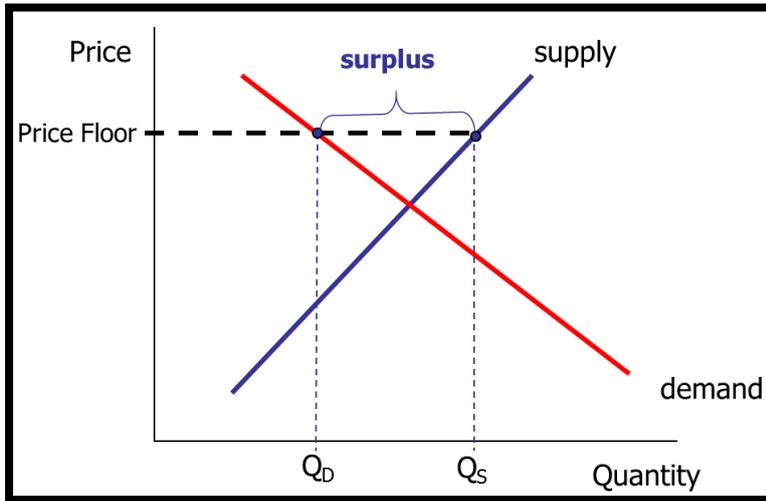
Price ceiling

- Where govt sets a maximum price that suppliers may charge
- Price ceilings lead to shortages
- Govts over riding the price mechanism
- Leads to black markets due to price controls and ends up harming the poorer people in society
- E.g. rent control



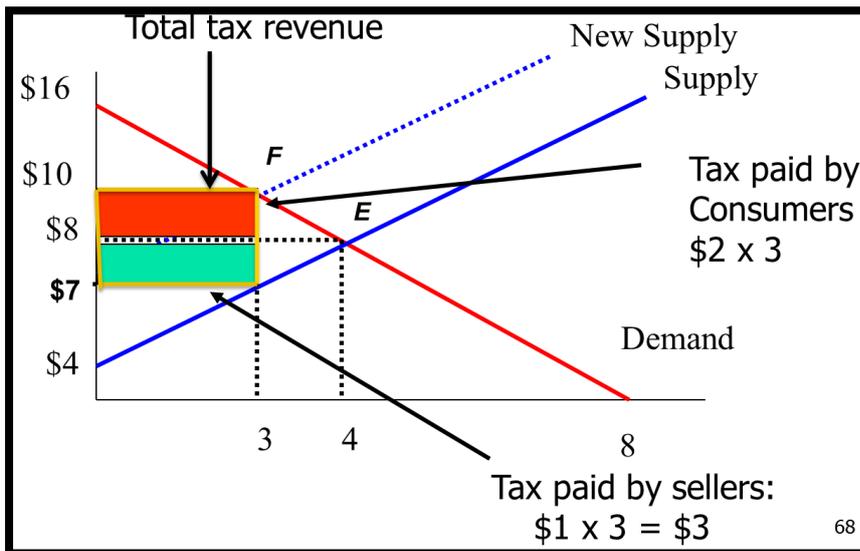
Price floor

- Where govt sets a minimum price that buyers have to pay
- Leads to a surplus
- E.g. agricultural support, prices/subsidies



Taxes

- Tax on g/s is a way of collecting revenue for public services and discouraging consumption of harmful substances



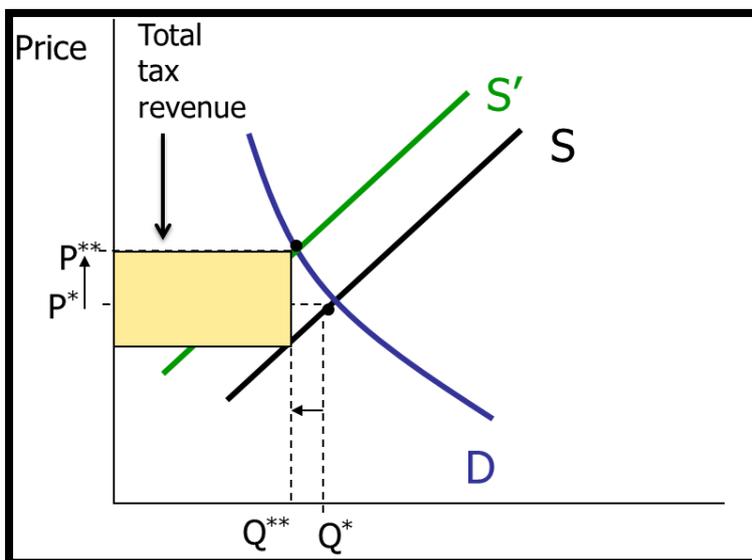
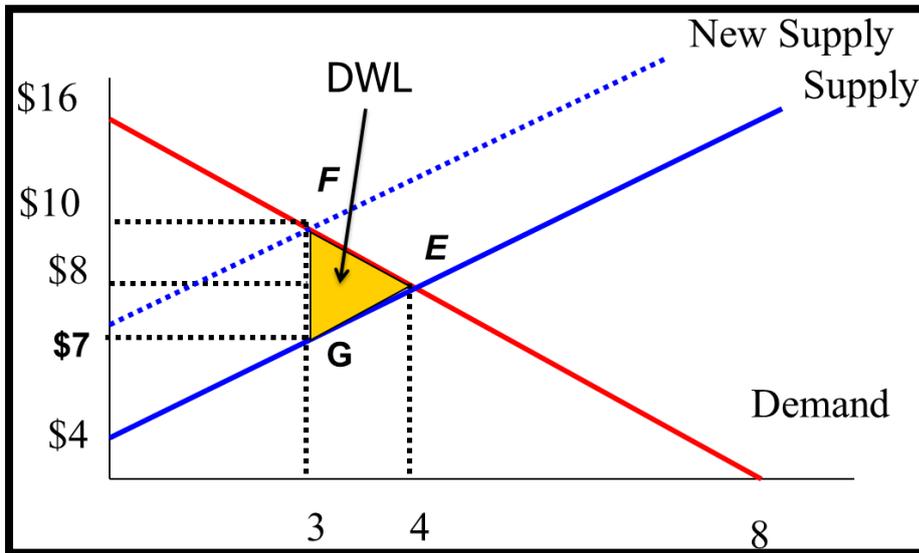
Deadweight loss

- If market left alone equilibrium will occur which is attained with max CS and PS so allocative efficiency is achieved
- When govt interferes it changes market equilibrium and reduces CS and PS which isn't offset by a gain in revenue to govt so a loss in allocative efficiency (deadweight loss)
- Also called excess burden carried by consumers and producers

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Deadweight loss of a tax

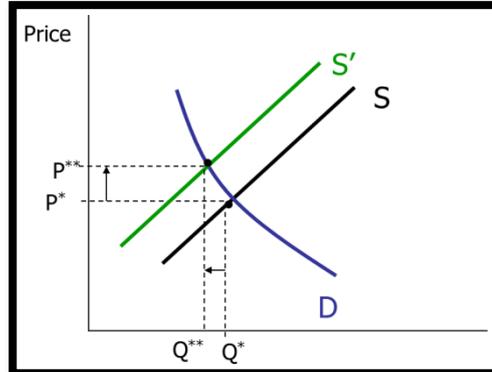
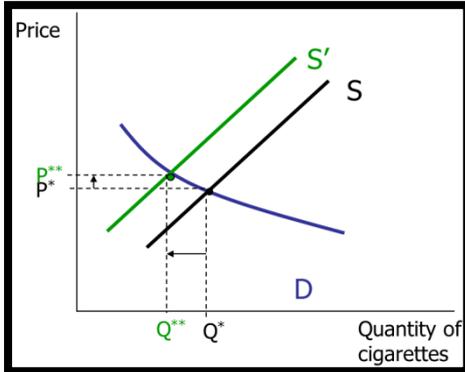
- A tax reduces economic surplus as it distorts the basic cost-benefit criterion that would guide efficient decision making about consumption and production
- A loss on society
- Tax forces equilibrium price up
- So some buyers and sellers get squeezed out as a result of price increases caused by tax
- DWL can come in the form of admin costs when subsidies are introduced



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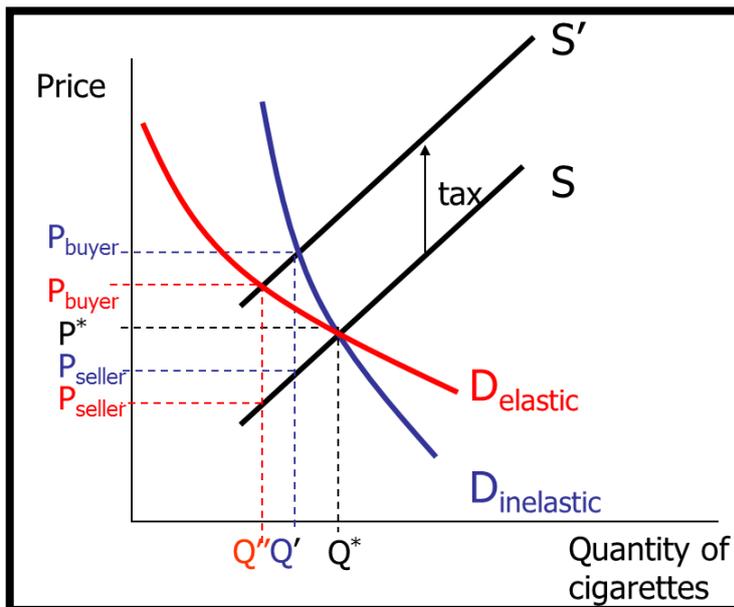
Shifts in supply on demand

- When demand is highly elastic a shift in supply will have a small effect on price and a large effect on quantity
- When demand is highly inelastic a shift in supply will have a large effect on price and a small effect on quantity



Tax incidence

- The more inelastic demand is the higher the proportion of tax is on the buyer
- The more elastic demand is the higher the proportion of tax is on the seller



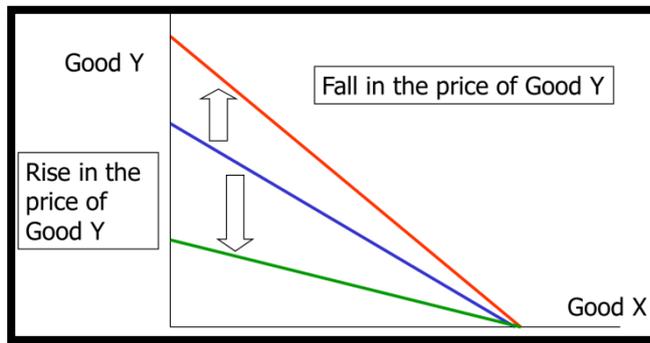
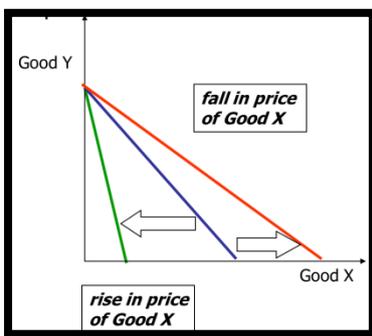
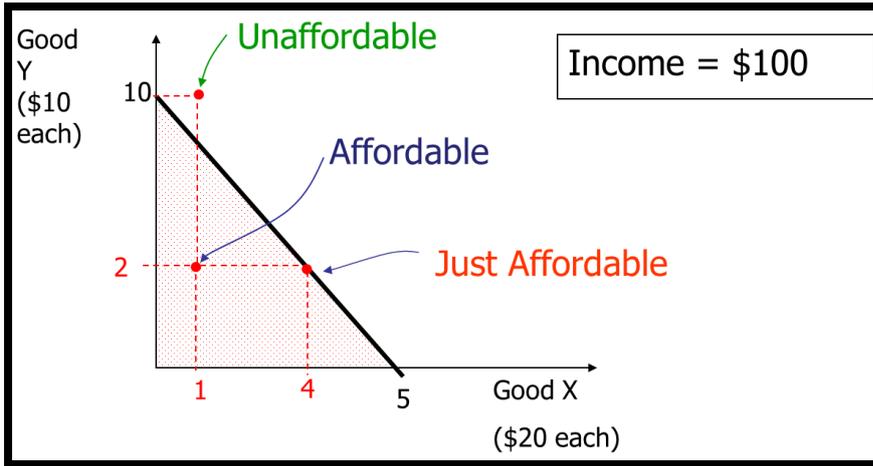
The opportunity set

- Consists of the combination of goods a person can afford, it depends on income and the price of each good

Budget constraint

- Graphs the frontier of the opportunity set when only two goods are available
- Is always a straight line with a negative slope
- We only focus on the absolute value of the slope
- Changes in income will shift the budget constraint parallel
- Changes in price swivels the budget constraint

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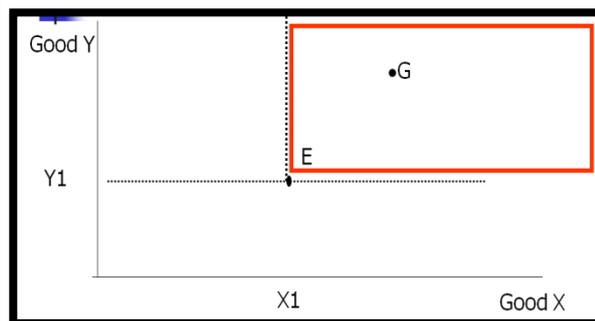
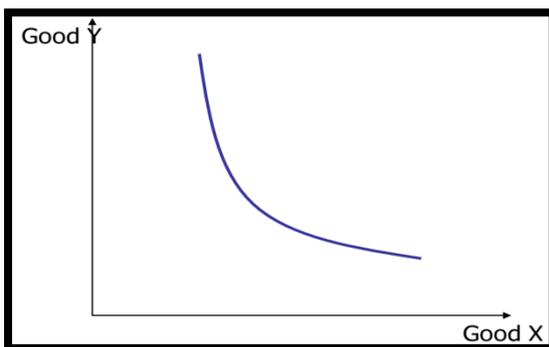


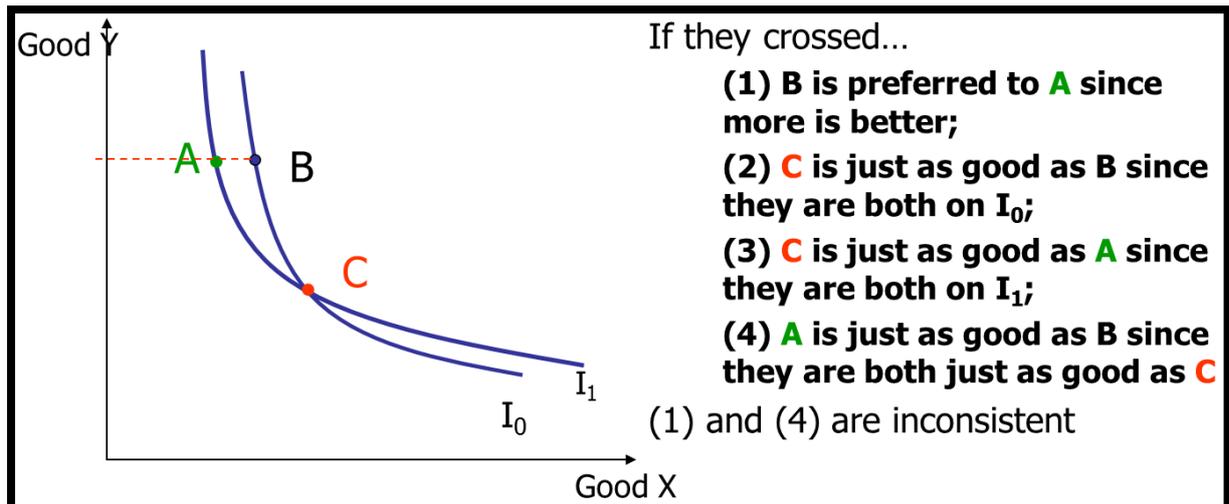
Utility

- The satisfaction a consumer derives from consumption of a bundle of goods

Indifference curves

- Depicts the combination of two goods which an individual is indifferent too
- Any consumption bundle which lies north and east is preferred
- Any consumption bundle which lies south and west is not preferred
- NE > SW = higher utility
- Indifference curves are usually smooth and cant cross





More is better assumption

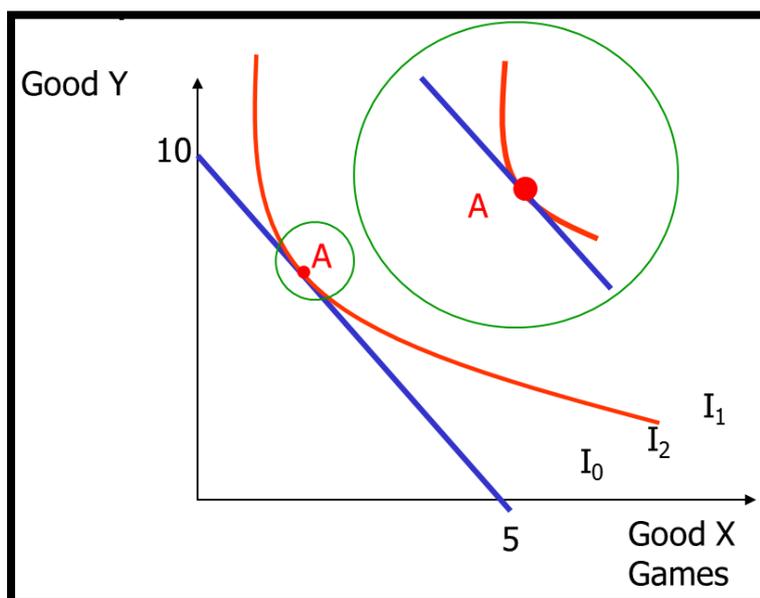
- The more of a good a person has the better off they are
- This implies indifference curves slope down and higher indifference curves represent higher utility levels
- Indifference curves cannot cross
- Curves to north east represent higher levels of utility

Diminishing Marginal rate of substitution

- The more of one good a consumer has the more he is willing to give up to get an additional unit of the other good
- This means indifference curves are flatter as we move along it and can be interpreted as a preference for averages rather than extremes

