ECON1101 Notes

Microeconomics 1 (Australian National University)

ECON1101 – Microeconomics 1 Summarised Notes (Lectures 1-4)

Introduction (Lecture 1)

Economics = Study of decision making; how people make decisions – allocation of scarce resources
- Way of thinking/analysing problems & the world

Microeconomics – individual units – behaviour of individuals and firms
Macroeconomics – study of economy-wide phenomena – inflation, unemployment, etc.

Positive/normative economics
- Positive – objective/factual – statements that are verifiable
- Normative – subjective – what economic agents should do

Trade-offs

'Unlimited wants but limited resources'

Time and money are limited resources – there are other things we could do with these resources
Opportunity cost – the best alternative that must be given up to obtain some item
Marginal change – a small (incremental) change – marginal cost + marginal benefit

Methodology – the science side
1. Identify problem/issue
2. Develop a model based on simplified assumptions
3. Collect data and test model

Developing the model
- Simplified description of reality – used to understand and predict relationships
- Built on foundation of theory – uses those factors (variables) that are most important to explaining the event
- Requires simplified assumptions

Direct – positive association
Inverse – negative association

Demand and supply

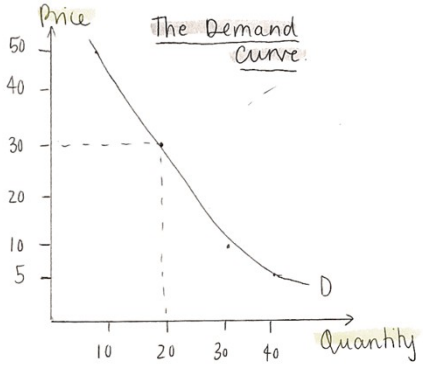
The forces that make market economics work and the foundation for most economic analysts – interaction of supply and demand determines prices in a market economy and prices determine the allocation of goods and services

Market – Where a group of buyers and sellers interact to purchase a good or service – formal and organised OR virtual

Demand – The quantity demanded of a good is the amount of the good that buyers are willing (and able) to purchase
- The most important determinant of the quantity demanded is the price
- Law of Demand - as the price rises, the quantity demanded of the good falls, conversely, as the price falls, the quantity demanded rises

Demand

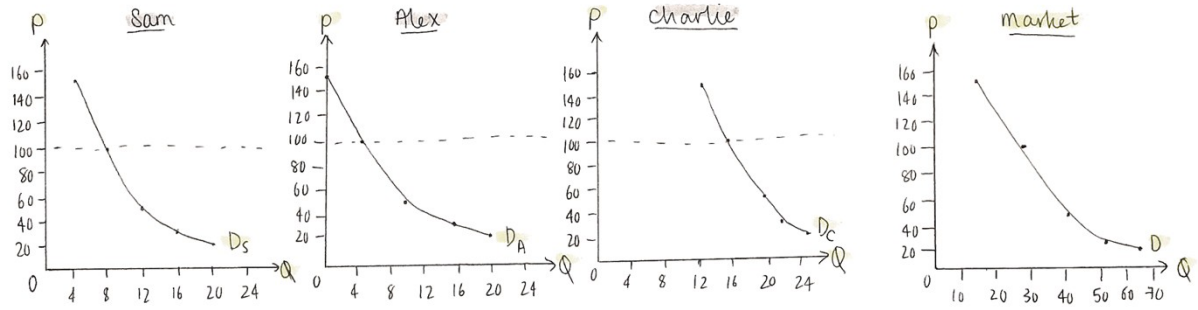
The Demand Curve
Price always goes on the y-axis, quantity on the x-axis



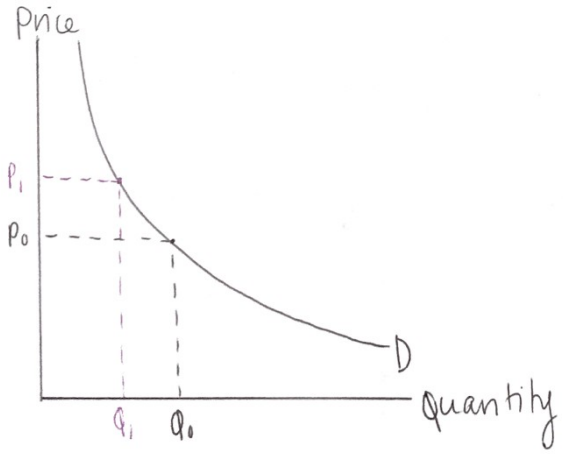
Price ($)	Quantity Demanded
50	10
30	20
10	30
5	40

Market Demand – sum of all individual demands for a particular good or service
- Graphically – individual demand curves → summed horizontally = obtain the market demand

Price	Q^D for Sam	Q^D for Alex	G^D for Charlie	Market Demand
$20	20	20	25	20 + 20 + 25 = 65
$30	16	15	22	16 + 15 + 22 = 53
$50	12	10	19	12 + 10 + 19 = 41
$100	8	5	16	8 + 5 + 16 = 29
$150	4	0	13	4 + 0 + 13 = 17

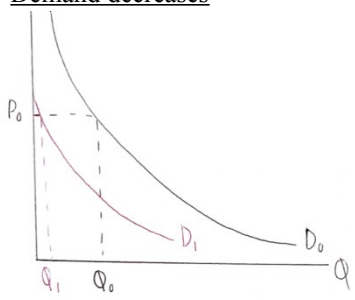


Movement along the Demand Curve
When market demand curve drawn → all other things constant (economists' assumption of ceteris paribus – 'all else constant')
Changes in quantity demanded
- Movement along the demand curve
- Only generated by a change in the price of the product
- Price is the only thing that changes but is not the only determinant of quantity

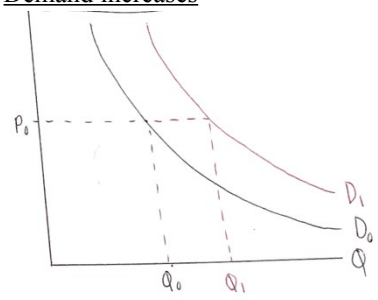


Shifts in the Demand Curve
Increase in demand = at every price, quantity demanded increased - shifts to right
Decrease in demand – at every price the quantity demanded has decreased = shifts to left
Demand = f (P_X, Y, P_Y, preferences, expectations)

Demand decreases



Demand increases



Consumer Income
Suppose income increases;
- If demand for the good rises = good is normal (e.g. coffee, food, property, car, furniture)
    - ✶ Thus the curve shifts to the right
- If demand for the good falls = good is inferior (e.g. 2 minute noodles, home-brand, bus trips)
    - ✶ Thus the curve shifts to the left

If a question about these goods comes up in an assessment – discuss both normal and inferior goods

Related Goods
Suppose the price of a related good increases;
- If demand for the original good rises = goods are substitutes (both of equal demand/quality)
    - ✶ E.g. Doritos and CCs
- If demand for the original good falls = goods are complements (demand depends on one other good)
    - ✶ E.g. Gaming console and games

Expectations of Future
E.g. the price of pants is about to rise = quantity demanded decreases

Preferences
E.g. when a campaign raises awareness of the fact that underpaid ‘sweatshop’ labour makes the pants?