The optimal choice

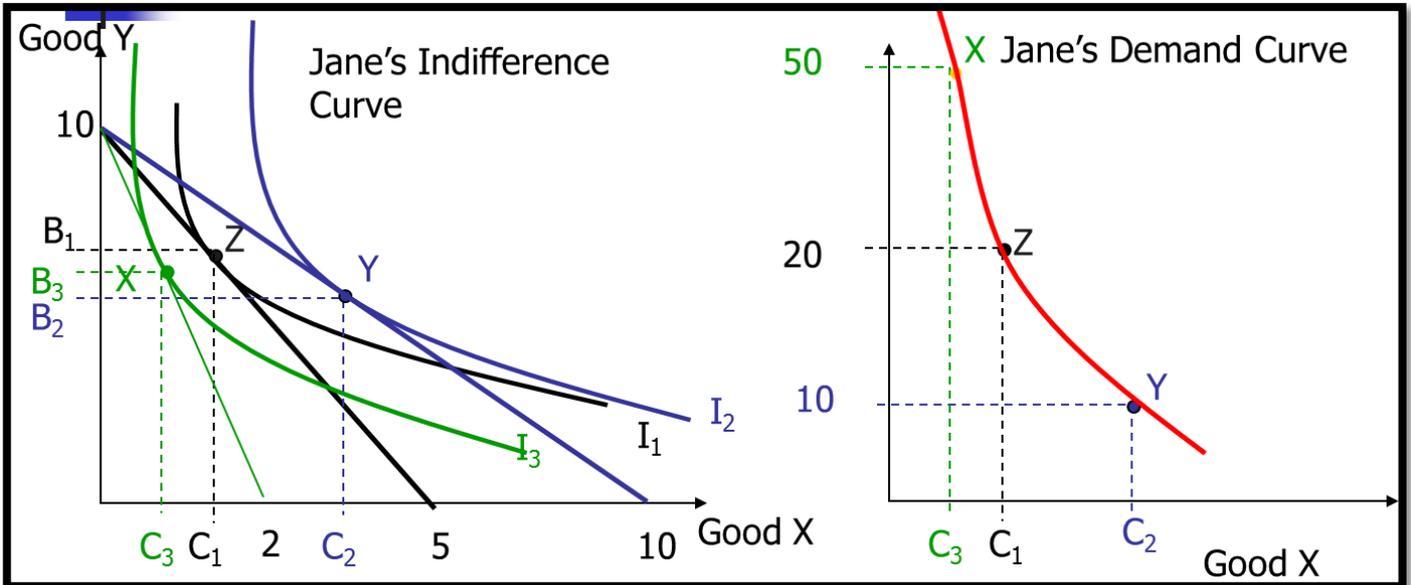
- At the optimal bundle the indifference curve is tangible to the budget constraint
- The optimal choice is where the slopes are equal
- Marginal rate of substitution is where price of x/price of y



Using indifference curves to illustrate choice

- Budget constraint and indifference curves are used to illustrate change in consumption when price changes
- A price change swivels the budget constraint

Deriving the demand curve

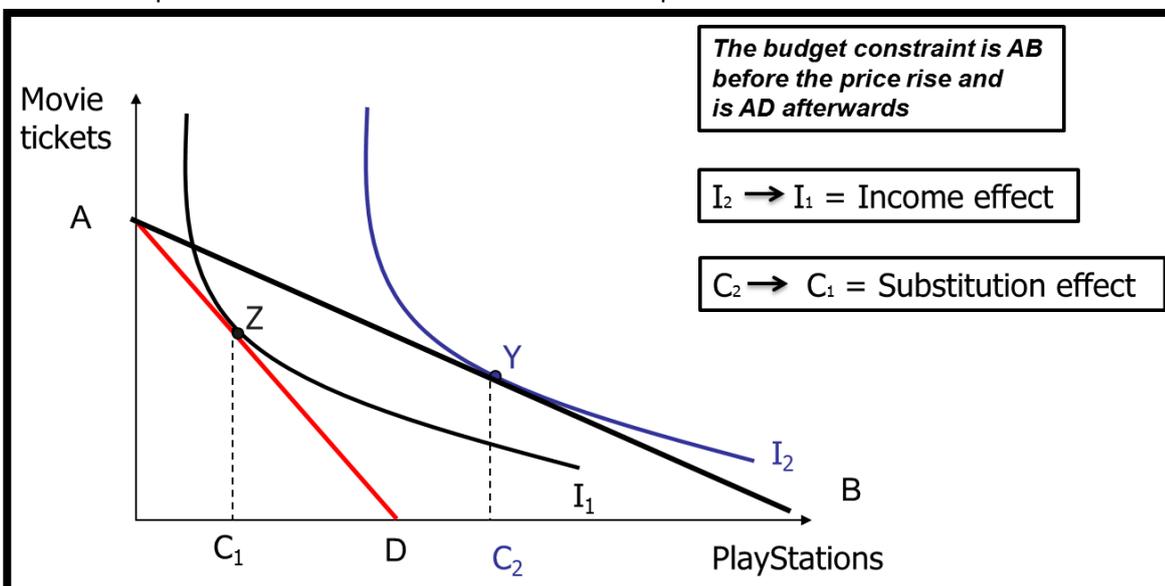


Income effect

- Change in quantity demanded due to the fact that the price change has changed the amount of both goods that can be consumed

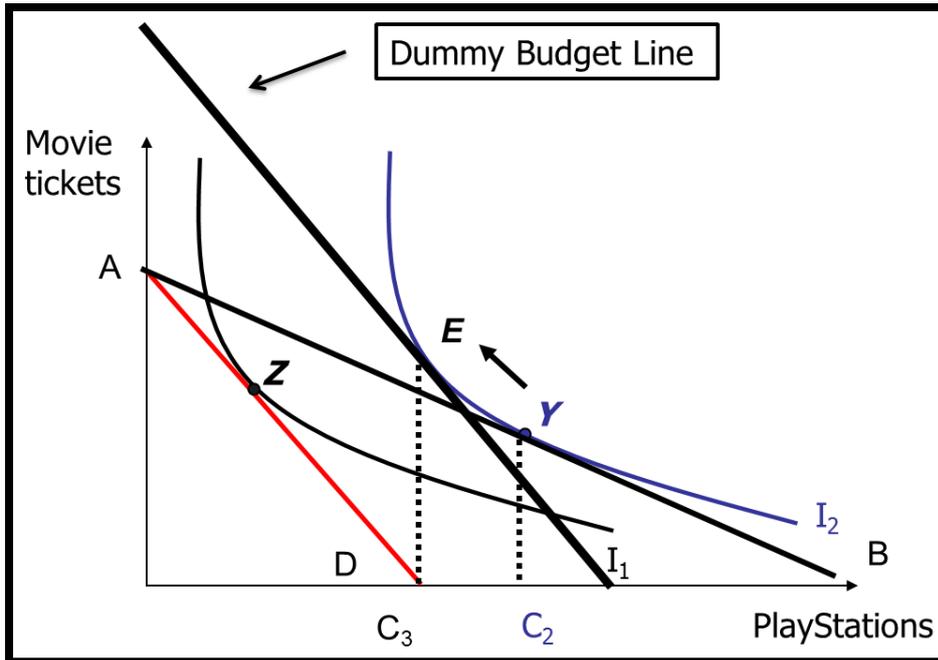
Substitution effect

- Change in quantity demanded due to the change in the relative price of the good
- When price of good rises, consumers substitute away from expensive goods to cheaper alternatives
- When price falls consumers substitute towards the cheaper goods and away from more expensive goods
- If the price rises, this will result in a loss of utility for the consumer as they now feel poorer
- A shift in both the budget constraint and indifference curve is the result of the relative price of goods rising meaning consumer can purchase less and because of this the consumer experiences a loss of income because of the price rises



Dummy budget line

- Used to isolate a point and show a shift to the new real level of consumption



Profits

- Profit = total revenue – total cost
- Profits change as quantity changes

Profit maximising assumption

- Economist assume suppliers want to maximise profits
- This means they want to minimise the cost of producing any quantity
- The lower the cost of producing a given quantity the higher the profits

Production function

- Shows the relationship between quantity of inputs and quantity of outputs
- We assume the firm knows its production function

Average product

- The total amount of output divided by the amount of input
- Other inputs are held constant
- E.g. average product of labour is total output divided by total units of labour

Marginal product

- The increase in output due to an increase in one input
- When all other inputs are held constant

Marginal product of labour

- The slope of the production function at a certain point

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Diminishing marginal returns (law of variable proportions)

- The more of one input is added while other inputs remain unchanged the marginal product of the added input diminishes
- Happens when one input is fixed due to the fact that the fixed input imposes a capacity constraint

Long run

- The shortest time it takes for all inputs to become variable
- Firms plan for the long run where they can adjust the size of all inputs to production

Short run

- The time period during which at least one input is fixed
- Firms operate in the short run where they have chosen their cost structure and can only increase output by varying some of their inputs to production

Fixed costs

- Costs that are fixed over the short run
- They have to be paid even if no output is produced
- They can't be changed in the short run

Variable costs

- Costs that the supplier can vary in the short run to increase or decrease the level of production

Total cost

- $TC = FC + TVC$

Marginal cost

- The change in total cost from producing an extra unit

$$MC \text{ (at } Q) = \frac{\Delta TC \text{ (at } Q)}{\Delta Q}$$

Average cost

$$AC \text{ (at } Q) = \frac{TC \text{ (at } Q)}{Q}$$

Average variable cost

$$AVC \text{ (at } Q) = TVC \text{ (at } Q) / Q$$

Accounting and economic profit

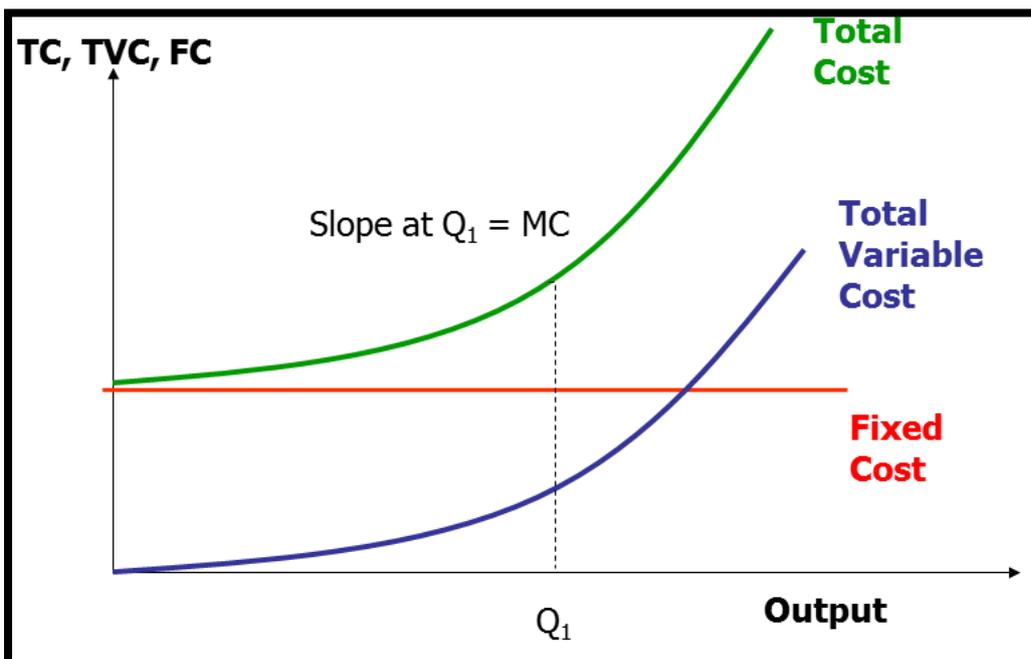
Accounting Approach

Revenue	\$107,000
Costs:	
Advertising	\$10,000
Rent	\$10,000
Salaries	\$40,000
Supplies	\$5,000
Total Cost	\$65,000
Net Profit	\$42,000 (Revenue-TC)

Opportunity Cost Approach

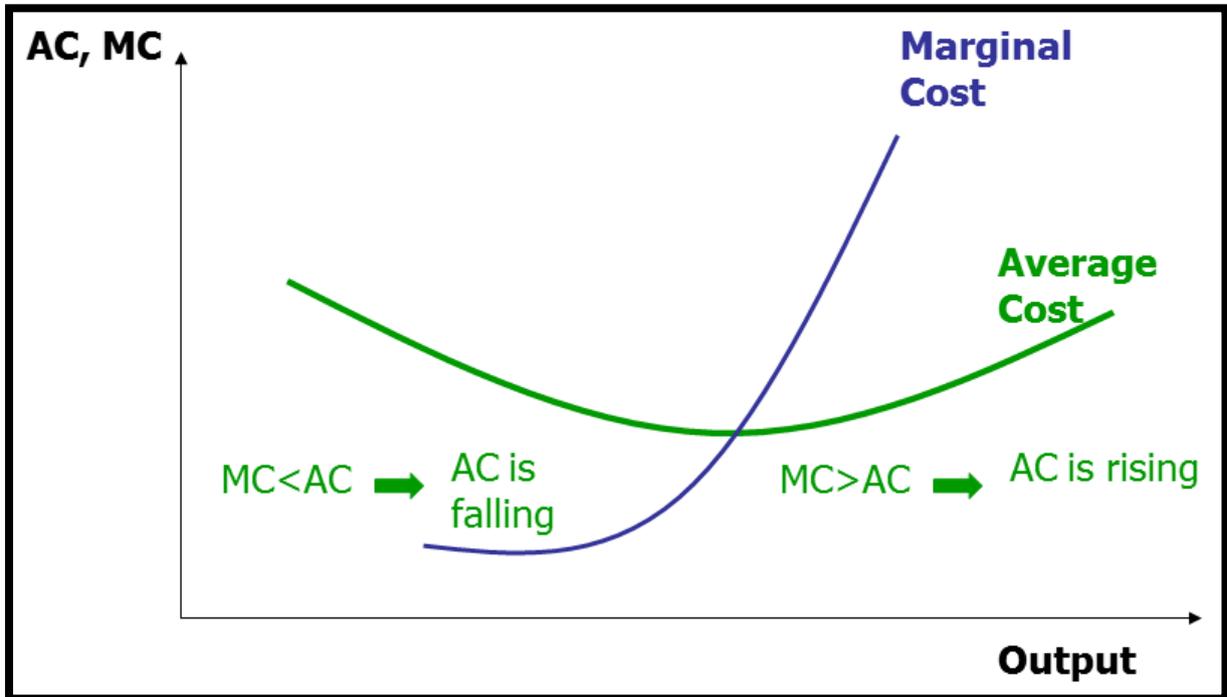
Revenue	\$107,000
Explicit Costs:	
Advertising	\$10,000
Rent	\$10,000
Salaries	\$40,000
Supplies	\$5,000
Implicit Costs:	
Forgone Salary	\$30,000
Forgone Interest (7% of \$50,000)	\$3,500
Forgone Lease	\$18,000
Total Cost	\$116,500
Net Profit (Loss)	-\$9,500

Total cost curves



Marginal cost curves

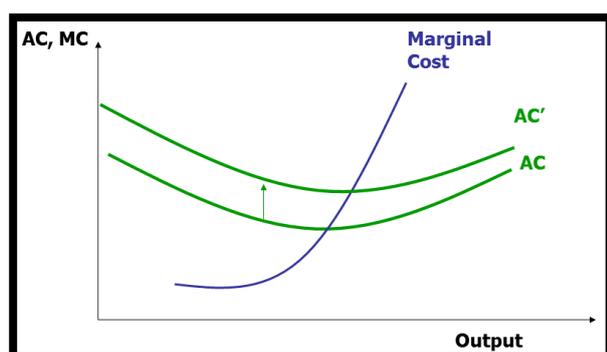
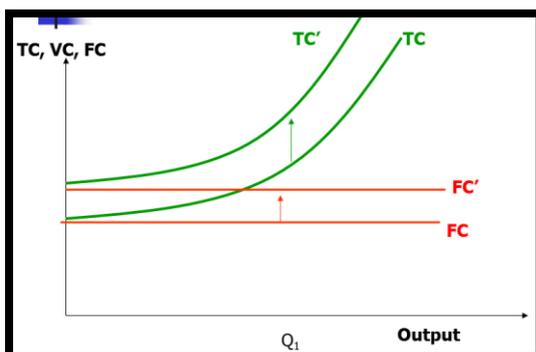
- Diminishing marginal returns explains why the average cost curve is U shaped
- The marginal cost curve intersects the average cost curve at the minimum point of the average cost curve



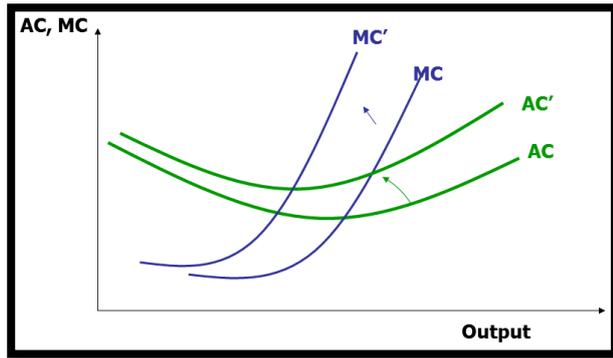
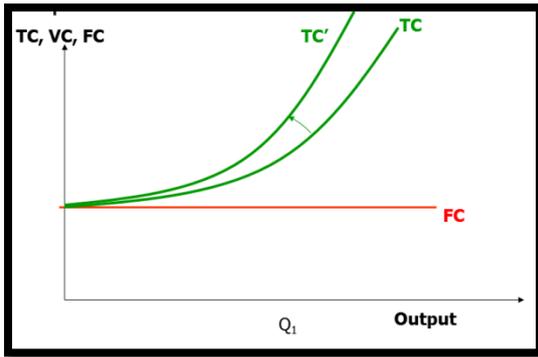
Marginal and average cost

- If marginal cost is less than average cost then average cost is decreasing
- If marginal cost is greater than average cost then average cost is increasing
- Costs come down due to increasing returns with each additional input of a variable factor giving a higher return
- E.g. as you increase the number of miners in a mine the operation becomes more efficient and the returns will keep increasing
- It will stop when we get to the optimum combination of variable to fixed factors
- When returns decline the cost increase is evident by the upward trend in the cost curves known as capacity constraint

Shift in curves if fixed input increases

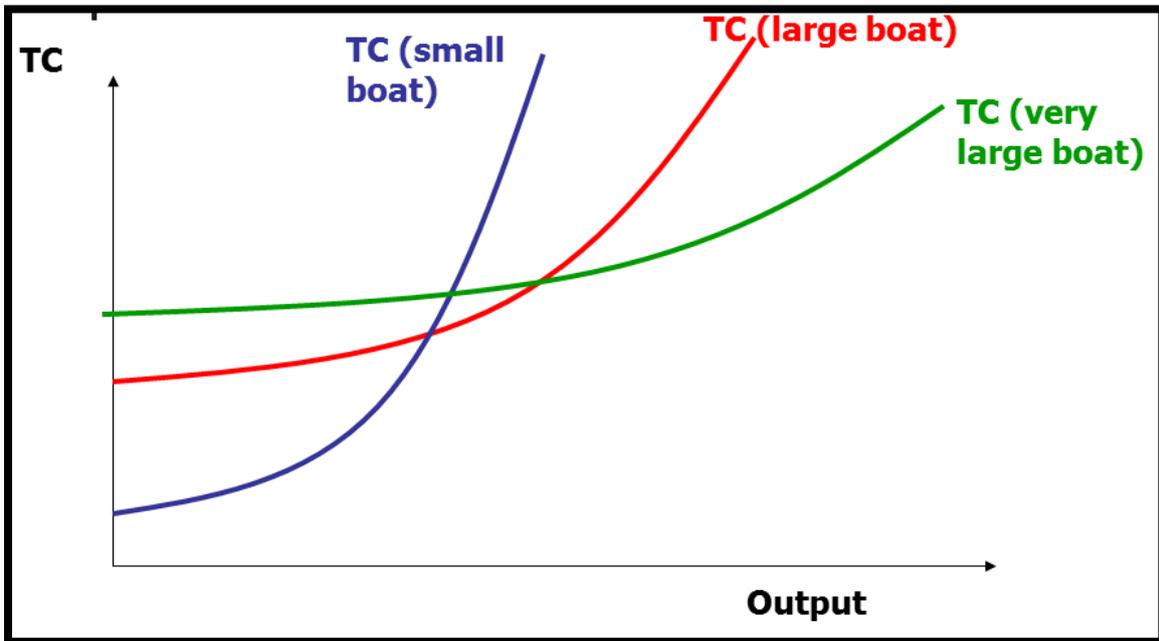


Shift in curves if variable input increases



Long run

- Fixed inputs are only fixed over the short run
- Over the long run all inputs can be changed
- The long run total cost curve shows the minimum cost of producing any quantity if all inputs are variable

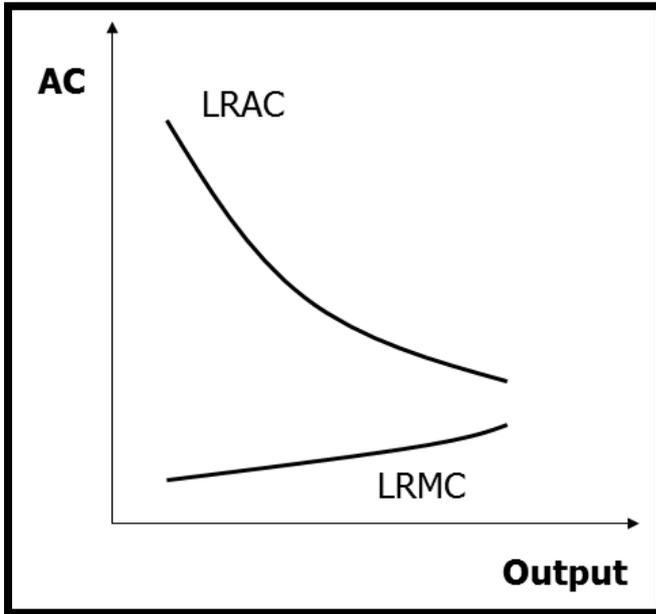


Long run average cost

$$\frac{LRTC}{Q}$$

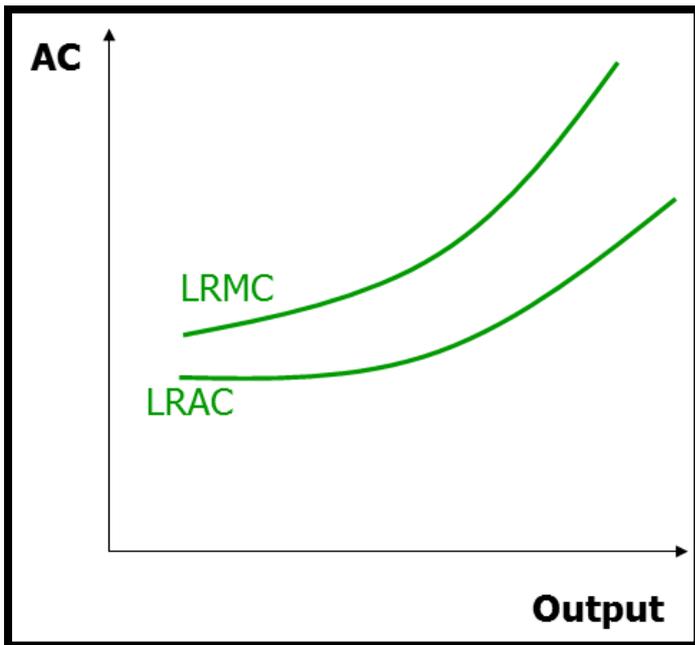
Increasing returns to scale

- If the long run average cost curve is negatively sloped then the production process has increasing returns to scale
- This means that the change in output is greater than the change in inputs



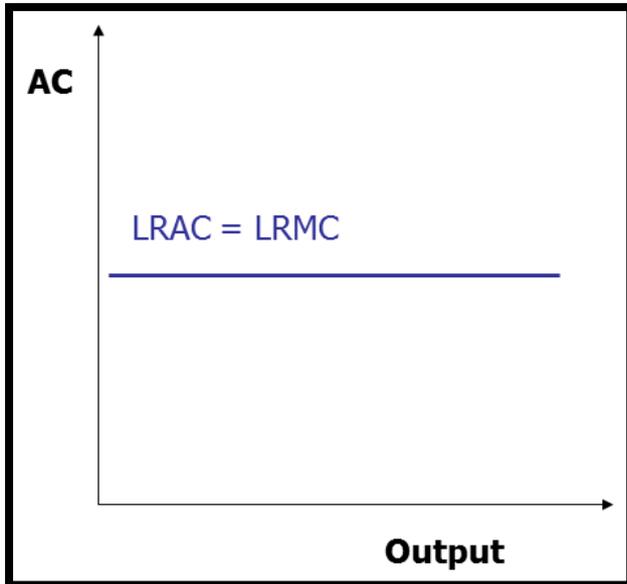
Decreasing returns to scale

- If the long run average cost curve is positively sloped then the production process has decreasing returns to scale
- This means the change in output is less than the change in inputs
- When a firm becomes too big there are diseconomies of management



Constant returns to scale

- If long run average cost curve is constant then the production process has constant returns
- This means the change in output equals the change in inputs



Principal of substitution

- The greater the substitutability of labour and capital the less will be the effect of a price increase in one input on the cost of producing a certain quantity of output

Perfect competition

- Many sellers
- Many buyers
- Seller is a passive price taker
- Homogeneous product
- Free entry and exit
- Perfect knowledge of the market
- Individual buyers and sellers are small compared to the market
- Each individual buyer and seller doesn't have market power
- Each individual takes the market price as given and then decides how much to sell or buy
- Price = marginal revenue

Break even

- Where a firm earns exactly zero economic profits
- Total economic cost often includes a normal rate of return on capital

Total revenue

- Price * quantity

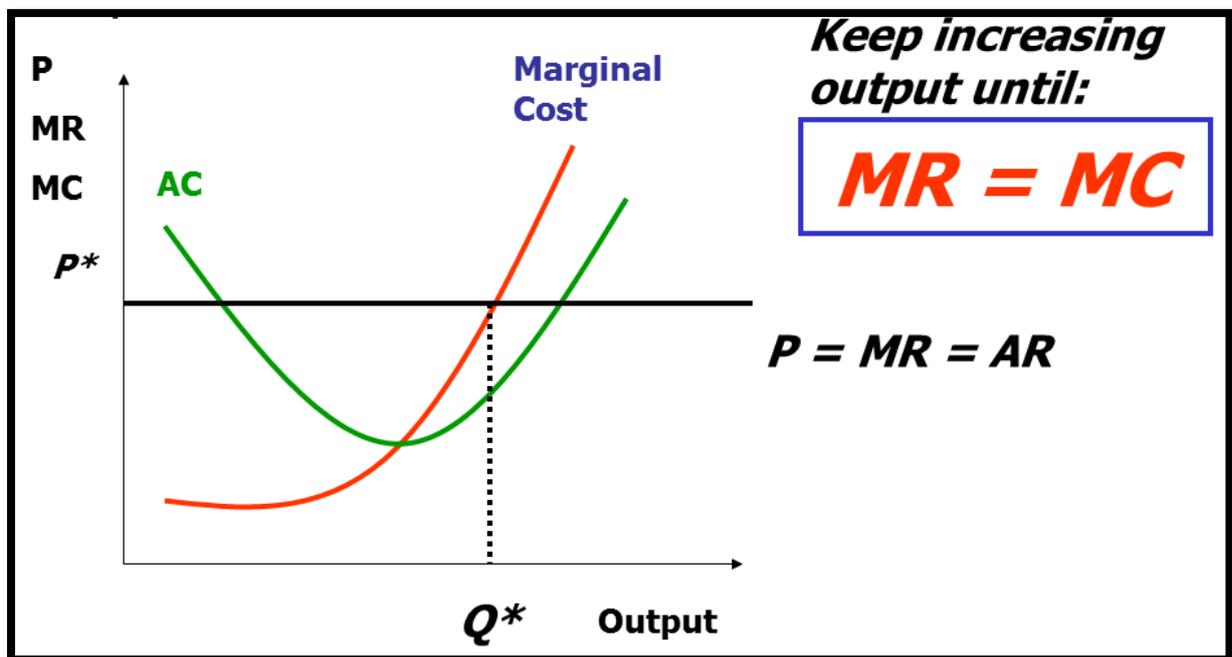
Marginal revenue

- The extra revenue that the seller gets when he produces and sells an extra unit of output

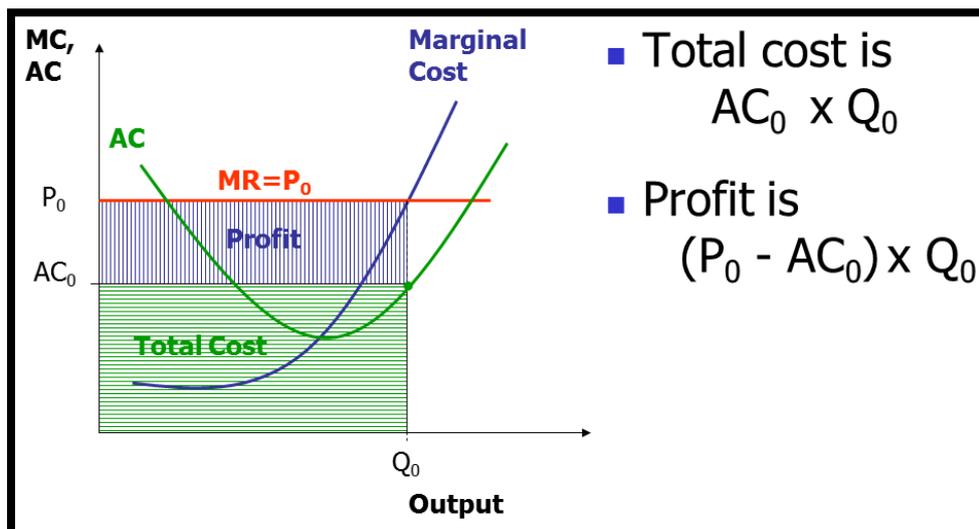
$$MR = \Delta TR / \Delta Q$$

Profit maximising condition

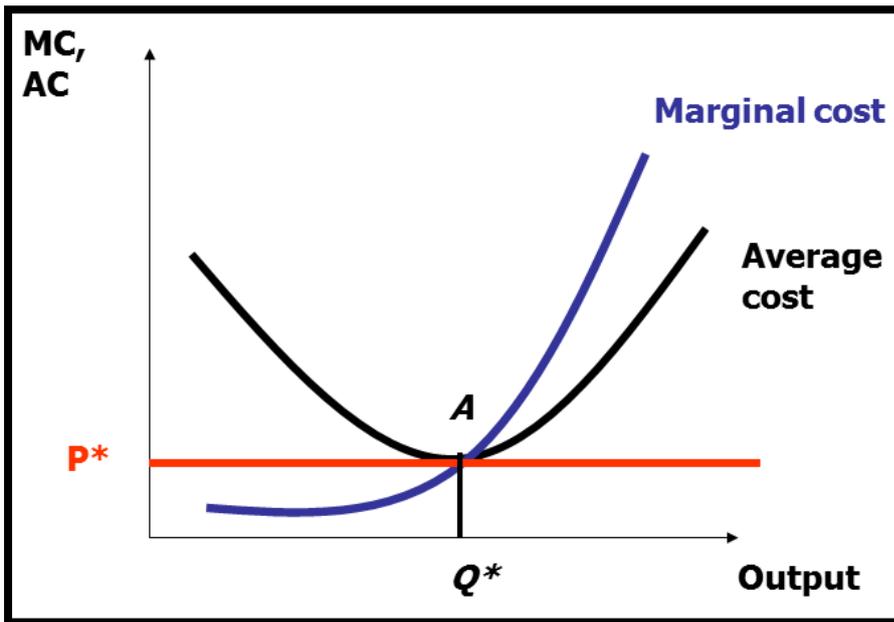
- As our costs are based on OPC there is a hidden element of profit in our cost figures
- This explains why the production of the last unit of output where $MC = MR$ is justified



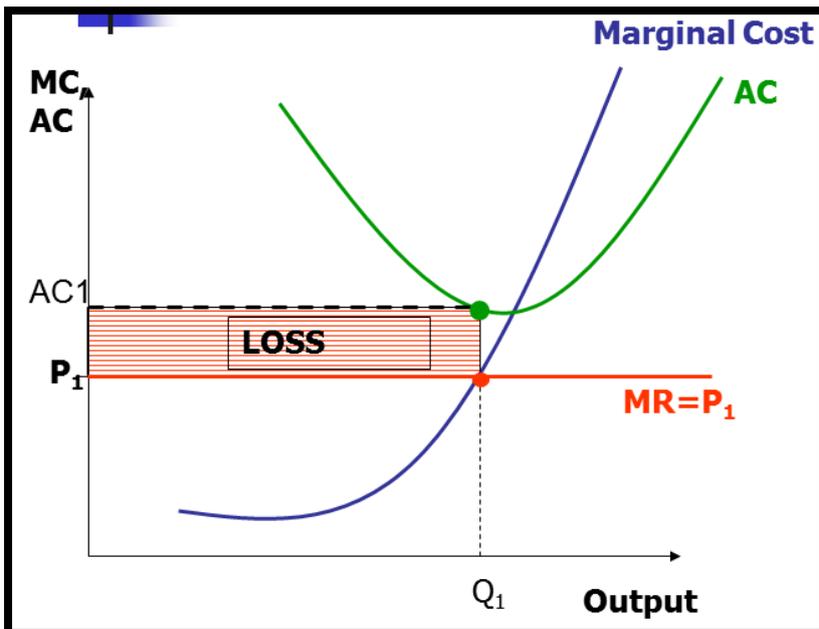
Supernormal profit



Normal profit



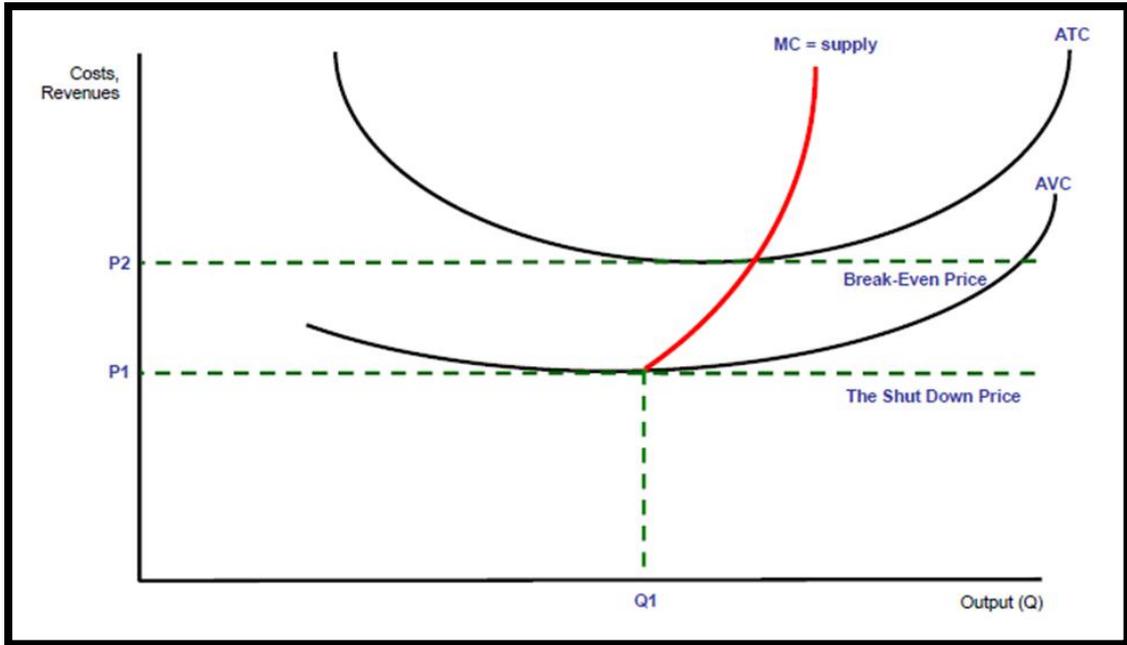
Subnormal profit



Shutdown price

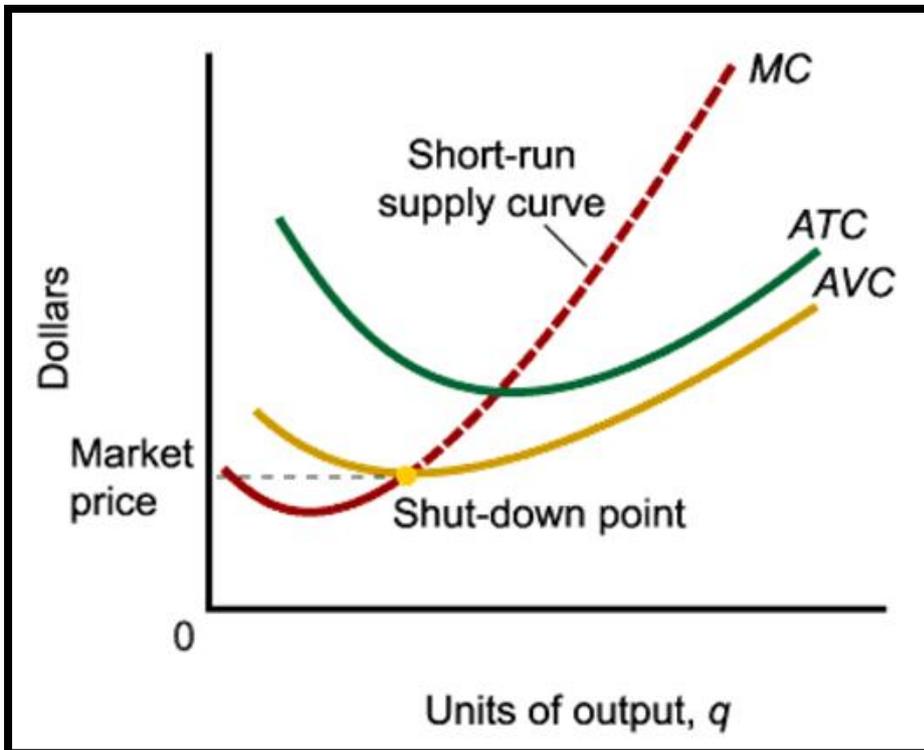
- Firm will only shutdown if revenue does not cover variable cost
- So when the price falls below minimum AVC the firm would rather not produce anything because fixed costs have to be met
- When price is equal to the minimum AVC the firm is indifferent between producing and shutting down