Consumers and Incentives

Tastes and preferences

- Everyone has different likes and dislikes – two things in common
  - ✶ We all want the 'biggest bang for our buck'
  - ✶ What we actually buy reflects our tastes and preferences

Prices of goods and services

Two characteristics of prices

- Prices are fixed – no negotiation
- We can buy as much as we want of something without driving the price up (because of an increase in demand)
  - ✶ Each individual is such a small part of market that there is no effect on price

Income money: The budget set – assumptions

1. No saving or borrowing, only buying
2. Even though a straight line to represent purchase choices, we only purchase whole units

Example – assume that you have an income of $300 to spend on two goods – sweaters ($25) and jeans ($50)

Graphical representation – axis doesn't matter

Spending all income means the buyer is on the budget constraint

Sweaters	Jeans
0 ($0)	6 ($300)
2 ($50)	5 ($250)
4 ($100)	4 ($200)
6 ($150)	3 ($150)
12 ($300)	0 ($0)

Slope of the budget constraint = rise/run (always negative)

Y-intercept is called $\overline{Y}$ and is calculated by $\overline{Y}=\frac{I}{P_Y}$

- The higher number of units of Y that can be purchased (i.e. only purchasing Y)

X-intercept is called $\overline{X}$ and is calculated by $\overline{X}=\frac{I}{P_X}$

- The higher number of units of X that can be purchased (i.e. only purchasing X)

Equation for the budget constraint

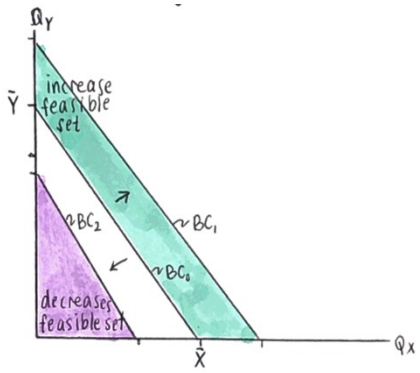
$$Q_S P_S + Q_J P_J = I$$

(quantity of sweaters x price of sweaters) + (quantity of jeans x price of jeans) = income

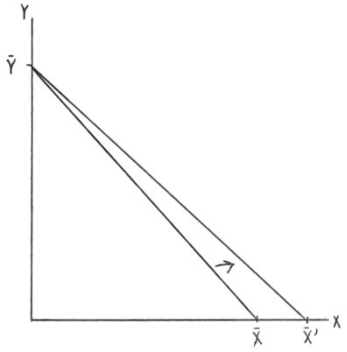
As you increase consumption of sweaters you have to forgo the number of jeans you can buy – this is the opportunity cost of buying more sweaters

- If quantity of sweaters bought is to increase, the quantity of jeans must be decreased by $\frac{P_s}{P_J}$
- Slope of BC is the opportunity cost of the x-axis good

Price of one good changes
As price <u>decreases</u> – more of that product is available to be purchased, so the x/y-intercept changes (depending on whether x or y is the good in question)
Both the x/y-intercept and the slope change, but one intercept stays the same



Income of consumer changes
As income <u>increases</u> – BC shifts right (more income is available to buy both products)
As income <u>decreases</u> – BC shifts left (less income is available to buy both products)
Both the x-intercept and the y-intercept change, but the slope of the graph stays the same



How to choose the 'best' bundle
When someone consumes something, they derive a benefit from its consumption → <u>utility</u>
- The more that is consumed – <u>utility</u> increases at a decreasing rate

Definition of utility – tells us how much the consumer 'likes' something – ordinal
- Your level of utility is different from everyone else's – still ranks preferences (different scales)
- Given that we cannot see or measure utility – we approximate it through determining benefit

Requires two conditions
1. Always spend all your money
2. Maximise your benefits/utility

<u>One good</u> – spend all money on that good
<u>Two good</u> – different levels of utility/benefit (preferences) & different prices

Example: Utility from sushi <u>or</u> utility from burgers
Sushi - price = $12; utility = 50
Burgers – price = $12; utility = 100
<u>How to determine which product</u>: marginal utility/price
- Sushi = 50/12 = 4.17
- Burger = 100/12 = 8.33

Should buy burger as higher value

Example: Utility from concert ticket <u>or</u> utility from going to the movies
Concert ticket – price = $175; utility = 500
Movies – price = $20; utility = 50
<u>How to determine which product</u>: marginal utility/price
- Concert ticket - 500/175 = 2.86
- Movies - 50/20 = 2.5

Should buy concert ticket as higher value
Second concert marginal utility = 400; second movie marginal utility = 48
- Second concert ticket = 400/175 = 2.28
- Second movie = 48/20 = 2.4

Should then buy a movie ticket instead as the movie has a higher value

Consumer Equilibrium

$$\frac{MB_X}{P_X}=\frac{MB_Y}{P_Y} \rightarrow \frac{MU_X}{P_X}=\frac{MU_Y}{P_Y}$$

If $\frac{MB_X}{P_X} > \frac{MB_Y}{P_Y}$, consume more x; increase quantity x and MBx decreases. Thus, $\frac{MB_X}{P_X}$ eventually = $\frac{MB_Y}{P_Y}$
Spend income based on the budget constraint.

Best bundles

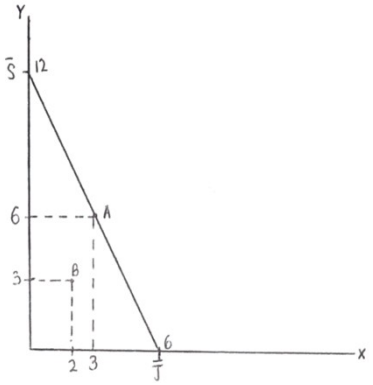
Example 1: Choosing the 'best' bundle

	Sweaters ($25)			Jeans ($50)		
Quantity	**Total Utility**	**Marginal Utility**	**MU/$**	**Total Utility**	**Marginal Utility**	**MU/$**
0	0	-	-	0	-	-
1	100	100/1 = 100	4	160	160/1 = 160	3.2
2	185	85	3.4	310	150	3
3	260	75	3	410	100	2
4	325	65	2.6	490	80	1.6
5	385	60	2.4	520	30	0.6
6	435	50	2	530	10	0.2
7	480	45	1.8	533	3	0.06
8	520	40	1.6	535	2	0.04

Marginal utility = change in total utility / change in quantity
Bundles:

a) 6 sweaters and 3 jeans = $150 + $150 = $300 (optimal)
b) 3 sweaters and 2 jeans = $75 + $100 = $175 (not spending enough – feasible, not optimal)