**Shut-down point:
Price = Minimum AVC = MC**



Short run supply curve for perfect competition

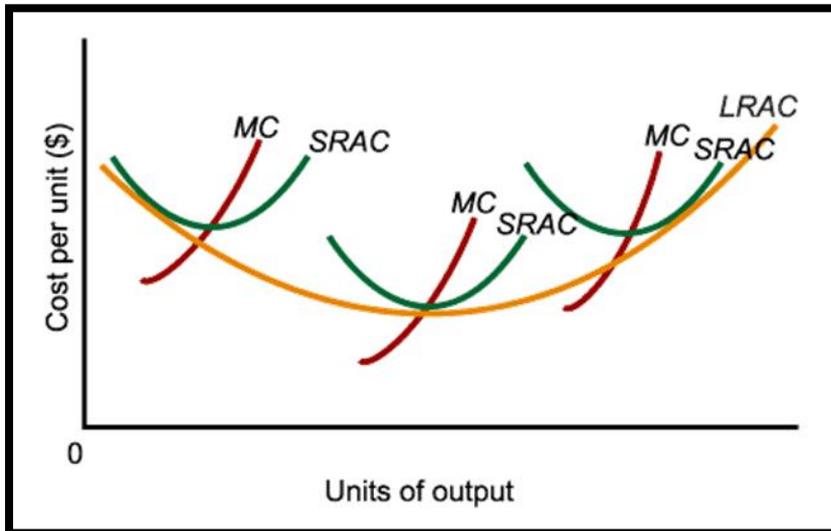
- The part of the marginal cost curve that lies above its AVC curve
- The industry supply curve in the short run is the horizontal sum of the marginal cost curves



Long run average cost curve

- Graph that shows the different scales on which a firm can choose to operate in the long run
- Each scale of operation defines a different short run

Economies and diseconomies of scale

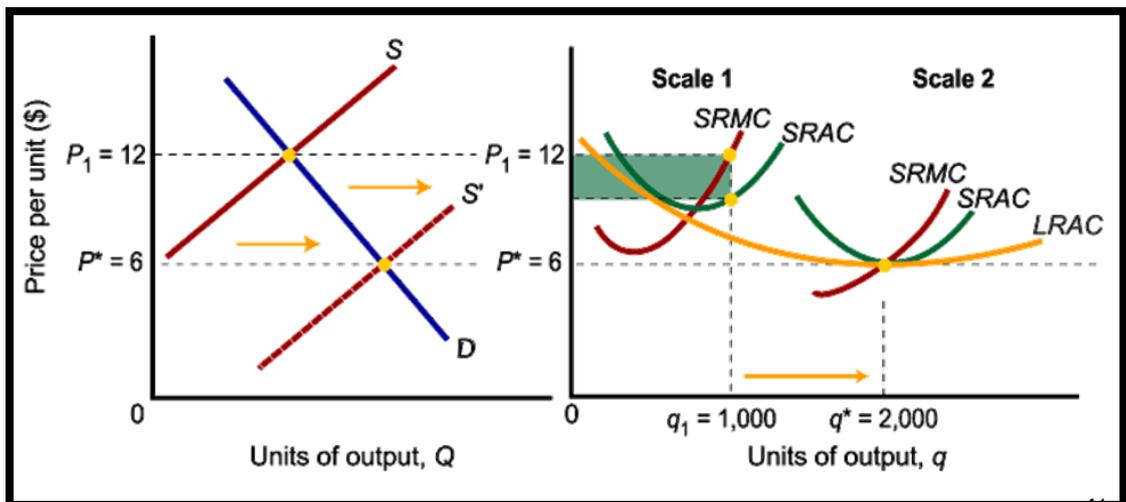


Optimal scale of plant

- The scale that minimizes average cost

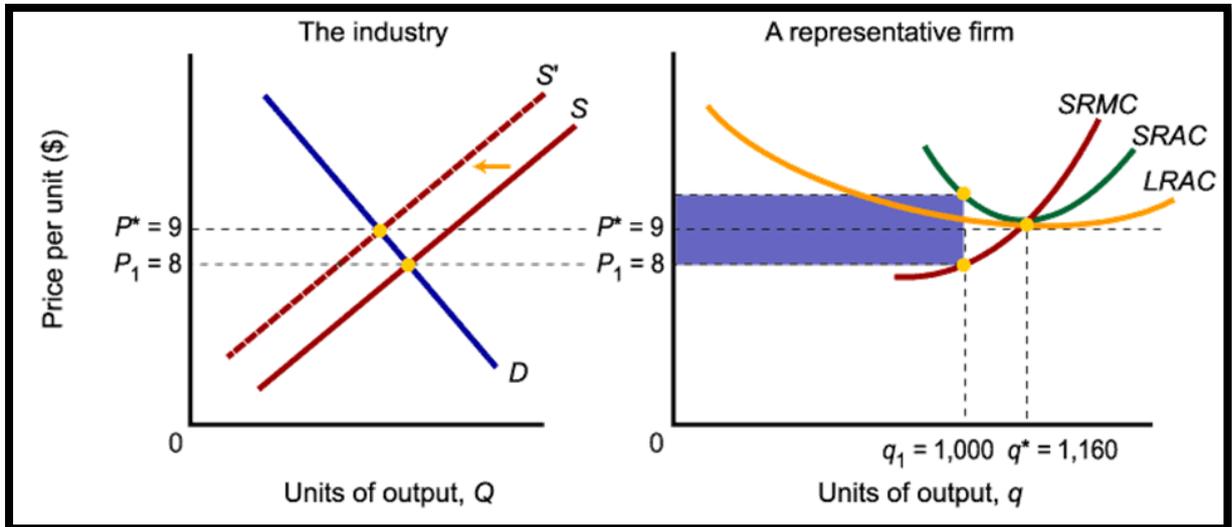
Long run profits

- Firms expand in the long run when increasing returns to scale are available
- Prices will be driven down to the minimum point on the long run average cost curve
- The existence of positive profits will attract new entrants to an industry
- As firms enter the industry the supply curve shifts right and prices fall
- Firms continue to enter as long as positive profits are being earned



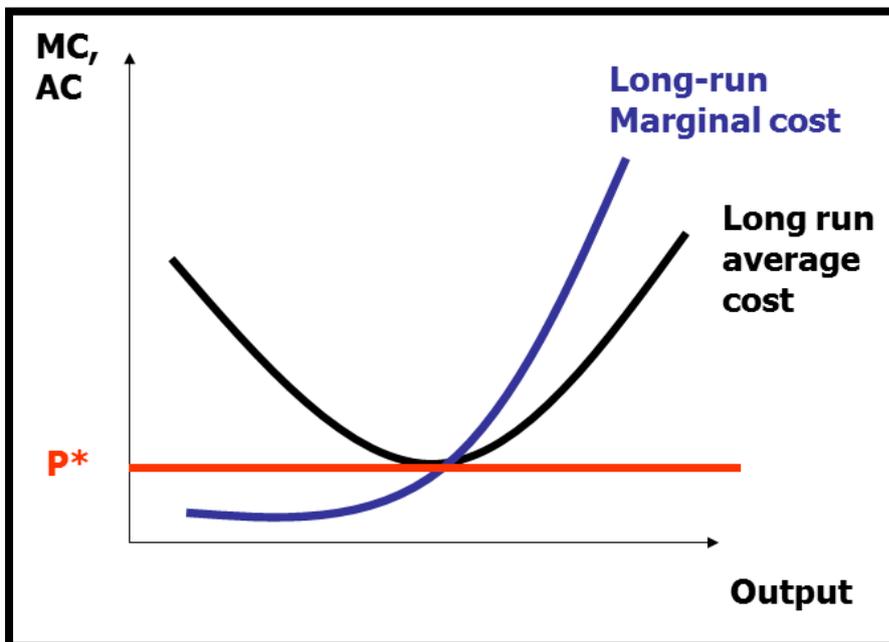
Long run loss

- When a firm in an industry suffers a loss there is an incentive for them to exit
- As firms exit the supply curve shifts left driving up prices
- The industry eventually returns to long run equilibrium and losses are eliminated



Perfect competition equilibrium

- In the long run equilibrium price is equal to the minimum of long run average cost
- Profits are driven to zero



Zero profit

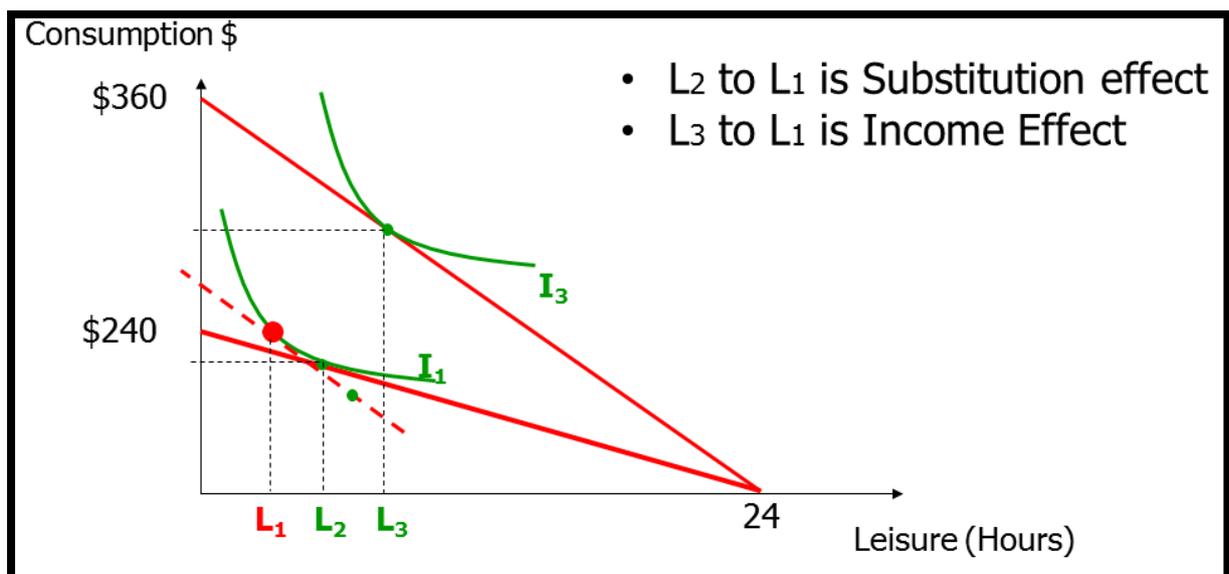
- The zero profit condition is that the owner of the firm is unable to earn more elsewhere
- Economic rents are earned by a firm if it has a lower average cost curve than all other firms
- We assume perfectly competitive firms don't earn economic rents (not more than normal profit)

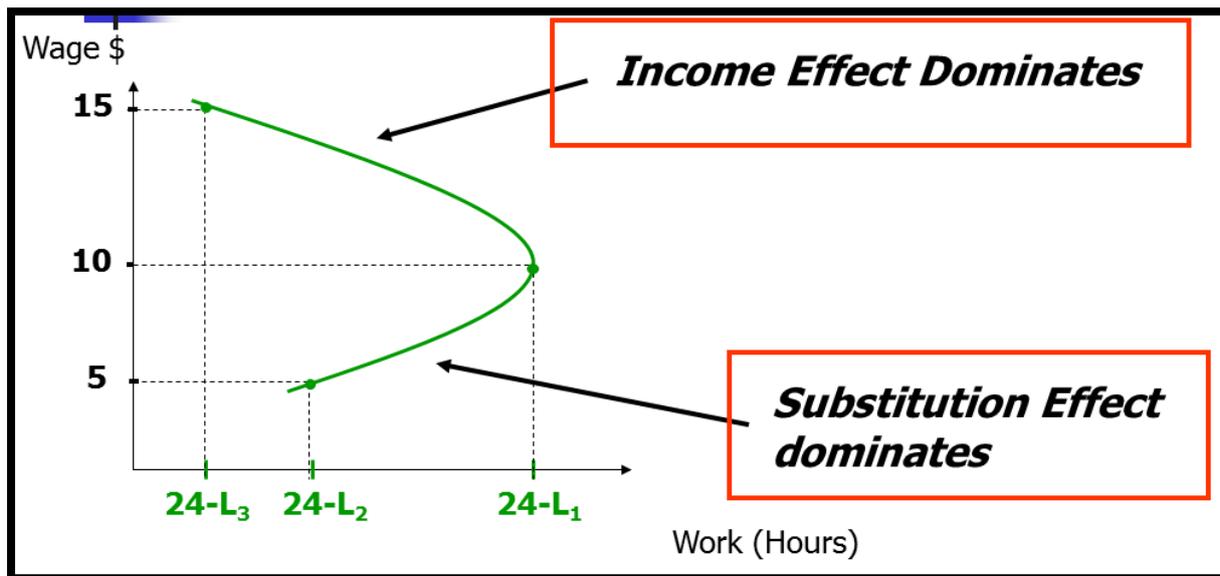
Deriving the upward sloping labour supply curve

- As wages rise the OPC of leisure hours rises so people want to consume less leisure
- As wages rise income increases so workers want more leisure, if leisure is a normal good
- Increases in wages will cause the substitution effect and income effect
- When the wage rate falls the OPC of leisure falls so people desire more leisure as the wage is not attractive as much as it was before
- When wages rise the OPC of leisure increases so normally people should offer to work more hours
- But the income effect takes over as people will prefer to have more leisure as they already have a high income

Backwards bending labour supply curve

- Normally supply curve is upward sloping illustrating the desire of people to work more hours at higher wages
- However the income effect may lead to a backward bending supply curve for labour
- If the substitution effect dominates then consumers consume less leisure and work more (labour supply will slope up)
- If the income effect dominates then consumers work less to consume more leisure (labour supply curve will slope down)





Market situations

Feature	A) Perfect competition	B) Monopolistic competition	C) Oligopoly	D) Duopoly	E) Monopoly
 market firm					
Type of competition	Perfect	Imperfect	Imperfect	Imperfect	Imperfect
Number of sellers	Many small firms	Many small firms	A few large firms dominate	Two firms	One firm
Type of product	Homogenous	Differentiated	Differentiated	Differentiated	No substitutes
Barriers to entry	None	Weak	Strong	Strong	Strong
Control over price	Price taker	Weak	Price maker	Price maker	Price maker
Control over quantity sold	None	Weak	Limited	Limited	Strong
How do the firms compete?	Unable	Price and non-price competition	Non-price competition	Non-price competition	No competition
Demand curve					
New Zealand example	Dairy farmers, vegetable growers	Retail shops, e.g. clothes stores and restaurants	Oil companies, banks	Vodafone and Telecom	NZ Post, Personalised Plates

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Imperfect competition

- Producers are price makers
- They compare extra revenue from producing one more unit to the extra cost of producing one more unit
- The market price exceeds marginal cost
- The price is too high and output too low compared with perfect competition

Imperfect information – adverse selection

- Can occur when a buyer or seller enters into an exchange with another party who has more information

Moral hazard

- Arises when one party to a contract passes the cost of his behaviour to the other party on the contract
- The problem is that the contracting parties can't determine the future behaviour of the people they are contracting with

Externalities

- A cost or benefit resulting from some activity that is imposed upon third parties
- Also called spill over costs or neighbourhood effects

External benefits

- When external benefits are not considered we may fail to do things which are worth it and this leads to an inefficient allocation of resources

External cost

- When external costs are not considered we may engage in activities that are not worth it

Marginal social cost

- The total cost to society of producing an additional g/s
- MSC is equal to the sum of the marginal cost of producing and the damage costs involved in the production process

Public goods

- Goods that are non-rival in consumption and their benefits are non-excludable
- Public goods have characteristics that make it difficult for the private sector to produce them profitably (market failure)

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Characteristics of public goods

- A good is non-rival in consumption when one consumer's consumption doesn't affect another consumer's consumption of the same good
- A good is non-excludable when no one can be excluded from enjoying its benefits so the good can't be withheld from consumers that don't pay for it
- E.g. police, motorways, public parks
- Because people can enjoy benefits of public goods whether they pay for them or not they are usually unwilling to pay for them – free rider problem

Monopoly

- The existence of a single seller in the market
- This gives the seller market power in terms of the price that the seller can charge
- Market power is the ability of a seller to raise market price without losing all its customers

Pure monopoly

- A single firm that produces a product with no close substitutes and which significant barriers to entry prevent other firms from entering the industry to compete for profits

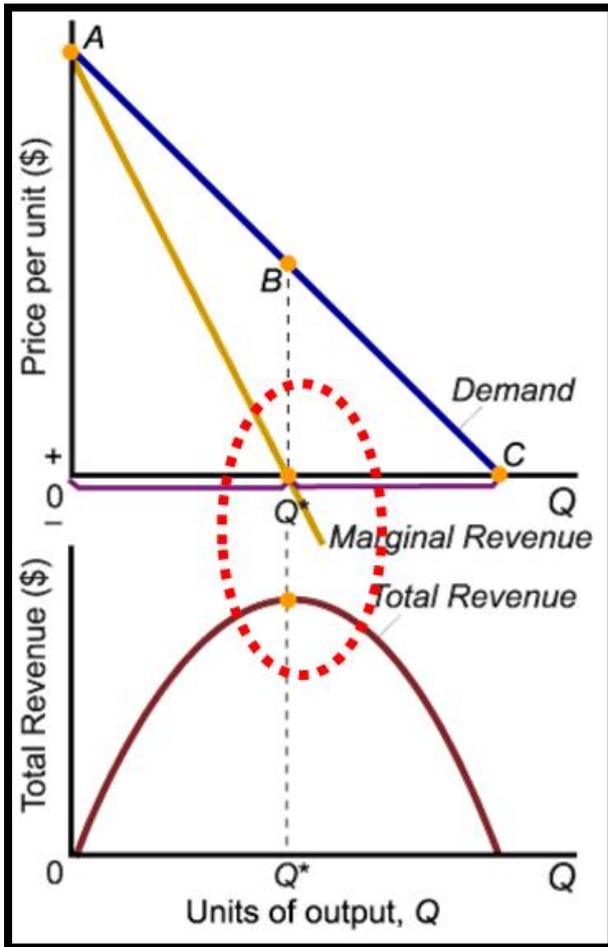
Barriers to entry

- Things that prevent new firms from entering and competing in imperfectly competitive industries
- E.g. patents, economies of scale, ownership of a scarce factor of production

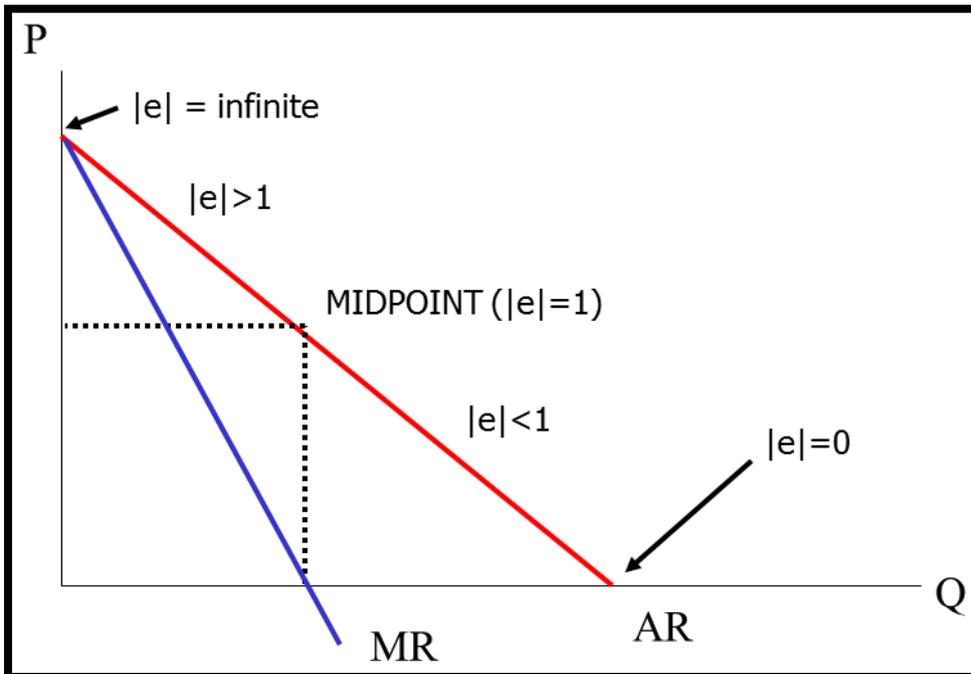
Revenue curves in imperfect competition

- AR does not equal MR
- Only way to sell more is to drop the price which will affect all earlier units as well
- For this reason both the AR and MR curves slope downwards
- The MR curve falls more steeply than the AR curve
- When total revenue is maximum marginal revenue is equal to zero because marginal revenue is the slope of total revenue so when TR is max the slope is zero
- Marginal revenue has the same price intercept as the AR curve, twice the slope of the AR curve and half the quantity intercept as the AR curve

MR is where TR = 0



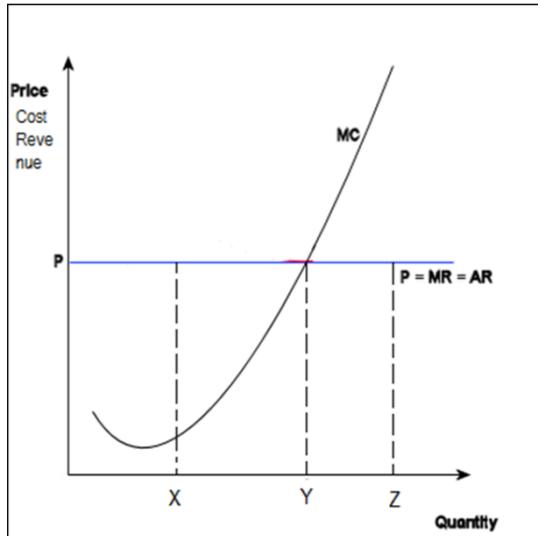
Elasticity on a linear demand curve



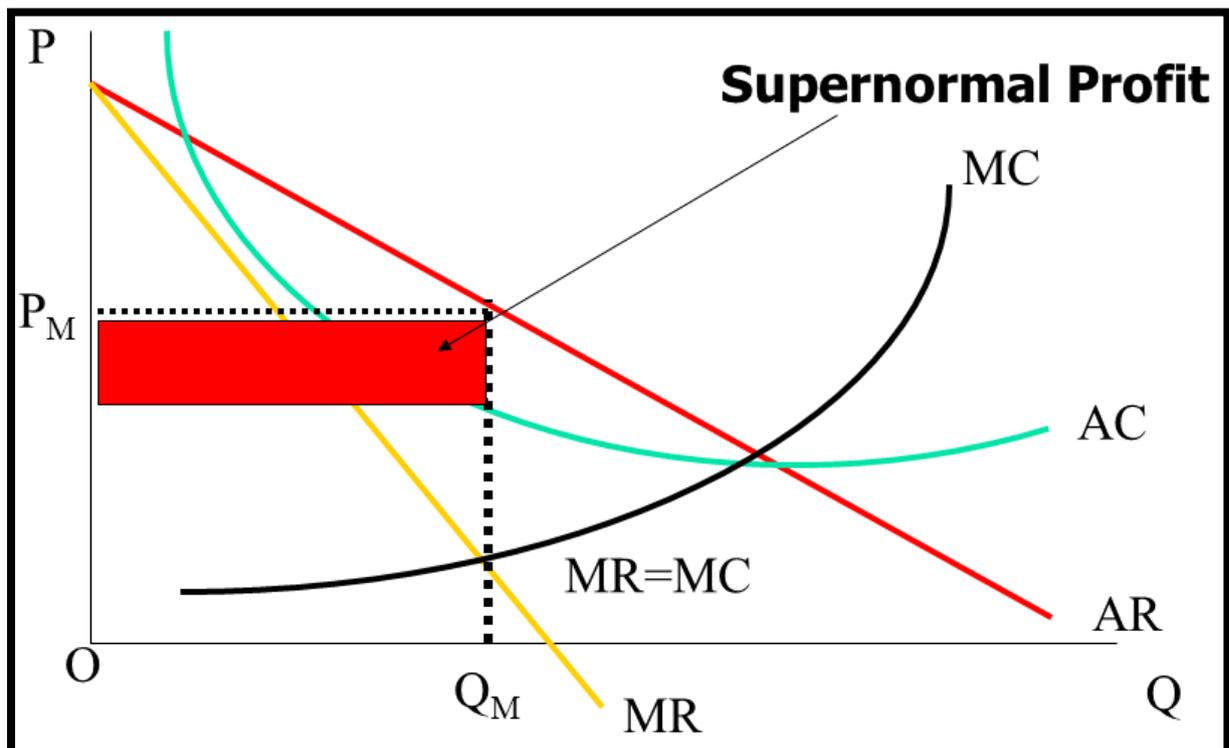
LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Price and output decisions for a monopolist

- If MR is greater than MC then producing an extra unit would bring in more revenue in total than it would add to total cost
- If MR is less than AC then producing an extra unit would bring in less revenue in total than it would add to costs
- So firms will keep producing until $MC = MR$ which is the level of output that maximizes profit



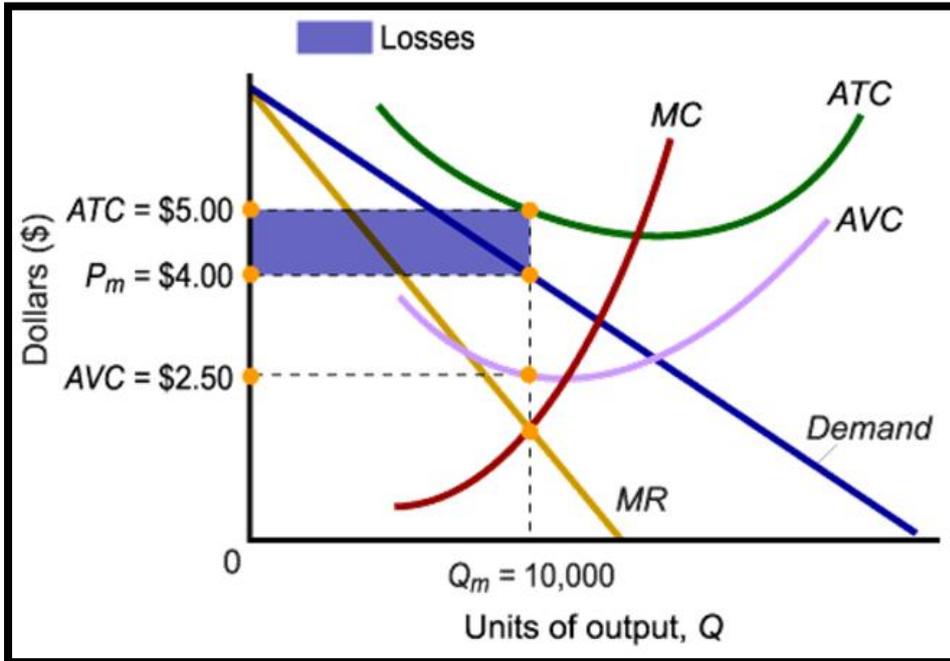
- We should not produce at Z because $MC > MR$
- We should not produce at X because $MR > MC$
- So the optimum level of output for a firm is where $MC = MR$ as this maximises profit



Absence of supply curve in monopoly

- A monopoly firm has no supply curve that is independent of the demand curve
- A monopolist sets both price and quantity and the amount of output supplied depends on both its marginal cost curve and demand curve that it faces

Subnormal profit



Optimal mark-up formula

- $(P - MC)/P$
- The profit maximising amount to raise price above costs is determined by elasticity
- The larger the elasticity is the lower the mark up

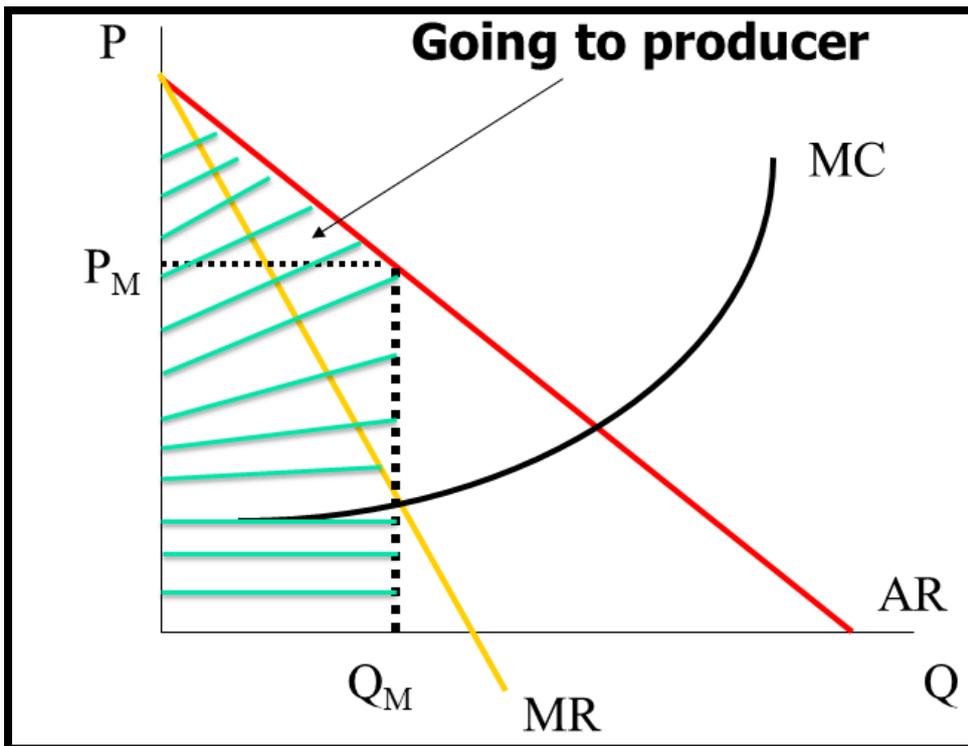
Price discrimination

- It is more profitable to charge different consumers different prices based on their willingness to pay
- Price discrimination is a method where consumer surplus can be taken from the consumer and the producer appropriates it for himself
- Arbitrage makes it impossible to practice price discrimination
- Page 224 in course book for calculation

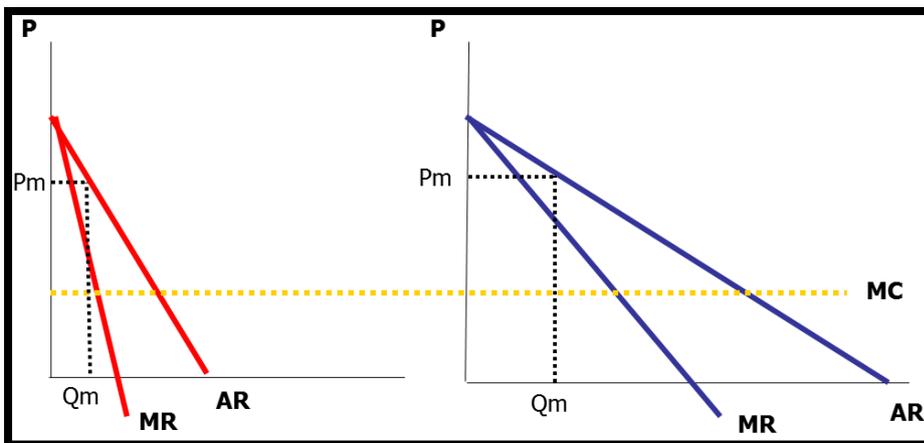
Conditions to practice price discrimination

- Different customers must exist
- Firms can identify the types
- Firms can prevent resale (arbitrage)
- Monopoly power is necessary
- Firms must have some control over prices (price makers)
- Must be separate markets with different elasticities
- Firm must be able to keep the market separate

Perfect price discrimination



Third degree price discrimination – 2 different prices in separate markets

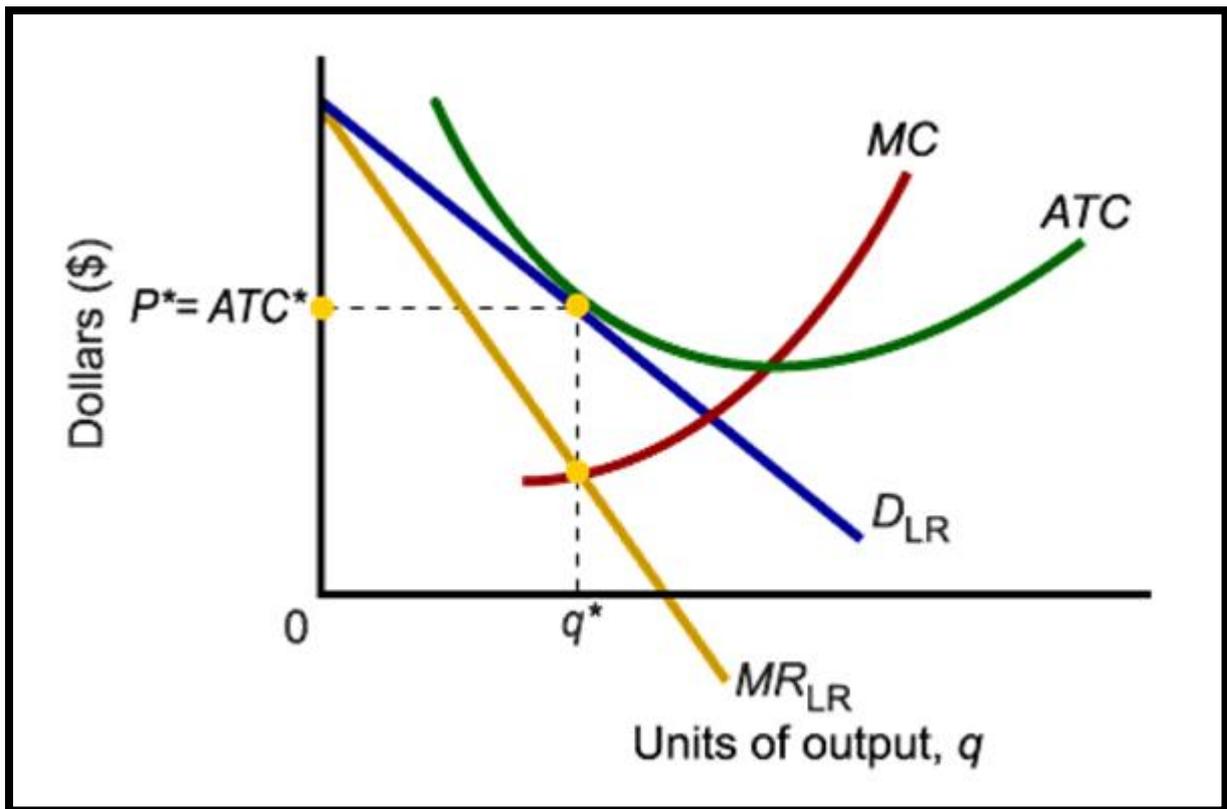


Monopolistic competition

- Many sellers
- A differentiated product
- Limited control over price
- Weak control over quantity sold
- Weak barriers to entry of other firms
- New firms can enter and established firms can exit with ease
- Based on availability of substitutes the demand curve faced by a monopolistic competitor is less elastic than perfect competition and more elastic than monopoly

Price and output in the long run

- If existing firms in the industry are making profits this will attract other firms to enter the market reducing price and market share between each firm
- In equilibrium each firm exactly breaks even
- In the long run economic profits are eliminated but average total cost is not minimized as firms won't realize all economies of scale available
- However in the long run price is above MC



LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Oligopoly

- Form of industry structure characterised by a few dominant firms
- Products are homogeneous or differentiated
- The behaviour of any one firm in an oligopoly depends to a great extent on the behaviour of others
- Leads to strategic interactions between firms
- Firms are interdependent
- Joint profit maximisation
- Few large sellers
- Price maker
- Control over quantity sold
- Strong barriers to entry
- Price rigidity
- Substantial non-price competition

Homogeneous oligopoly

- When the products are close substitutes
- E.g. petrol, sugar
- Price is very important because everything else is similar

Differentiated oligopoly

- When the products sold by the oligopolistic are not close substitutes
- E.g. movies, wine
- Each firm owns its own brand so price isn't as important
- Perceived superior brands

Petrol firms

- No small sellers in the market
- Sometimes owned by the govt

Beer firms

- Some pubs brew their own beer
- NZ firms make speciality wines

Fringe firms

- Offer speciality (niche) products
- They try out new idea but most fail
- Tomorrow's market leaders are today's tiny fringe firms

Oligopolistic profit maximising decision

- Oligopolist wants to maximise its profits
- It has to worry about market demand and what its rivals choose to do
- There are a few large firms that are concerned about what other firms may do
- Each oligopolist has to worry about the reactions of its major rivals to its own actions
- Oligopoly is more complex than perfect competition or monopoly