The places where marginal utility is '=' – must be the same to be optimised – want to be optimising (i.e. on the line)

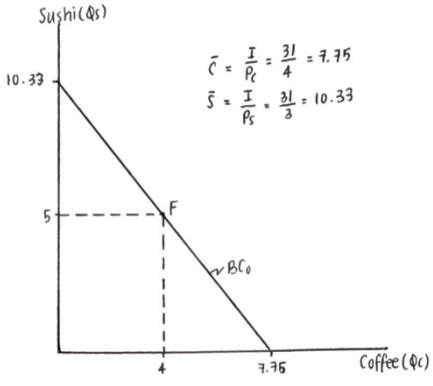


Example 2: Choosing the 'best' bundle

	Coffee ($4)			Sushi ($3)		
Quantity	**Total utility**	**Marginal utility**	**MU/$**	**Total utility**	**Marginal utility**	**MU/$**
0	0	-	-	0	-	-
1	120	120	30	90	90	30
2	240	120	30	180	90	30
3	340	100	25	255	75	25
4	420	80	20	320	65	21.67
5	480	60	15	380	60	20
6	530	50	12.5	434	54	18
7	560	30	7.5	456	22	7.33

Marginal utility per dollar is the same at many points
Income is $31
Bundles:

a) 1 coffee ($4) + 1 sushi roll ($3) = $7 (feasible, not optimal)
b) 1 coffee ($4) + 2 sushi rolls ($6) = $10 (feasible, not optimal)
c) 2 coffees ($8) + 1 sushi roll ($3) = $11 (feasible, not optimal)
d) 2 coffees ($8) + 2 sushi rolls ($6) = $14 (feasible, not optimal)
e) 3 coffees ($12) + 3 sushi rolls ($9) = $21 (feasible, not optimal)



f) 4 coffees ($16) + 5 sushi rolls ($15) = $31 (optimal)

Same example but price of coffee is $5

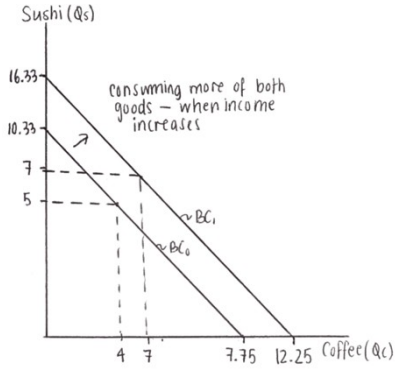
	Coffee ($5)			Sushi ($3)		
Quantity	**Total utility**	**Marginal utility**	**MU/$**	**Total utility**	**Marginal utility**	**MU/$**
0	0	-	-	0	-	-
1	120	120	24	90	90	30
2	240	120	24	180	90	30
3	340	100	20	255	75	25
4	420	80	16	320	65	21.67
5	480	60	12	380	60	20
6	530	50	10	434	54	18
7	560	30	6	456	22	7.33

Bundles:

a) 3 coffees ($15) + 5 coffees ($15) = $30 (most optimal outcome that is also feasible)

If there are no matches – choose the closest match
Follows law of demand; as price of coffee goes down, our consumption goes up

Income changes
If your change increases from $31 to $49 with coffee = $4 and sushi = $3 = using original graph

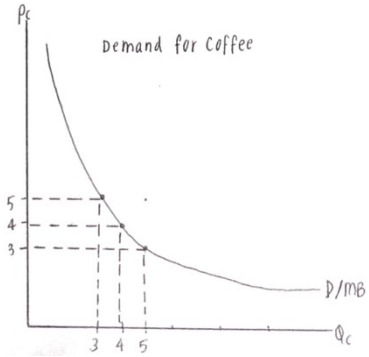


Original income
I = 31
$\overline{S}$ = 31/3 = 10.33
$\overline{C}$ = 31/4 = 7.75
Slope = 4/3
Bundle = 5 sushi rolls and 4 coffees

New income
I = 49
$\overline{S}$ = 49/3 = 16.33
$\overline{C}$ = 49/4 = 12.25
Slope = 4/3
Bundle = 7 sushi rolls and 7 coffees

Optimal bundle and demand
From the above example:

- When coffee $4, sushi $3 and income $31 → 4 coffees and 5 sushi rolls
- When coffee $5, sushi $3 and income $31 → 3 coffees and 5 sushi rolls
- When coffee $3, sushi $3 and income $31 → 5 coffees and 5 sushi rolls
- When coffee $4, sushi $3 and income $49 → 7 coffees and 7 sushi rolls



Consumer surplus
Consumer surplus - the difference between what you are willing to pay and what you have to pay (the marked price)
Quantity demanded of a good is determined by our:

- Willingness to pay (WTP)

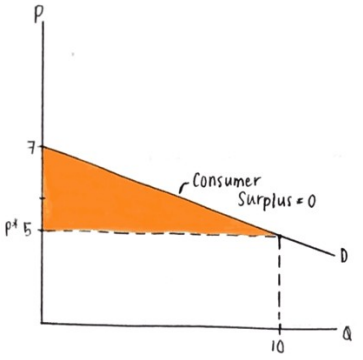
- Measures how much a consumer values the good or services

P > WTP → No sales
P =< WTP → Sales!

Buyer benefits – amount they pay is less than they willing to – this difference is the consumer surplus
Consumer surplus = willingness to pay – amount paid for each unit sold

$$CS = \sum_{q=0}^{q^* \text{¿} P^{max} - P^{\text{¿}} \text{¿}} \text{¿} \text{ or } CS = \frac{1}{2} Q \left(P^{max} - P^{\text{¿}} \right) \text{ (second is the linear demand curve)}$$

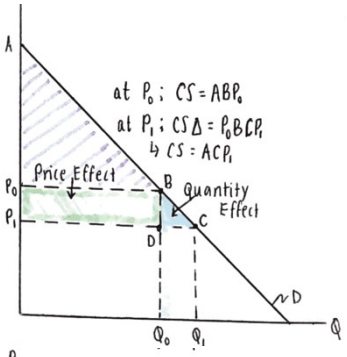
Given that the demand curve for each consumer is derived from the consumer's willingness to pay (likewise the market demand curve); at any quantity, the price given by the demand curve shows the WTP of the marginal customer.
Therefore, demand curve can be used to measure the consumer surplus



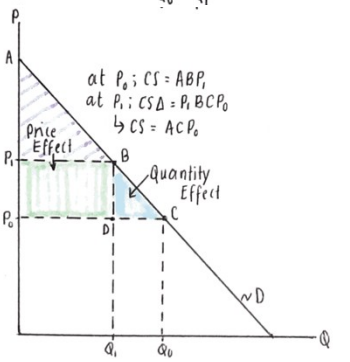
Total expenditure = P* x Q* (on the graph below)
Total willingness to pay = area under demand curve up to Q*
Consumer surplus = difference between total WTP & total expenditure

As consumer surplus increases, price decreases (indicated by the law of demand)

- For units 0 → Q_0, we now pay <u>less</u> so the difference between WTP and price has become greater (increases CS) – called the **price effect**
- The lower price means we consume more ($Q_1 > Q_0$) and an increase in CS from an increase in consumption – called the **quantity effect**



- For units 0 → Q_1, we now pay <u>more</u> so the difference between WTP and price has become smaller (decreases CS) – called the **price effect**
- The higher price means we consume less ($Q_0 > Q_1$) and a decrease in CS from a decrease in consumption – called the **quantity effect**



<u>Elasticity of Demand</u>

Definition of elasticity
Elasticity of demand – how responsive quantity demanded is to changes in the price level
Two formulas:

$$\varepsilon_D = \frac{\% \Delta Q^D}{\% \Delta P} \quad \underline{\text{OR}} \quad Arc\, \varepsilon_D = \text{¿]}$$

Inelastic – quantity demanded not very responsive to changes in prices

- $\% \Delta Q^D < \% \Delta P$
- E.g. cigarettes, necessary/staple goods, medicine, oil

Elastic – quantity demanded very responsive to changes in prices

- $\% \Delta Q^D > \% \Delta P$

- E.g. soft drink, smartphones, smith's chips, full fat milk – different brands/types substitutes

Example 1: calculating elasticity of demand

10% rise in price of butter
20% decrease in quantity of butter demanded

$$\varepsilon_D = \frac{\%\Delta Q^D}{\%\Delta P} = \frac{-20\%}{10\%} = -2$$

If the price goes from \$2.00 to \$2.25 and Q^D decreases from 8 to 6, E^D?

$$\varepsilon_D = \frac{\%\Delta Q^D}{\%\Delta P} = \frac{\left(\frac{Q_1 - Q_0}{Q_0}\right)\%}{\left(\frac{P_1 - P_0}{P_0}\right)\%} = \frac{\left(\frac{6-8}{8}\right)100\%}{\left(\frac{2.25-2}{2}\right)100\%} = \frac{\frac{1}{4}}{\frac{1}{8}} = \frac{8}{4} = -2$$

Thus 2% decrease in quantity demanded as 1% increase in price

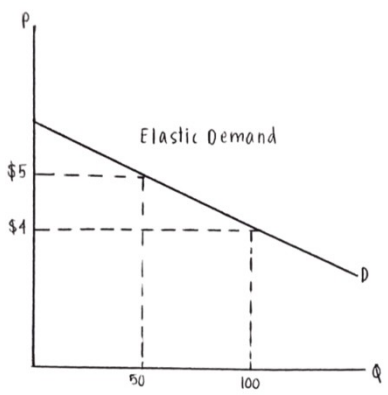
Using the ARC elasticity formula

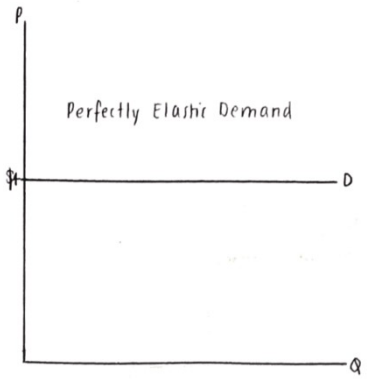
$$Arc\,\varepsilon_D = ¿] = \frac{\frac{6-8}{\left(\frac{6+8}{2}\right)}}{\frac{2.25-2}{\left(\frac{2.25+2}{2}\right)}} = \frac{\frac{-2}{7}}{\frac{2}{17}} = \frac{-17}{7} = -2.45$$

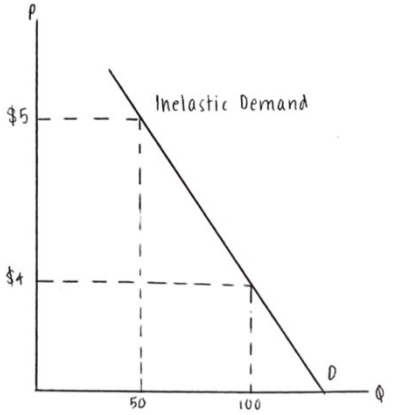
The arc formula is more precise – this product is elastic at least twice as much as what the rise is

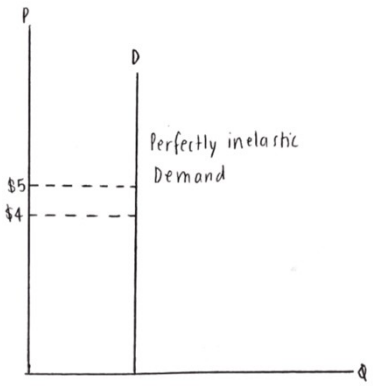
Elasticity of demand

- If $¿\varepsilon_D \vee ¿ > 1$, then demand for the good is elastic
- If $¿\varepsilon_D \vee ¿ < 1$, then demand for the good is inelastic
- If $¿\varepsilon_D \vee ¿ = 1$, then demand for the good is unit elastic (percentage change equal)
- If $¿\varepsilon_D \vee ¿ = \infty$, then demand for the good is perfectly elastic
- If $¿\varepsilon_D \vee ¿ = 0$, then demand for the good is perfectly inelastic





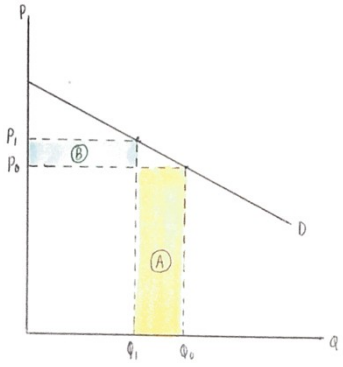




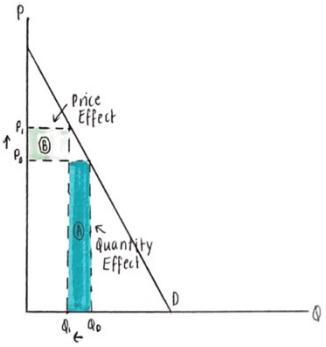
Determinants of elasticity – necessary (medicine, addictive products) vs. luxury items ($$ cars, etc.)
Time horizon – gives time to make sustainability changes

Total expenditure and demand elasticity

Total expenditure – how much consumers pay / producers receive from sales
Formula = P * Q
But an increase in price means that for the units consumers do purchase, consumers spend more (thus total expenditure increases)



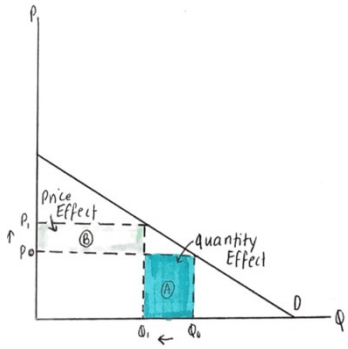
Changes in total expenditure depend on the relative size of area A vs. area B
Elasticity tells us which effect (quantity or price) is more strong
Example 1: Inelasticity – total expenditure increases