Price competition

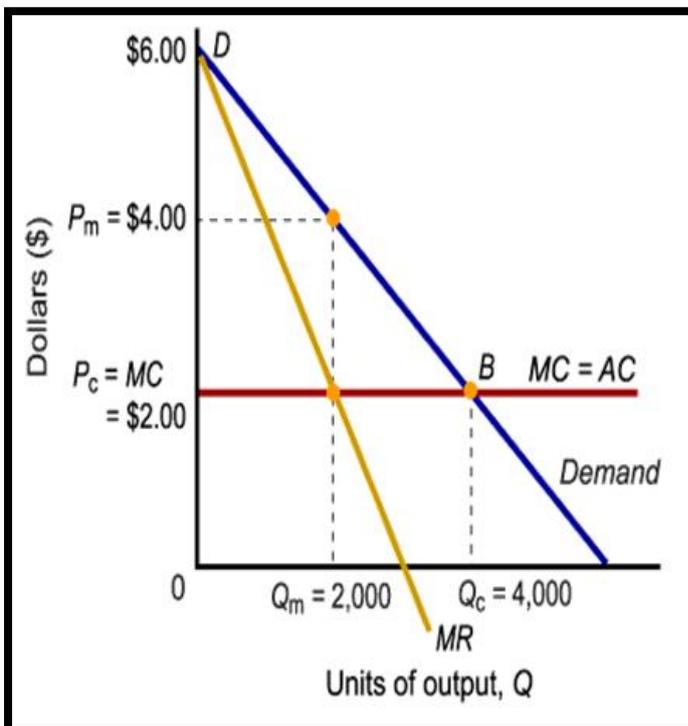
- Price war

Non-price competition

- Product variation
- Product differentiation
- Advertising

Price leadership

- Makes it easier to conclude



Oligopolist choice

- The higher the price the more tempting it is for one of the firms to cheat by undercutting the others to gain market share

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Cartel

- Way that firms may co-operate in order to increase market power
- An ideal cartel is one strong enough to extract full monopoly prices for all members combined
- They never produce at $P = MC$

Collusion model

- Firms agree to set the most favourable price to achieve joint profit maximisation
- However this is illegal

Tacit collusion

- When firms coordinate their actions without talking to each other
- This is achieved through price leadership

Dominant price leadership

- Where one firm has a dominant power through size or market share
- Can survive a price war longer

Exclusive territories

- Producer gives a wholesaler or retailer the exclusive right to sell a good with a certain region
- So stores in one region can buy the product only from one wholesaler
- Prevents competition amongst wholesalers

Exclusive dealing

- Producer insists any firms selling its product not to deal with its rivals

Tie-ins

- When the customer buys one product they must buy another from the same firm even if they would rather buy from someone else
- E.g. game consoles and games

Resale price maintenance

- Producer insists that any retailer selling his product must sell it at the list price
- Common with pharmaceutical products
- Like exclusive territories this practice is designed to reduce competitive pressure at the retail level

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Consequences of restrictive practices

- Firms claim that restrictive practices are designed to increase economic efficiency
- However these practices can reduce efficiencies elsewhere
- They are often subject to court cases and sometimes struck down as illegal

Entry deterrence

- Preventing other firms from entering the market
- Patents – requires large amounts of capital
- Franchise or license – advanced technology required
- Ownership of inputs – land
- Lack of information about costs
- Market strategies deter entry
- E.g. airlines use yield management where they sell a few seats at a time at a lower price

Predatory behaviour

- An existing firm may deliberately lower its price below the new entrants cost in order to drive the new entrant out and discourage future entry
- Also known as predatory prices

Excess capacity

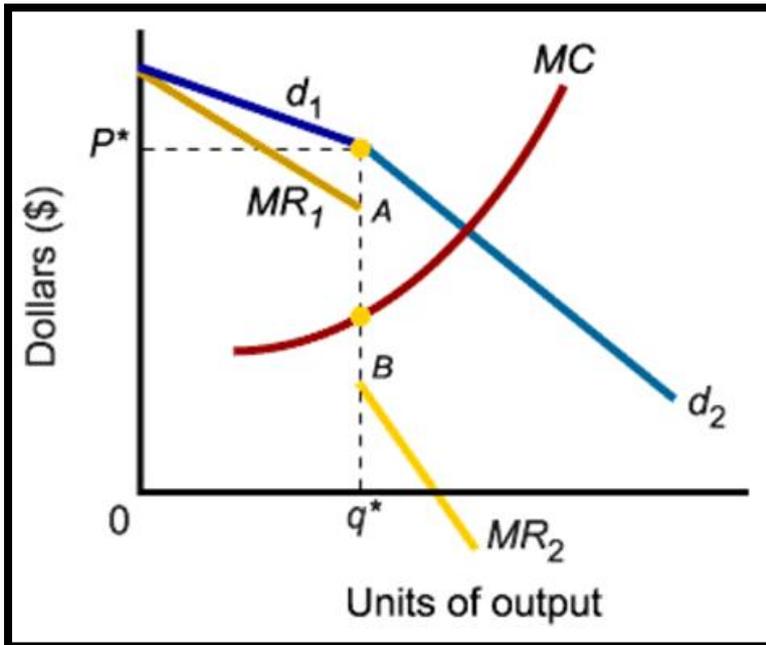
- Existing firm builds a large production facility
- Signals to the entrant that it will expand production drastically if any new firms enter
- This will lead to a sharp reduction of profit
- Potential entrants look at the existing firms installed capacity and realize it can expand product at minimal cost
- So decides it's not worthwhile to enter

Oligopoly models

- Gentlemen's agreement
- Gift schemes
- Non-price competition
- Don't rock the boat

The kinked demand curve model

- The kink follows the assumption that competing firms will match a price cut from one of them but won't follow if a single firm raises the price
- Leads to the prediction of stable prices
- On the elastic part increases in price will result in decreased market share as this action isn't followed by competitors so results in a large decrease in the firms quantity demanded
- On the inelastic part a decrease in price will result in a decrease in market share as competitors will lower their prices further than the original firm did



Oligopoly conditions

- The only necessary condition of oligopoly is that firms are large enough to have some control over price
- Oligopolies differ
- One extreme is firms are in a cartel and act as a monopolist
- Another extreme is firms compete for a small contestable market in response to observed profits

Game theory

- The behaviour of any given oligopolist depends on the behaviour of the other firms in the industry
- This creates the need for strategic behaviour

Oligopoly inefficiencies

- They are likely to price above MC which means there is underproduction
- Strategic behaviour can force firms into deadlocks that waste resources
- Product differentiation and advertising may pose a real danger of waste and inefficiency

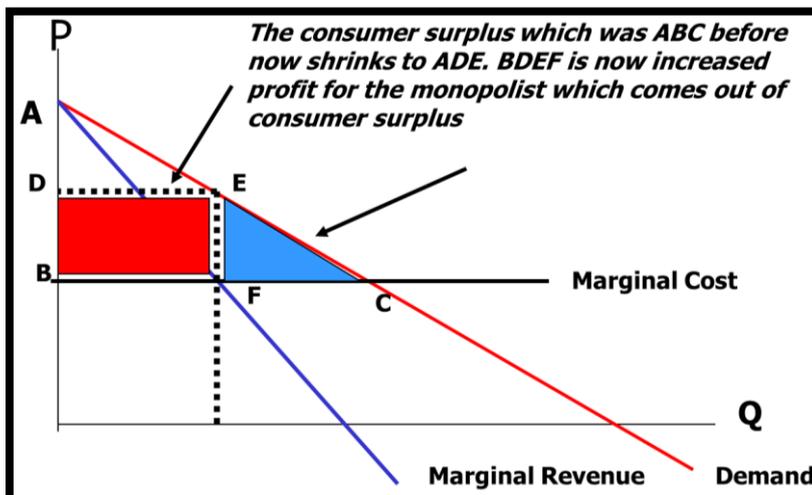
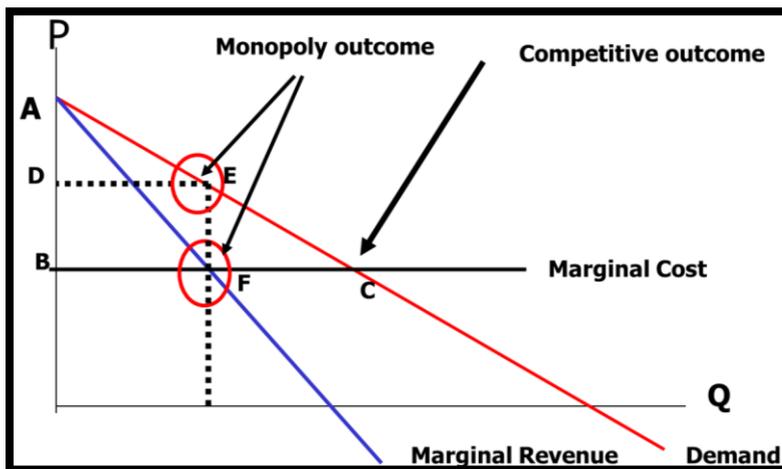
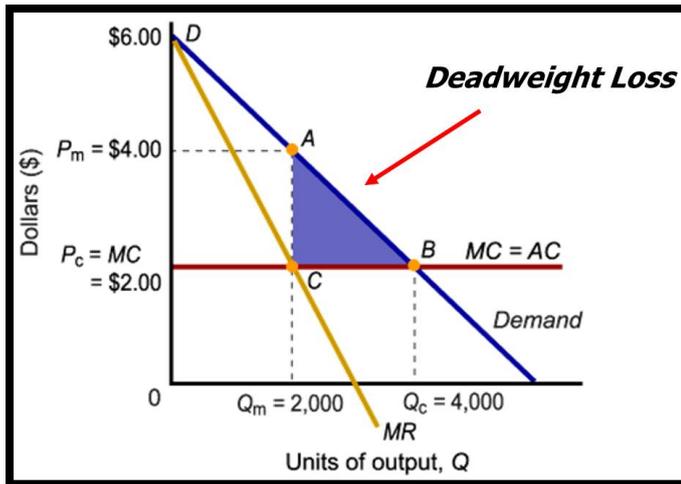
LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Monopoly inefficiencies

- They price above mc which means underproduction from societies point of view
- Lack of competition and high barriers to entry enables monopolies to sustain high prices and reduces the incentives to innovate or employ more efficient production processes

Social cost of monopoly

- Monopoly leads to an inefficient mix of output



LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Why monopolies are inefficient

- Monopoly leads to lower output and higher prices
- They impose social cost in the form of deadweight losses
- They reduce consumer surplus

Managerial slack

- Monopolies facing no threat of competition have little incentive to lower production cost
- The resulting lack of efficiency when firms aren't exposed to competition is called managerial slack

Reduced research and development

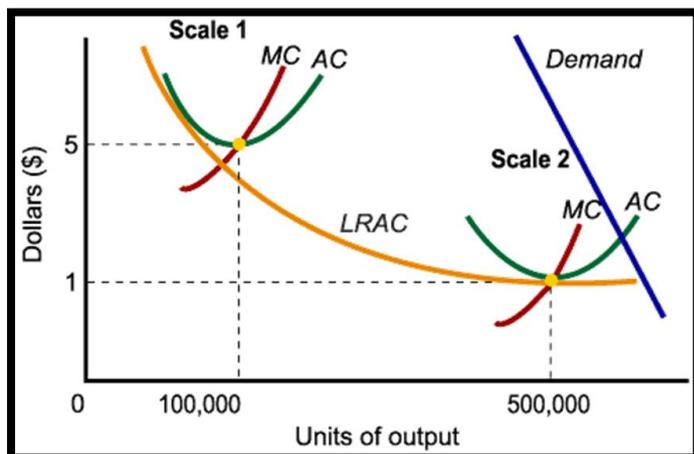
- Monopolies have less of an incentive to engage in R&D of new products

Govt policy towards monopoly

- Get gov't to run the firm
- Let the private sector run it but regulate it
- Leave it alone and hope for the best

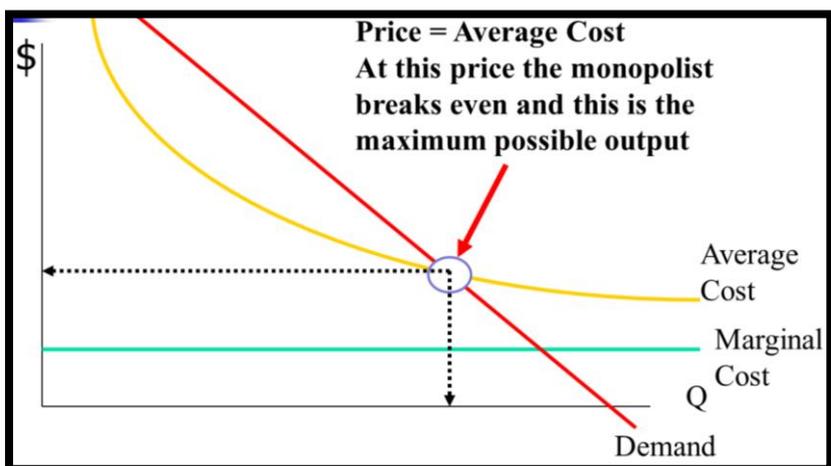
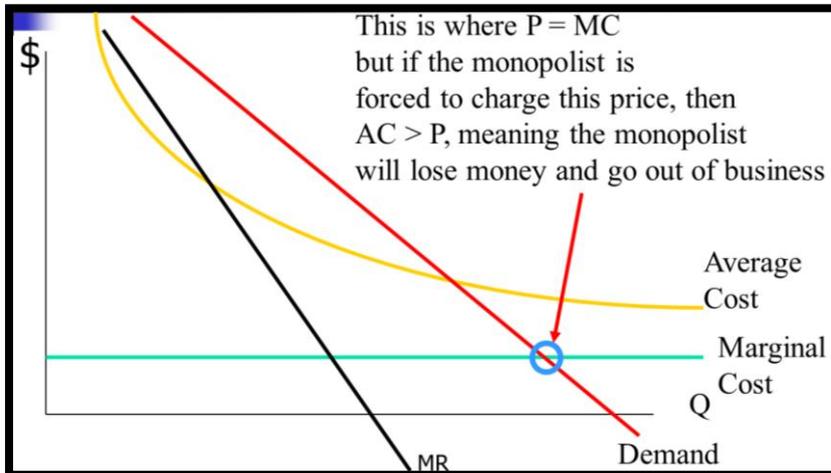
Natural monopoly

- An industry that has large economies of scale in producing its product
- This means the average cost curve keeps sloping down for the whole range of the market demand curve



Regulating a natural monopolist

- MC pricing is not possible
- If AC is still coming down then the MC has to be lower and still the firm is forced to provide their product where $MC = 0$ the firm will not cover the per unit cost and suffer losses



Competition policy

- Govts often adopt laws and regulations to prevent monopolisation in markets
- This is to ensure firms with large market share don't abuse the power they have
- In NZ competition policy is run by the commerce commission
- Decisions of the commerce commission can be appealed through the high court

Types of competition policy

- Competition law to curb anti-competitive behaviour:
- So open collusion on price, resale price maintenance (setting minimum retail prices) and refusal to deal with other firms is illegal

Merger policies

- To prevent markets from becoming uncompetitive through domination by one or two firms

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Advantages of product differentiation and advertising

- Gives the market system its vitality and are the basis of its power
- Advertising provides consumers with the valuable info on product availability, quality and price which is used to make efficient choices in the market

Disadvantages of product differentiation and advertising

- Leads to waste and inefficiency
- Large sums of money are spent to create non-existent differences among products
- Advertising raises the cost of products and contains little information (an annoyance)
- Advertising can lead to unproductive warfare and may serve as a barrier to entry preventing real competition

Game theory

- Analyses oligopolistic behaviour in terms of the outcomes of different moves and counter moves
- Firms anticipate rival reactions to each possible move and assess the payoff in each case to see the best possible move

Cooperative game

- Allow for the possibility that players can negotiate binding contracts

Non-cooperative game

- Disallow the possibility of binding contracts
- Cannot signal legal agreements because of commerce commission so this prevents the cooperative game

Types of non-cooperative games

- One-shot simultaneous games where there is one turn all at once
- Repeated games where they all play the same simultaneous move over and over again
- Sequential games where they allow follow different paths depending on the outcome of each stage of the game

Setting up a game

- At least 2 players
- A list of possible moves
- A list of payoffs
- The pay-offs could be zero sum which is where total profit is fixed and if one gets it the other gets nothing

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

		Player 2	
		Left	Right
Player 1	Top	P1: \$6 P2: \$6	P1: \$1 P2: \$8
	Bottom	P1: \$8 P2: \$1	P1: \$3 P2: \$3

- Bottom is the dominant strategy for player 1 regardless of what player 2 chooses
- Right is the dominant strategy for player 2 regardless of what player 1 chooses

Dominant strategy

- The best strategy regardless of what the other player does
- What a rational decision maker will choose

		ROCKY	
		Don't Rat	Rat
GINGER	Don't Rat	Ginger: 1 year Rocky: 1 year	Ginger: 7 years Rocky: free
	Rat	Ginger: free Rocky: 7 years	Ginger: 5 years Rocky: 5 years

- Based on self-interest each prisoner believes ratting is best whether or not the other prisoner confesses or not
- As a result they both end up worse off than if neither had ratted
- By ratting both players have played their best response and this forms the Nash equilibrium
- This is the fundamental reason for predicting the actions of players in a strategic game

Firm 1's STRATEGY	Firm 2's STRATEGY	
	$q_2 = 5$	$q_2 = 6$
$q_1 = 5$	1's profit = \$50 2's profit = \$50	1's profit = \$45 2's profit = \$54
$q_1 = 6$	1's profit = \$54 2's profit = \$45	1's profit = \$48 2's profit = \$48

- The worst outcome for each occurs if both cheat on the agreement and expand output
- This results in lower prices & profits
- In this game each firm has a dominant strategy to cheat on the agreement by expanding output
- So there is a unique Nash equilibrium in which the firms don't collude

Nash equilibrium

- A situation when each firm is doing the best they can given the current actions of the other firms
- Game theory helps us understand why prices in oligopoly usually fall short of the monopoly price
- Firms must strive to get as close as possible to the monopoly price and as far away from the perfectly competitive price

Cheating

- Cheating amongst oligopolistic firms is good for the consumers
- The incentive to cheat works in favour of the consumer at all times

The advertising game

- Firms use advertising to increase market share
- This can result in prisoners dilemma and Nash equilibriums

Pink's STRATEGY	Blue's STRATEGY	
	Do not advertise	Advertise
Do not advertise	P's profit = \$50 B's profit = \$50	P's loss = -\$25 B's profit = \$75
Advertise	P's profit = \$75 B's profit = -\$25	P's profit = \$10 B's profit = \$10

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD

Examples of prisoner's dilemmas

- Negative ads in political campaigns
- Military spending
- Owners of sports teams paying over the top salaries for superstars
- Students having to get more degrees to look better in the job market

Game theory

- Analyses oligopolistic behaviour as a complex series of strategic moves and reactive countermoves among rival firms
- In game theory firms are assumed to anticipate rival reactions

Dominant strategy

- One that a player would prefer regardless of the actions of the other player
- Not all games have dominant strategies

Nash equilibrium

- Set of strategies for which each player accurately believes they are doing as well as possible given the other play plays their equilibrium strategy

Why non price competition is a feature of oligopoly

- All firms attempt to act in collusion for their mutual benefit to attain joint profit maximisation
- This results in the lack of price competition amongst them but firms try to gain market share by resorting to non-price competition strategies such as advertising
- Although the desire to cooperate with each other in regard to price dominates an oligopolistic industry firms try to capture a larger share of the market by using non-price competition

		Country B	
		Trade restrictions	No restrictions
Country A	Trade restrictions	-2, -2	3, -3
	No restrictions	-3, 3	0, 0