Initially at P_0 → $Q^D = Q_0$
$TE_0 = P_0Q_0$
If the price increases to P_1 → Law of demand says Q^D decreases to Q_1
- ✶ Less units are bought/sold – thus TE decreases (quantity effect)
- ✶ The higher price on units purchased – TE increases (price effect)

- If inelastic demand (i.e. % change in Q^D < % change in P)
- Quantity effect < price effect
- Total expenditure increases – inelasticity

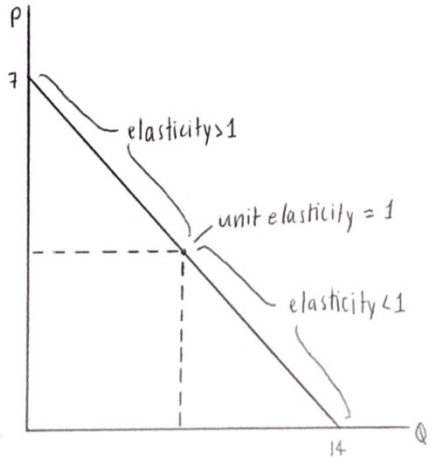
Example 2: Elasticity – total expenditure decreases



Initially at P_0 → $Q^D = Q_0$
$TE_0 = P_0Q_0$
If the price increases to P_1 → LOD says Q^D decreases to Q_1
- ✶ $TE_1 = P_1Q_1$
- ✶ Decrease in quantity demanded – consumers purchase less (thus TE decreases – quantity effect)
- ✶ The higher price on units purchased – TE increases (price effect)

- Elastic demand (i.e. % change in Q^D > % change in P)
- Quantity effect > price effect
- Total expenditure decreases – elasticity

Elasticity of a linear demand curve



Lower quantities – elasticity > 1
Higher quantities – elasticity < 1
Middle of curve – elasticity = 1

a) $P_0 = \$1$; $P_1 = \$2$
$Q_0 = 12$; $Q_1 = 10$

$$\varepsilon_D = \frac{\%\Delta Q^D}{\%\Delta P} = \frac{\frac{2}{12}}{\frac{1}{1}} = \frac{\frac{1}{6}\%}{100\%}$$

Thus, as the denominator is larger (% change in quantity demanded > % change in price) – demand is <u>inelastic</u>

b) $P_0 = \$5$; $P_1 = \$6$
$Q_0 = 4$; $Q_1 = 2$

$$\varepsilon_D = \frac{\%\Delta Q^D}{\%\Delta P} = \frac{\frac{2}{4}}{\frac{1}{5}} = \frac{0.5\%}{0.2\%}$$

Thus, as the numerator is larger (% change in quantity demanded > % change in price) – demand is <u>elastic</u>

Cross price elasticity of demand

<u>Definition</u> – how much the quantity demanded responds to change in the price of a related good
Calculated as the % change in quantity demanded / % change in price of related good

$$\varepsilon_{XP} = \frac{\%\Delta Q_X^D}{\%\Delta P_Y}$$

Price of good A *increases*, quantity demanded of good A *decreases* and the quantity of good B *increases*	Price of good A *increases*, quantity demanded of good A *decreases* and the quantity of good B *decreases*
<u>Substitute goods</u> – e.g. Doritos and CC's	<u>Complement goods</u> – e.g. corn chips and salsa
Positive relationship - $\varepsilon_{XP} > 0$ for substitutes	Negative relationship - $\varepsilon_{XP} < 0$ for complements

Income elasticity of demand

<u>Definition</u> – how much the quantity demanded responds to a change in consumer's income

$$\varepsilon_I = \frac{\%\Delta Q^D}{\%\Delta I}$$

Income *increases*, demand *increases*	Income *increases*, demand *decreases*
<u>Normal goods</u> – e.g. soft drink, alcohol	<u>Inferior goods</u> – e.g. instant noodles, bus trips
Positive relationship - $\varepsilon_I > 0$	Negative relationship - $\varepsilon_I < 0$

Goods that are necessary – income inelastic (e.g. food, fuel, clothing, utilities, medical)
Goods consumers regard as luxuries – income elastic (e.g. sports cars, furs, expensive foods)
Luxury goods: $\varepsilon_I > 1$

<u>Supply</u>

Quantity supplied – amount of a good that sellers are willing and able to sell
Law of supply – (with all else equal – ceteris paribus) quantity supplied rises when the price of the good rises → <u>Q^S increases when P increases</u>

Supply curve – upward sloping

Price of pants	Quantity of pants supplied
20	3
30	16
50	25
100	33
150	40

<u>Market supply</u> – sum of all individual supplies for all sellers of a particular good or service

Price for pants	Tony's supply	Jude's supply	Naseem's supply	Total supply
20	3	2	4	9
30	16	12	10	38
50	25	20	17	62
100	33	26	30	89
150	40	36	42	118

This can be done graphically – see demand

Movements along the supply curve
Change in quantity supplied – can only occur with a change in the price of the good
Change in supply – either shifts left or right, caused by a change in a determinant other than price
Determinants include – input prices, expectations about future, number of sellers and technology

The shifts in the supply curve work the same as the demand curve – see demand
- A shock that leads to an increase in supply – shifts right
- A shock that leads to a decrease in supply – shifts left

Input prices
- Increase in price of inputs = increased cost of production → decrease in supply – shifts to left
- Decrease in price of inputs = decreased cost of production → increase in supply – shifts to right

Technology
- Increase in technology → increase in supply – shifts to right
- Decrease in technology → decrease in supply – shifts to left

Number of sellers
- Increase in number of producers = increase in size of market → increase in supply – shifts to right
- Decrease in number of producers = decrease in size of market → decrease in supply – shifts to left

Producers and their incentives

Assumptions:
1) No buyer or seller in the market is big enough to have an effect on the price
2) Sellers in the market produce identical goods
3) There is free entry and exit in the market

Goal of the seller = maximise profit
Sellers must solve 3 problems to do so:
1) What good to make – how to make it?
2) What is the cost of making the product?
3) How much can the seller charge for the product in the market?

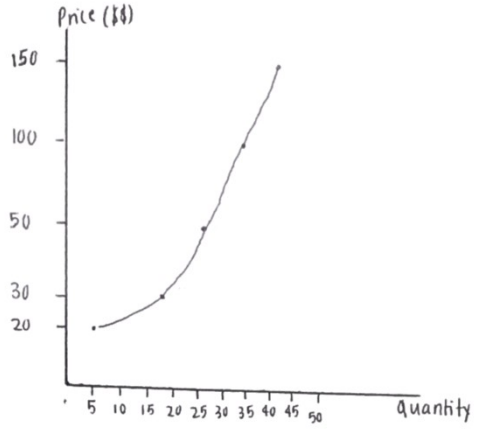
1. The production process
Turning inputs into outputs – the production function
$Y = f(K, L)$ (where Y is the output, K is the fixed inputs and L is the variable inputs)

Variable factors – inputs that can be changes in a certain period of time and that change if the level of output changes
Fixed factors – inputs that cannot be changed (in short-run) and stay same regardless of level of output

Short run vs. long run
In the short run some assets are 'fixed' (i.e. we can't change)
In the long run – we assume there are no fixed assets – varies from firm to firm (industry to industry)

Production function

Number of workers (variable input)	Output (Coffees/hour)
0	0
1	20
2	38
3	48
4	55
5	61



As there is an increase in variable inputs – output increases (at a decreasing rate)

Marginal product (of L) shows how much output changes when inputs change
Marginal product – additional output that is generated by an additional unit of input

$$MP_L = \frac{\Delta Q}{\Delta L}$$

So, for the table above; marginal product of labour respectively = 20, 18, 10, 7, 6

Example – Calculation of marginal product of labour
Number of workers = 6, 7
Output = 32, 46
MP_L = change in quantity/change in variable factor (labour) = 7-6/46-32 = 14/1 = 14

The slope of the production function describes how much extra each worker is contributing to output.

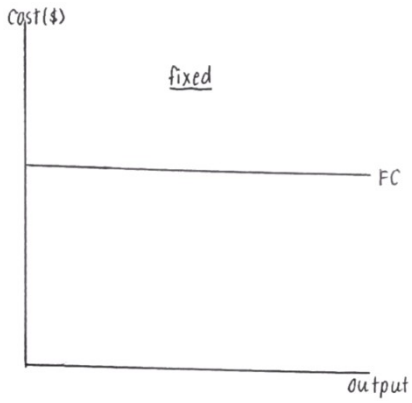
Law of diminishing marginal product – output increasing at a decreasing rate (when variable factors increase)
Why marginal product can increase with the early increases in variable factors
- Specialisation – splitting workers into different tasks
- Learning – training

Law of diminishing marginal returns - At some point, each additional worker contributes less output than the worker before
- Why is this?
  - ✶ Length of floor space
  - ✶ Equipment
  - ✶ Too many variable inputs for the fixed inputs
- As we increase variable inputs, fixed inputs need to be shared amongst more and more workers – production then decreases

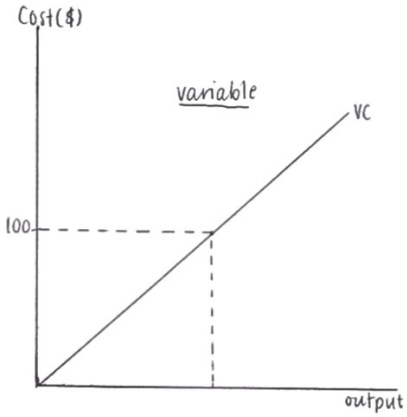
2. The cost of production

If a firm is using inputs, it must be incurring costs – costs of production
Costs are associated with the factors of production and the 'run' – length of time
Production costs may be fixed or variable (just like inputs)

Fixed Costs (FC)
Do not vary with the quantity of output produced
Total fixed costs (TFC)



Variable Costs (VC)
Do vary with quantity of output produced
Total variable costs (TVC)



Opportunity (or implicit) costs
- Cost of the next best alternative
- OC of money, time invested in a business – next best uses may be in another business

Production costs = all opportunity costs (implicit and explicit)
- Explicit costs - input costs that require a money outlay (costs you can receive a receipt for)
  - ✶ E.g. milk, electricity
- Implicit costs – input costs that don't require a money outlay – forgone opportunities
  - ✶ E.g. time

Economic profit – total revenue – (minus) total cost (including implicit and explicit costs)
- Smaller than an accounting profit (accounting is only explicit costs)

Example of economic profit
Someone wants to open a store; it costs $500,000 to rent the store and to buy stock – in order to run the business, the person must quit their job with a $50,000 salary; they estimate $510,000 worth of sales per year – is this investment worth it?
Accounting profit = TR – TC = 510,000 – 500,000 = 10,000 (positive profit – should operate business)
Economic profit = TR – TC (ex and imp costs) = 510,000 – 500,000 – 50,000 = -40,000 (negative profit – should not operate business)

Total costs = TVC (Total variable costs) + TFC (Total fixed costs)

Average costs
ATC – average total cost – cost of each typical unit of product
ATC = TC/Q = total cost/quantity
ATC = AFC + AVC
AFC – average fixed costs
AFC = TFC/Q = total fixed costs/quantity
AVC – average variable costs
AVC = TVC/Q = total variable costs/quantity

Marginal cost – increase in total cost caused by an extra unit of production

$$MC = \frac{\Delta TC}{\Delta Q}$$

Example – cost of production

Output/day	Employees	MP_L	VC	FC	ATC	AFC	AVC	MC
0	0	-	0	200	200	-	-	-
100	1	100	72	200	272	$2.00	$0.72	$0.72
207	2	107	144	200	344	$0.97	$0.70	$0.67
321	3	114	216	200	416	$0.62	$0.67	$0.63
444	4	123	288	200	488	$0.45	$0.65	$0.59
558	5	114	360	200	560	$0.36	$0.65	$0.63
664	6	106	432	200	632	$0.30	$0.65	$0.68
762	7	98	504	200	704	$0.26	$0.66	$0.73
854	8	92	576	200	776	$0.23	$0.67	$0.78

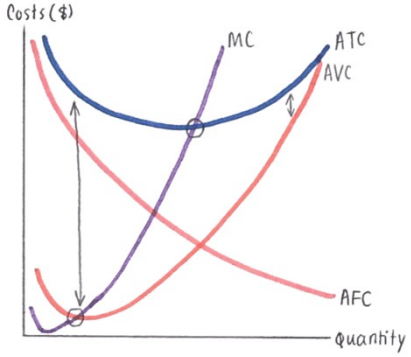
Average total cost (ATC) = Total cost/output → decreasing, flattened and starts increasing
Example: Output = 207; TC = 344; ATC = 344/207 = $1.66

Average fixed cost (AFC) = Total fixed costs/output → constantly decreasing (fixed # divided by increasing amounts)
Example: Output = 100; TFC = 200; AFC = 200/100 = $2.00

Average variable cost (AVC) = Total variable costs/output
Example: Output = 207; TVC = 144; AVC = 144/207 = $0.70

Marginal Cost (MC) = Change in total cost/change in output
Example: Output = 100, 207; TC = 272 to 344; MC = 344-272/207-100 = 72/107 = $0.67

Cost curves
ATC = AFC + AVC
Difference between curves is AFC, which gets smaller, so AVC gets closer to ATC
MC – always goes through the minimum points of AVC and AFC curves



Average total cost curved = u-shaped → at low output (Q) – we have high fixed costs spread out amongst few units of output so most of ATC is AFC; as we continue producing (output increases) ATC becomes greater and a larger component of ATC

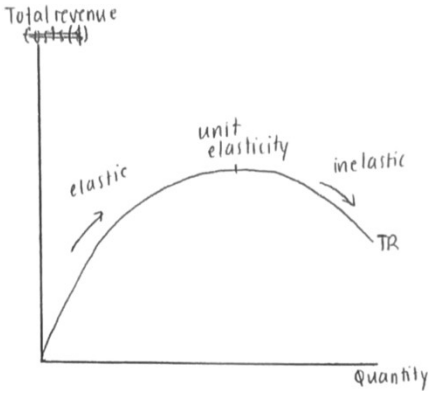
Why does the marginal cost curve rise with the amount of output produced?