Dominant Strategy Nash Equilibrium

Game with 2 Nash equilibriums and no dominant strategy

- Coordination problem
- Neither firm is prepared to risk the mutually better strategy

		<i>Firm B</i>	
		Strategy 1	Strategy 2
<i>Firm A</i>	Strategy 1	3, 2	0, 0
	Strategy 2	0, 0	2, 3

Prisoner's dilemma

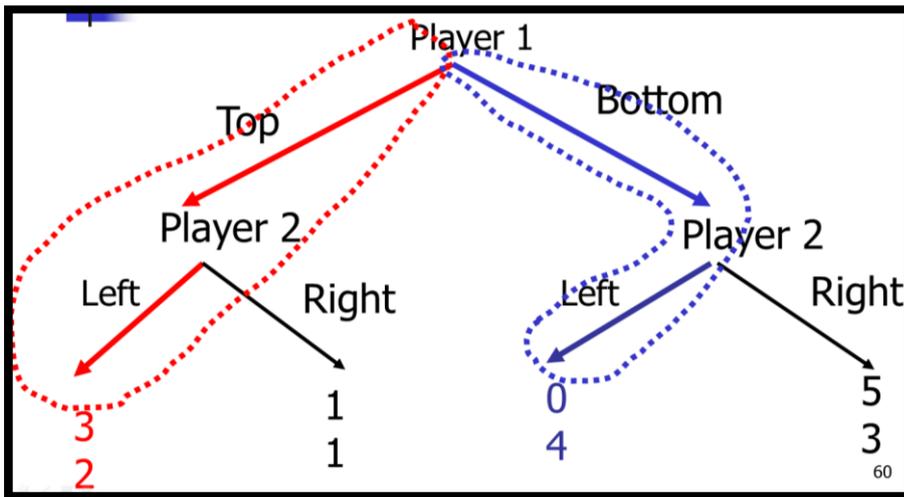
- Infinitely repeated prisoners dilemma games can sustain the cooperative equilibrium as the long term non-cooperative equilibrium

Tit for tat strategy

- In tit for tat one oligopolist might threaten to increase output if the other does even though it won't maximise profits
- If the rival believes this threat after it had been done a few times (credibility) the rival may believe it may be better to work in peace
- Tit for tat strategy can foster cooperation as long as each player sticks to it
- Reputations can also help
- Role of institutions
- Gaining a reputation in the short run e.g. initially the mechanic won't be able to charge more than other mechanics that don't care about reputations
- Organisation such as the world trade organisation are there to enforce agreements and members have to abide by rules (not beggar thy neighbour policy)
- May firms use meet the competition clauses where they match or beat competitors prices
- Neither firm wants to announce a price cut since its makes the rivals product cheaper

Games with sequential moves

- We solve for the equilibrium outcome using the principle of backward induction

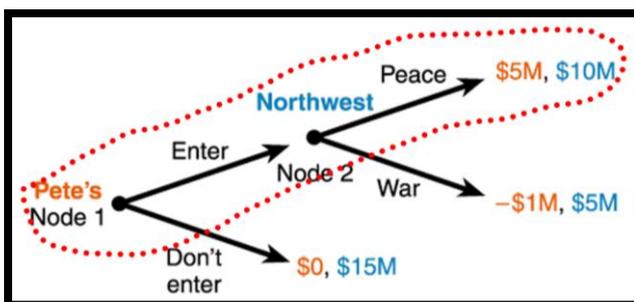


Time consistency

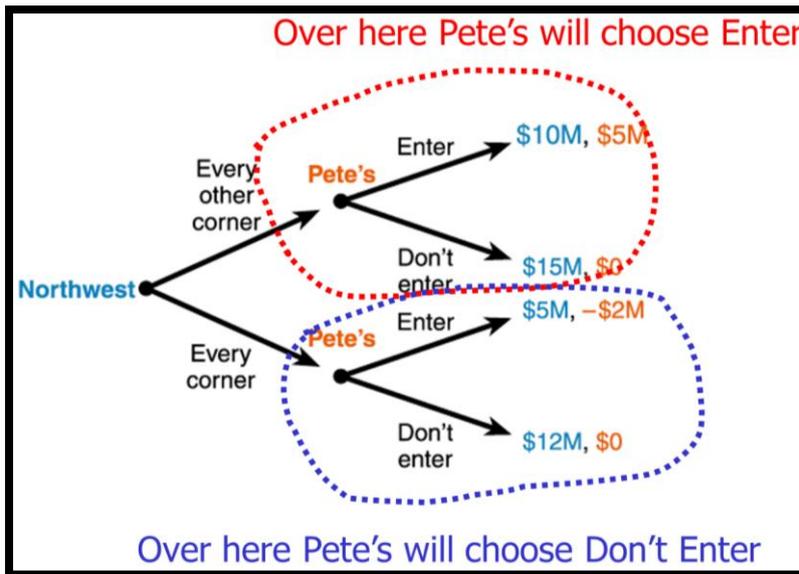
- Arises where one player's promise or threat is designed to influence the other player's actions
- Response to actual entry
- Hostage negotiation
- E.g. bringing up children – crying shouldn't be a weapon

Commitments

- Time inconsistency is where one player's promise or threat is designed to influence the other player's action but are not carried out when the time to do so arrives
- Making credible commitments is a way of solving time inconsistency problems



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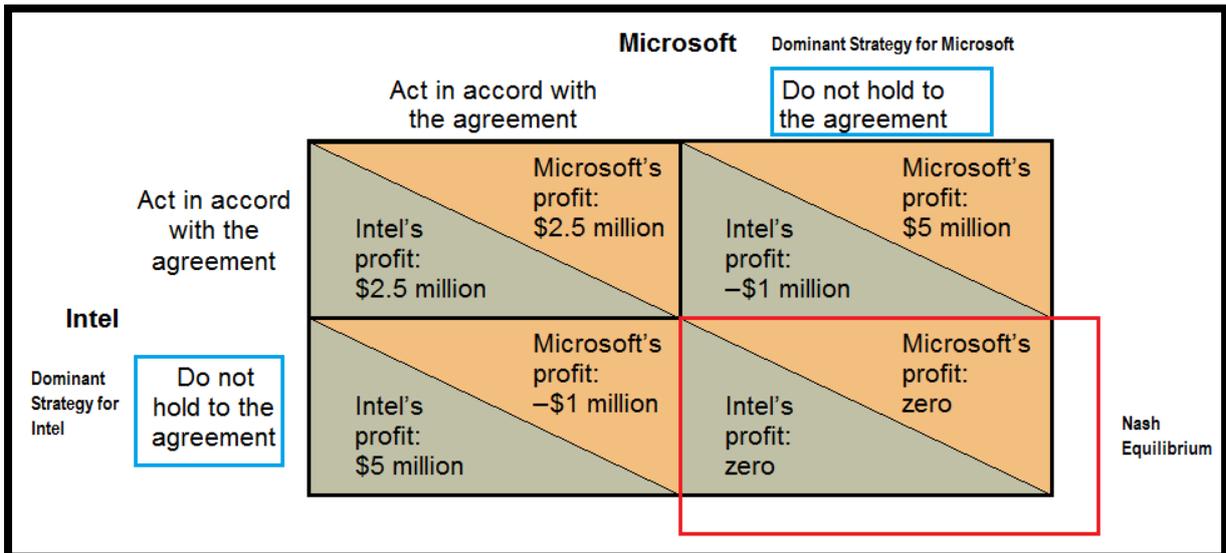
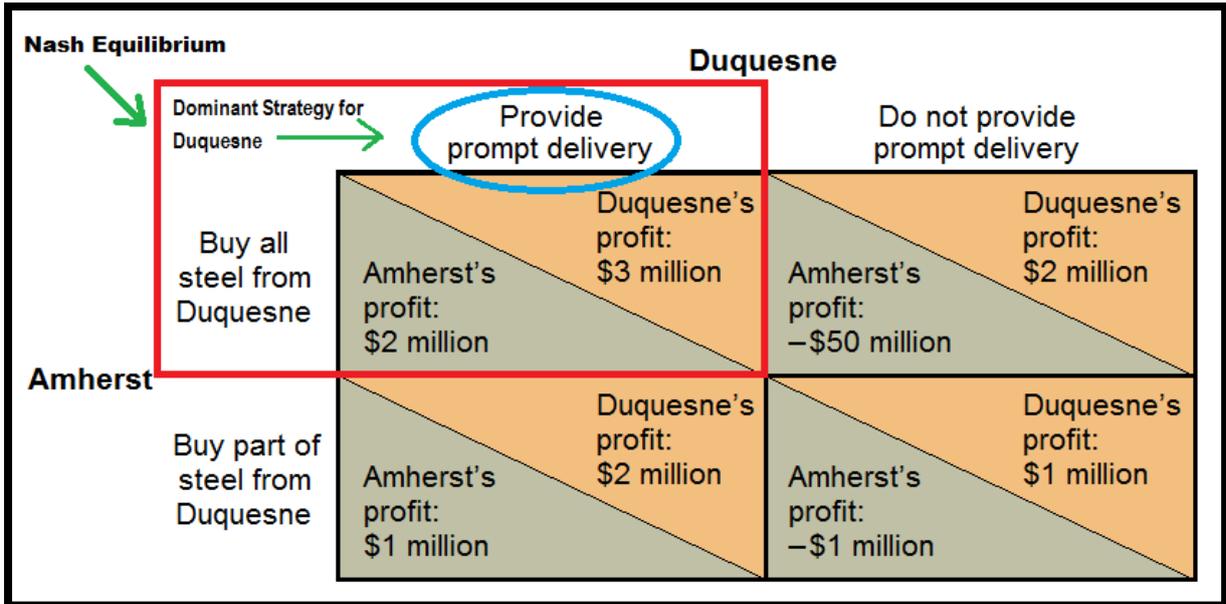


- Here Pete can use rollback to determine what happens if he enters
- Northwest will find it better to compete peacefully
- Any threat by northwest will not be credible so no commitment
- In this case start with Northwest and when Pete enters he knows what northwest had done
- Use rollback again
- If northwest has opened in every other street Pete will enter as northwest will not wage war
- If northwest opens in every street then there is more commitment which is more credible than a price war
- This strategy will be more expensive to northwest but he is trying to keep Pete out of the market by making it overcrowded

Game theory summary

- A game is a competitive situation in which two or more players pursue their own interests and no players can dictate the outcome
- Outcomes for all contingencies are displayed on payoff matrices or game trees
- The prisoners dilemma game illustrates the tendency to cheat on collusive or cartel agreements
- Firms can engage in a wide range of strategic moves
- Threats need to be credible to be effective
- The effects of oligopoly are difficult to predict but game theory offers a tool for analysis of: non-price competition, advertising, market entry, product differentiation

LITTLE NOTABLES EXCLUSIVE – WESLEY HARFIELD



Adverse selection

- Also known as hidden information
- Unevenly distributed information about types
- E.g. buying a used car which looks fine on the exterior but really its bad

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Moral hazard

- Also known as hidden actions
- Unevenly distributed information about actions
- Undesirable results caused by difficulties in monitoring the behaviour of someone who may have different objectives to you
- E.g. if business is slow is this due to a lack of demand or are workers shirking and being rude to customers
- Moral hazard is when its costly to monitor behaviour so allowing people to respond in unwanted ways to incentives
- It can result in markets failing to exist for some people or products
- E.g. you buy full protection car insurance then drive like a madman and this results in people with bad driver characteristics not being able to buy insurance while people with good driver characteristics paying higher premiums
- Responses to solve this problem include forcing consumers to pay excess fees and insurers not paying 100%

Asymmetric information

- Recognises that in some situations some parties may have more information than others and are therefore able to exploit that extra information to gain an advantage
- E.g. used car markets
- Asymmetric information can lead to efficiency losses when defective units dominate used product markets which can lead to complete market failure
- Asymmetric information can result in the least desirable consumers or sellers remaining in a market while the most desirable consumers or sellers opt out of a market

Signalling

- Market signals can be used to counteract the consequences of asymmetric information by allowing participants to convey increased information to the market
- E.g. education is a signal in labour markets, warranties and prices are signals in product markets

Principal agent problems

- The principal wants something done by someone else who may have different objectives
- Asymmetric information is one of the primary causes of the principal agent problem
- Bonuses or other incentives can solve this problem by providing motivation for the agent to act in the best interest of the principal

Contract solutions to incentive problems

- Can be solved in simple transactions by rewards and punishments
- E.g. you want a document type so you agree to pay a certain fee if the document is done by an agreed time and you fine the typer for every typo and every minute of delay
- However it is too expensive or too complicated to write contracts on all possible outcomes

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Reputation solutions

- Reputations play an important role in providing incentives and preventing parties from renegeing on contracts
- Firms lose reputation and profits if they abuse their position of power over information

Reputation as a barrier to entry

- If prices are too low then the incentive to provide quality is low as well
- So in markets where reputation is important competition may not lead to price cutting
- Sometimes the necessity of establishing a reputation acts as an important barrier to entry and limits the degree of competition in markets

Market for health insurance example

- The market for health insurance provides an illustration of the impact imperfect information can have
- Moral hazard: reduced incentive to economize on health care when insurance companies pick up the tab
- Adverse selection: insurance companies want the lowest risk patients leaving the ones with the high costs to others
- If insurance companies can't distinguish between high and low risk patients it has to charge anyone asking for insurance more due to the adverse selection argument

Credit card example

- Credit card firms have to charge a high interest rate to everyone as they don't know who will default on their payments
- So essentially the people with good credit history are forced to subsidize the people who might default on their credit balances

The search problem

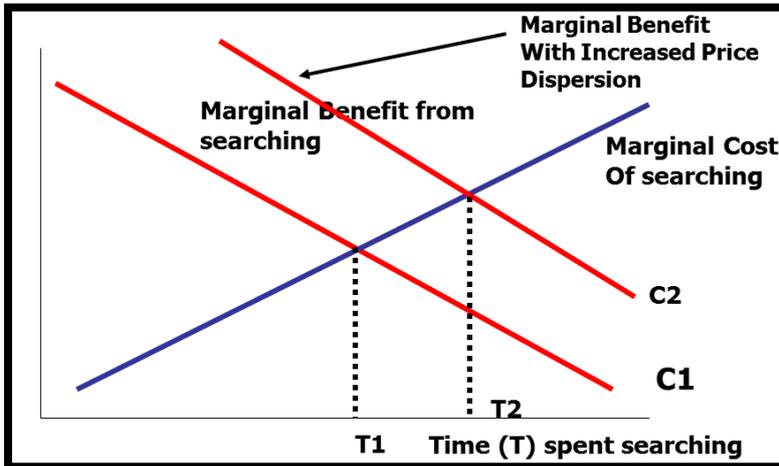
- In the basic competitive model the price of the same good is the same everywhere
- In reality though similar goods sell for different prices at different locations

Price dispersion

- Households and firms spend considerable amounts of time searching for low prices which is costly
- This means that price dispersion can persist with some stores charging higher prices so they make greater profits but with lower levels of sales
- E.g. consumers search for cheaper prices, firms search for good workers, workers search for good jobs
- Search is an important and costly economic activity

The search decision

- The expected benefit of additional time spent searching is decreasing over time
- As you search more and more the marginal benefit goes down
- If the price dispersion increases you should now be spending more time on searching
- So therefore if there is a decrease in price dispersion you should spend less time searching



Price dispersion and search time

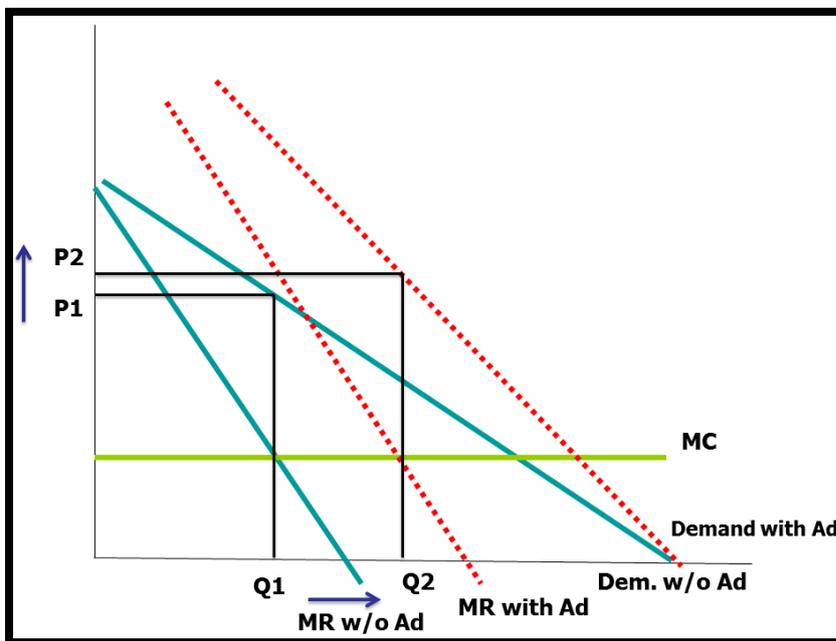
- You should spend a greater time searching for a good that has greater price dispersion e.g. rental apartment
- However it's not beneficial to search too long for a product with low price dispersion e.g. petrol
- The lower the price dispersion/difference less time should be spent on searching to maximise the marginal benefit

Search and imperfect information

- Firms know searching is costly
- So a firm won't lose all its customers if it has a price higher than its competitors

Advertising

- Advertising provides information and persuades consumers
- Advertising is both a cause and consequence of imperfect information
- In perfectly competitive markets where products are homogeneous there is no benefit from advertising
- If a single producer advertises then this shifts the entire market demand curve outwards so it's hard to define what the individual benefit to the firm would be
- However if advertising can create perception that products are different than the market becomes imperfectly competitive
- This makes the demand curve for each producer slope down and gives the producer some discretion over the price of the product
- The point of advertising is to change the slope of the demand curve so reduce the price responsiveness of consumers and shift the demand curve out to increase profits



Motivating workers

- Given the existence of moral hazard it's important to motivate workers
- Workers have a price-wage
- Workers bring adaptability and a multitude of skills and experience to a job
- Most machines can only do one task and even robots can only do what they are programmed to do
- However machines have one advantage over which is they do what they are told except when they break down
- But workers have to be motivated if they are to work hard and exercise good judgements so they have a will of their own unlike machines

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Piece rates and incentives

- The system of payment where workers are paid for each item produced
- In many jobs employers offer a balance between a guaranteed minimum compensation and bonuses that rely on performance e.g. real estate dealers

Advantages of piece rates

- A firm providing a certain amount of guaranteed pay reduces the risk the worker bears

Disadvantages of piece rates

- The problem with this scheme is that it leaves the entire production risk to the workers
- With lower piece rate compensation there is less of an incentive to put in much effort
- Only certain jobs can use a piece rate system
- Piece rates are damaging to the quality of g/s
- Salesmen have little incentive to provide info to potential customers they perceive as not likely buyers or who might end up buying from another salesmen in the same firm