- Marginal product (MP_L) produced is typically decreasing
- When marginal product is increasing = output increases at a faster rate than costs (so marginal cost decreases)
- When marginal product is decreasing = output increases at a slower rate than costs (so marginal cost increases)

The relationship between marginal cost (MC) and average total cost (ATC)

- When MC < ATC, ATC is decreasing
- When MC > ATC, ATC is increasing
- When MC = ATC, ATC is at the minimum point of ATC (this is the minimum efficient scale – the point of production that is ideal)

3. How much should the producer make?

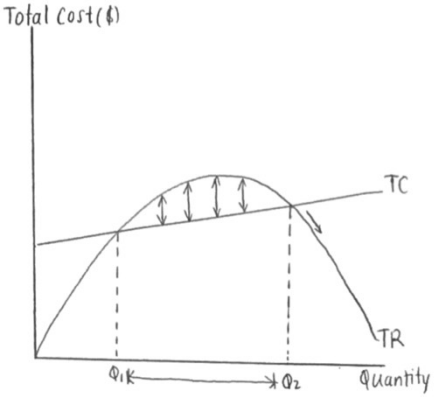


Total revenue – firm's return from sale of output (price x quantity sold – the firm can control the quantity sold)

- TR = Price x quantity sold
- The firm only has control over the quantity sold
- To increase the quantity sold, the price must decrease

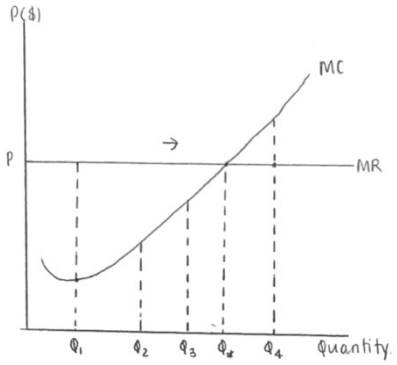
At low quantities, demand is elastic, so as the price decreases, there is a proportionally larger increase in quantity demanded – thus total expenditure increases

As price decreases, and we move along the demand curve, demand becomes more inelastic, and as price decreases at these points, quantity still increases, but by proportionally less – thus total expenditure decreases.



Total cost – amount paid for inputs used to make outputs

- On the total cost curve, a business does not want to be on either side of the intercept points of TC and TR as this results in negative profit – where TR < TC
  - ✶ Find the point in the middle where the gap between TC and TR (vertically) is largest
- Marginal cost is equal to the slope of the cost curve (TC)
- Marginal revenue is equal to the slope of the revenue curve (TR) at that particular point
- At the point where the slopes of TC and TR are the same, profit is maximised
- Similarly, when MC = MR, economic profit is maximised



Marginal cost and marginal revenue

Maximise profit (π) – by setting output where MC = MR

At points where MR > MC – produce

At points where MR < MC – do not produce

Profit – total revenue – (minus) total cost; TR – TC

π = TR – TC

Example – Cost of production (see table above for columns 2-5)

Output/day	Total cost (FC + VC)	Average total cost (TC/Q)	Average fixed cost (FC/Q)	Average var. cost (VC/Q)	Marginal cost ($\Delta TC / \Delta Q$	TR (if price = $0.68)	Profit (TR-TC)
0	200	-	-	-	-	-	-200

100	272	$2.72	$2.00	$0.72	$0.72	68	-204
207	344	$1.66	$0.97	$0.70	$0.67	140.76	-203.24
321	416	$1.29	$0.62	$0.67	$0.63	218.28	-197.72
444	488	$1.10	$0.45	$0.65	$0.59	301.92	-186.08
558	560	$1.00	$0.36	$0.65	$0.63	379.44	-180.56
664	632	$0.95	$0.30	$0.65	$0.68	451.52	-180.48
762	704	$0.92	$0.26	$0.66	$0.73	518.16	-185.84
854	776	$0.91	$0.23	$0.67	$0.78	582.72	-195.28

Lowest loss of profit across production = -$180.48 (thus MR = MC at the point where MC = $0.68, the business should then produce 664 units)

The seller's supply curve
A profit maximising firm will take the price (MR) and set it equal to MC (MC = supply curve)

Short-run decision to shut down
Sunk costs – cost that have already been committed and cannot be recovered – fixed costs of production
The firm considers its sunk costs when deciding to:

- Exit (i.e. a long run decision)
- Not whether to shut down (i.e. a short run decision)

In the short run, a firm needs to cover its variable costs of production to remain in business
<u>Shutting down in the short run</u>
A business operating in the short run will either produce or shutdown

If the business is to produce – they will receive the benefit of the total revenue, but they will have to pay fixed and variable costs (thus, their profit is equal to TR – FC – VC)

If the business is to shut down – they will receive no benefit, and they will have to pay fixed costs (Thus, their profit is equal to -FC)

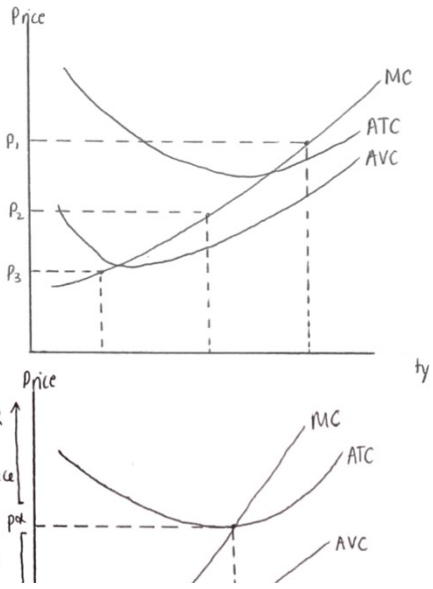
So, produce when:

$$TR \geq VC \vee P \geq AVC$$

A firm will shut down if P < AVC (min)

So, at:

- Q_1 → P is > AVC so the business should continue production
- Q_2 → P is > AVC so the business should continue production
- Q_3 → P is < AVC so the business should shut down operations