Efficiency wages

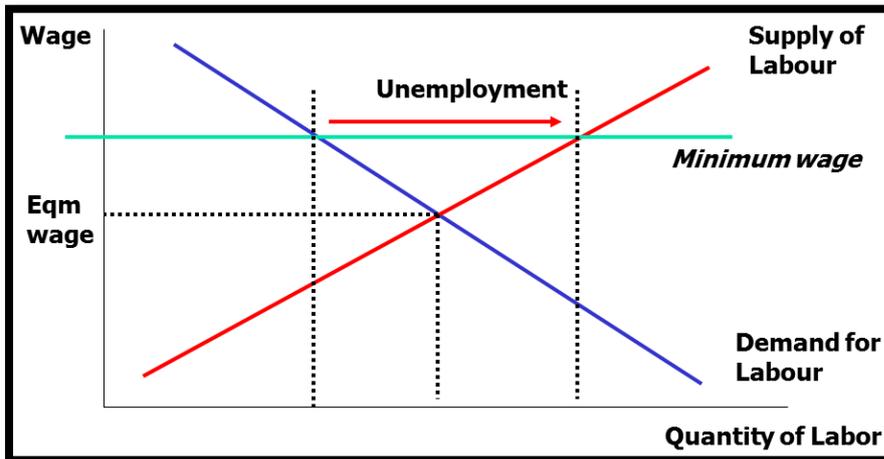
- To motivate workers employers use reward and punishment (carrot and stick)
- They may reward workers for performing well by making pay and promotion depend on performance and they may punish workers for shirking by firing them
- Monitoring effort continuously is expensive
- An alternative is to monitor less frequently but to impose heavy penalties if the worker is caught shirking
- One way of imposing a heavy penalty is to pay above market wage therefore if a worker is fired they suffer a large loss of income so the higher the wage the greater the penalty of being fired
- Higher wages can also reduce labour turnover, lead to more loyalty and enable the firm to attract more qualified workers (everyone has a reservation wage)

Efficiency wage theory

- Higher wages increase workers net productivity by reducing labour turnover or enabling firms to recruit a higher quality labour force
- In jobs where it's costly to monitor workers on a day to day basis employers are more likely to rely on high wages to motivate workers to perform well
- Wages of trust can explain why wages in capital intensive industries are higher than wages in less capital intensive industries
- The wage is paid as an incentive to handle expensive equipment with care
- Similarly workers who are entrusted with care of large amounts of cash are paid higher wages e.g. accountants cashiers

Minimum wage

- Minimum wage increases the incentive to work by increasing the difference between what someone on welfare receives and what a worker gets
- So the penalty for being fired is large
- Efficiency wages are the same as minimum wages except they are based on the employers choice



Summary

- Buyers and sellers don't have the same information which means there is asymmetric information which can lead to market failure
- The lack of reliable information can undermine the efficiency properties of competitive markets
- Signals such as education in the labour market can reduce the problems of asymmetric information
- Moral hazard problems arise when people adjust their behaviour and thereby increase risk after they buy insurance
- Co-insurance and excess fees reduce moral hazards
- Asymmetric information is a source of the principal agent problem
- Bonus systems and other incentives can reduce the principal agent problem
- Large pools of unemployed works can sustain an equilibrium efficiency wage

Externalities

- A cost or benefit resulting from some activity or transaction that is imposed or bestowed upon parties outside the activity of transaction
- Also called spillovers or neighbourhood effects
- When external cost are not considered in economic decisions we engage in activities that are not worth it e.g. over production and over consumption
- When external benefits are not considered we fail to do things that are worth it e.g. under production and under consumption
- These result in an inefficient allocation of resources

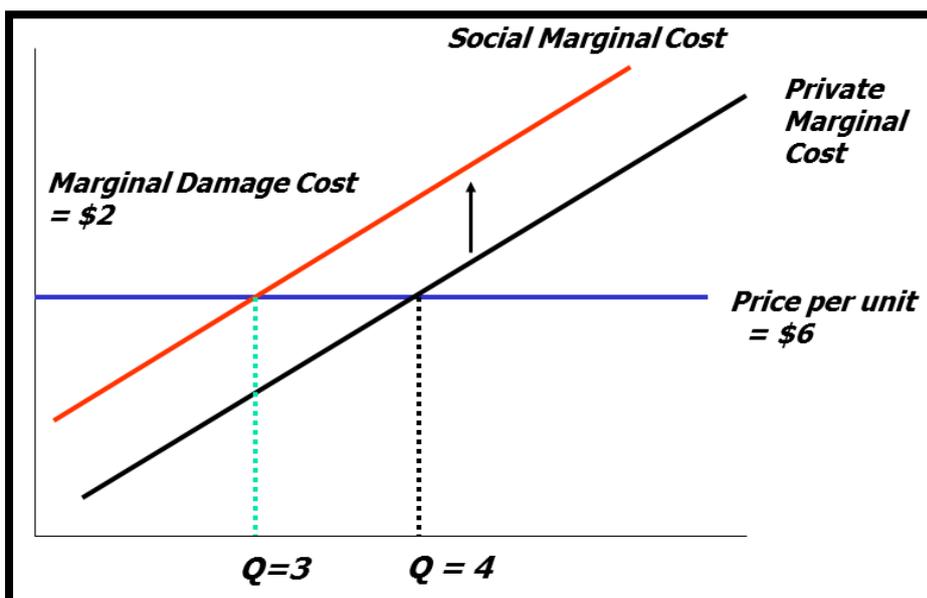
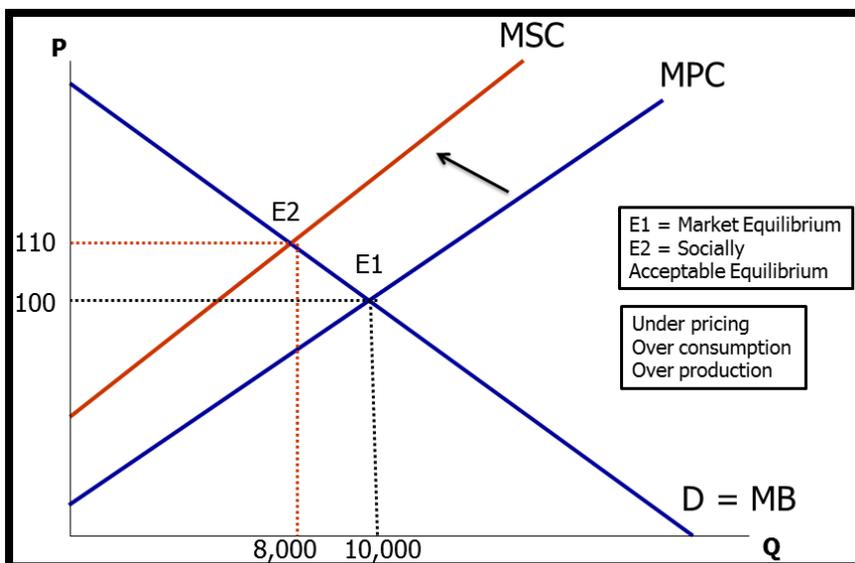
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Market failure

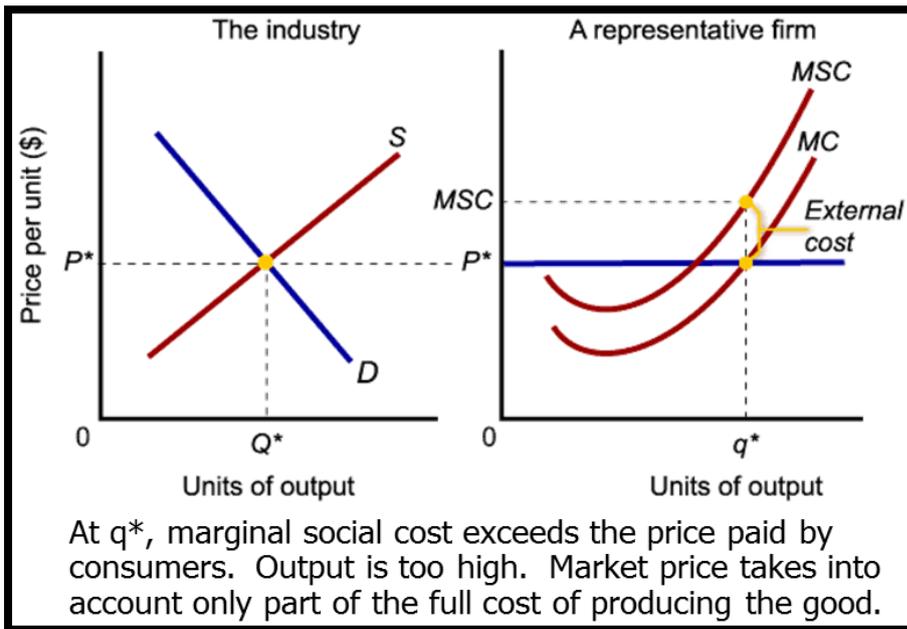
- Is what calls for collective action or state intervention
- In pursuit of market failure govts use fiscal policy, monetary policy, trade policy, incomes policy
- These policies are used to provide a stable environment conducive to economic growth
- Market failure is when the invisible hand of the price mechanism fails to allocate resources efficiently or to correct the incorrect price signals sent out by the price mechanism

Marginal social cost

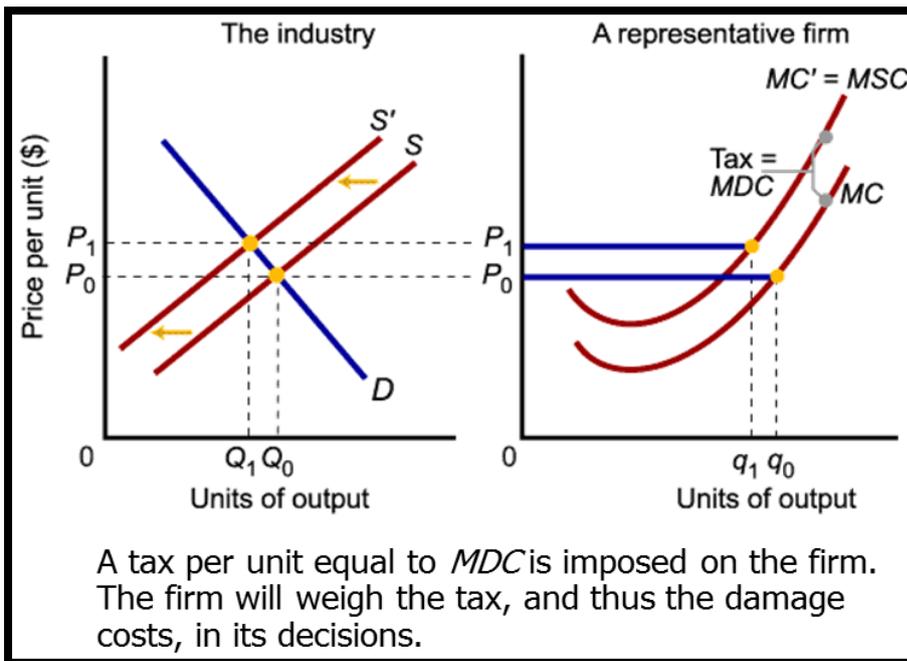
- The total cost to society of producing an additional good or service
- Marginal social cost is equal to the sum of the marginal cost of producing the product and the correctly measured damage costs involved in the process of production
- Marginal social cost = marginal private cost + spillover cost



Marginal social cost and marginal cost pricing



Internalising externalities



Marginal social benefit and marginal social cost

- Equating private marginal benefit to marginal cost leads to under provision of that good or activity
- Schooling for females in less developed countries which leads to lower child mortality rates and better child health is an example of social benefit exceeding private benefit

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Public goods

- Goods that are non-rival in consumption and their benefits are non-excludable
- Public goods have characteristics that make it difficult for the private sector to produce them profitably (market failure)
- E.g. police, army, motorways, public parks

Characteristics of public goods

- A good is non-rival in consumption when one consumer's consumption doesn't interfere with another's so the benefits of the goods are collective they accrue to everyone
- A good is non-excludable if once produced no one can be excluded from enjoying its benefits
- The good can't be withheld from those that don't pay for it

The free-rider effect

- Because people can enjoy the benefits of public goods whether they pay for them or not they are usually unwilling to pay for them

Problem with public goods supplied in a private market

- Consumers acting in their own self-interest have no incentive to contribute voluntarily to the production of public goods
- Most people don't find room in their budgets for many voluntary payments so the economic incentive is missing

Externalities and environmental economics

- The environment is where negative externalities play a large role
- The environment is a public good since it's non-excludable and non-rival in consumption
- Negative externalities plus the public good aspect of the environment leads to serious problems with pollution
- The problem is that there are no defined property rights for the environment
- We need to balance between the needs of business to create hazardous wastes as a by-product of the production processes as well as the rights of ordinary citizens to breathe fresh air

Coase's view

- The primary response should be to clearly define property rights rather than widespread government intervention
- Coase argued that with appropriately designed property rights markets could take care of negative externalities with government intervention
- Government doesn't need to be involved in every case of externality

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The Coase theorem

- Private bargains and negotiations are likely to lead to an efficient solution in many social damage cases without any govt involvement at all
- Three conditions must be satisfied for the Coase's solution to work
 1. Basic rights at issue must be assigned and clearly understood
 2. There are no impediments to bargaining
 3. Only a few people can be involved
- Bargaining will bring the contending parties to the right solution regardless of where rights are initially assigned
- However often the scale of the problems are huge involving many countries and many govts

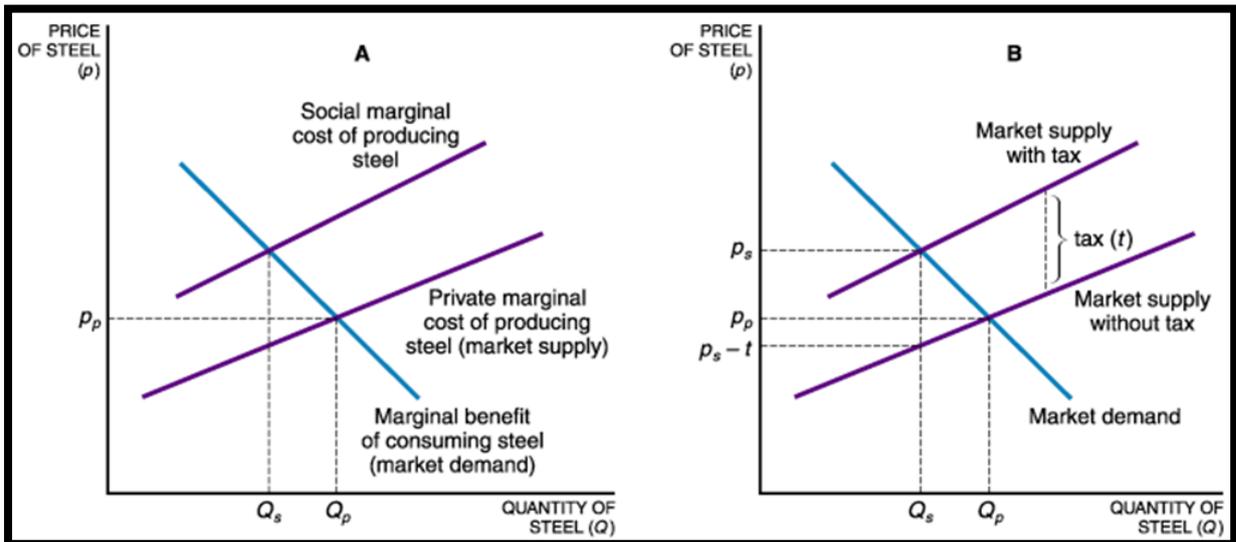
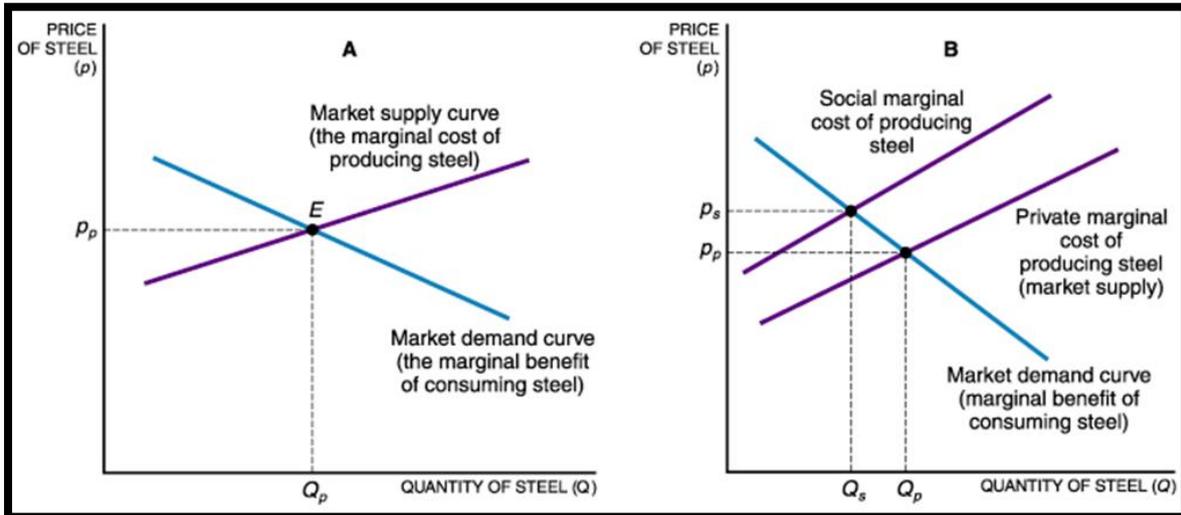
Command and control approach to environment issues

- Strict physical limits on amounts of pollutants as well as types of pollutants
- However the incentives are wrong so not the most efficient way of doing things
- When you impose physical limits on the units of pollutant that you can emit then the producer has an incentive to reduce pollution to that level
- However they have no incentive to go lower since it costs money to reduce pollution and going below the limit has no reward
- Therefore if faced with limits on pollution producers tend to stop at the limit and go no lower
- However this approach is cheap on transaction costs

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Tax and subsidy based approach to environmental issues

- The idea is to make producers pay for each unit of pollutant they emit
- This case the producer has an incentive to lower emissions to the point where marginal benefit equals marginal cost including the tax
- So if you set the tax equal to the marginal social damage this should get the producer to choose the socially optimum level of output



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Marketable permits approach

- The govt issues the same amount of permits so that the company produces the same level of pollution that you desired under the command and control approach
- But now firms can trade these permits
- So firms which can easily pollute less can sell their permits to firms who want to pollute more
- The incentive effects are similar to the tax and subsidy approach
- Firms have an incentive to reduce pollution to where marginal benefit = marginal cost
- As long as the cost of reducing one unit of pollution is less than the price the firm has to pay for each unit of pollution (permit prices) the firm will opt to reduce emissions
- Therefore the firms which are more efficient in reducing pollution can do so and sell their additional permits to others