Long run decision to exit
Some costs fixed in the short run become variable in the long run – thus long-run cost curves differ from short-run cost curves
In the long run – no fixed costs; therefore a firm needs to cover ALL costs to remain in the industry

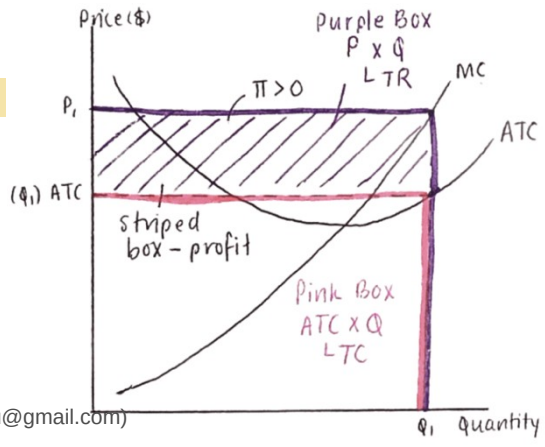
If a business is to produce – they will receive the benefit of the total revenue, but they will have to pay total costs (thus, their profit is equal to TR – FC – VC)

If a business is to exit – they will receive no benefits, but also incur no costs (thus, their profit is 0)

So, produce when:

$$TR \geq TC \vee P \geq ATC$$

A firm will decide to exit if P < ATC

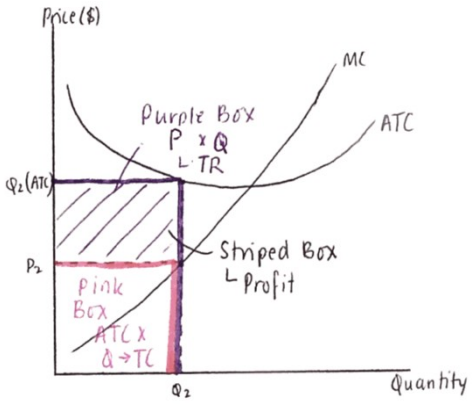


Profits

Positive

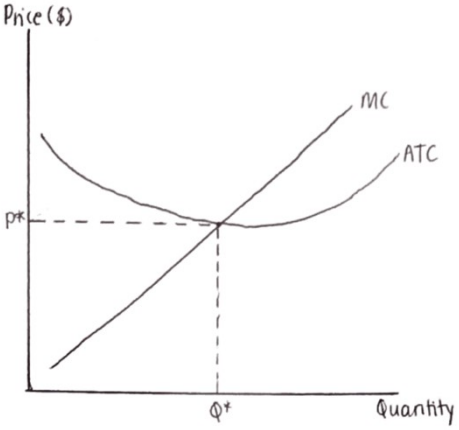
If price = P_1; the firm will profit maximise by setting Q where P = MR = MC
At Q_1, ATC of production < P
Therefore, profit > 0

Negative



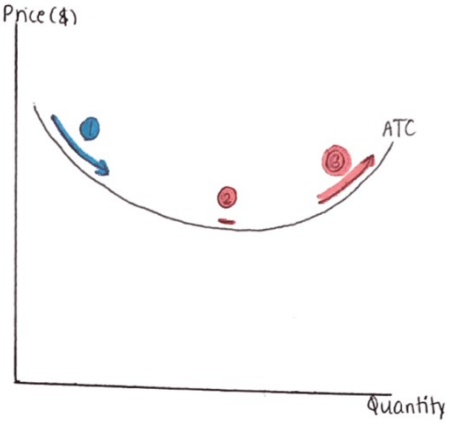
If price = P_2; the firm will maximise profit by setting Q where P = MR = MC
At Q_2, ATC of production > P
Therefore, profit < 0

Zero



At Q, ATC of production = P
Therefore, profit = 0

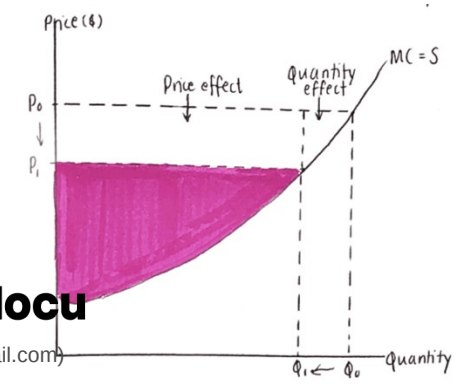
Economies of scale



At point 1 – when production increases (output increases) and ATC decreases; we have economies of scale (EOS)
At point 2 – when production increases (output increases) and ATC is constant/unchanged; we have constant returns to scale (CRTS)
At point 3 – when production increases (output increases) and ATC increases; we have diseconomies of scale (DOS)

Producer surplus

Quantity supplied of a good is determined by a firm's marginal cost (MC) – their willingness to accept payment.
A firm produces a good if the extra revenue (price) received is at least as good as the extra cost of producing – marginal cost



The willingness to accept measures how much the seller values the good or service – i.e. the marginal cost of production

- If P < WTS – no sale
- If P > WTS – sale
- If P = WTS – indifferent to selling the product

Producer surplus = amount received – costs to sellers

Price decrease

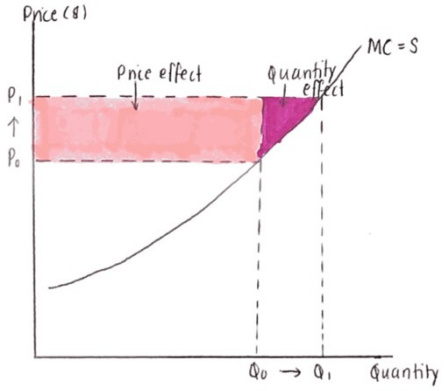
As price decreases → quantity supplied decreases by firms as there is decrease in producer surplus

- Lower price = decrease in producer surplus (price effect)
- Selling less (trading less) = decrease in producer surplus (quantity effect)

Price increase

As price increases → quantity supplied increases by firms as there is an increase in producer surplus

- Higher price = increase in producer surplus (price effect)
- Selling more (trading more) = increase in producer surplus (quantity effect)



Elasticity of supply

Two formulas

$$\varepsilon_S = \frac{\%\Delta Q^S}{\%\Delta P} \quad \text{OR} \quad Arc\,\varepsilon_S = ¿]$$

Example using simple formula

Price of chocolate decreases from $3 to $2.60 and quantity supplied decreases from 12 to 9, what is elasticity of supply?

$\varepsilon_S = \frac{\%\Delta Q^S}{\%\Delta P}$ = (9-12/12)/(2.6-3/3) = (-3/12)/(-0.4/3) = 1.875 → 1.88:1 (thus, supply is elastic)

Determinants of elasticity of supply

- Production cycle – length
  - ∗ Longer production time = more inelastic the supply curve
- Availability of inputs – longer production time if unavailable
- Time