

**BPES Managerial Economics Online:
List of acronyms, equations, and definitions**

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Introduction

This Guide has been produced in response to student feedback for a glossary. It is intended as a high level list of concepts covered in the module, with definitions and relevant equations. Please do not read it as a comprehensive set of notes that covers everything you need to know. It is a complement to the course materials you already have, where the depth of what you need to understand is.

1. Market outcomes

Acronyms

D: Demand (curve)

S: Supply (curve)

P: Usually refers to price (e.g. demand-supply graph)

Q: Usually refers to quantity (e.g. demand-supply graph)

I: Usually refers to household income

W: (Economic) Welfare

CS: consumer surplus

PS: producer surplus

DWL: deadweight loss

Key definitions and equations

Economics

A social science that studies decision-making in the context of scarce resources, affecting the production, distribution, and consumption of goods and services.

Economic agent

A person or entity (i.e. households and firms) that interact with other agents in an economy.

Microeconomics

Study or branch of economics that studies the decision-making process of individuals, households, and businesses in allocating resources. 'Micro' meaning small, which implies the field studies a part of an economy, such as an industry or a market.

Macroeconomics

Study or branch of economics that studies the decision-making process of an economy on a national level. 'Macro' meaning big/large, which implies the field is concerned with the performance and aggregate outcomes of an economy.

Demand

Demand is a function that states the relationship between the price of a good or service and the amount of the good or service which consumers would like to buy during a given time period. The relationship depends on the price of other goods, incomes, and preferences. We often express the inverse form of the relationship, where quantity demanded is a function of price.

Linear inverse demand function (holding income, price of other goods and preferences fixed):

$$Q_d = a - bP$$

where a is the quantity demanded if free ($P=0$) and b reflects the extent to which demand changes with price of the good itself (P). The demand function is for a given level of income, fixed preferences, and fixed price of other goods.

Linear demand function (allowing variable price of other goods and income):

$$Q_d = a - bP + xP^o + zI$$

where a is the quantity demanded if free ($P=0$), b reflects the extent to which demand changes with price of the good itself (P), x reflects the extent to which demand changes with the price of other goods (P^o) which is positive for substitutes and negative for complements, and z is the extent to which demand changes with the level of income (I). Preferences are assumed fixed in this formula for demand.

Quantity demanded

Quantity demanded refers to the quantity level consumers are willing to buy at a certain price. It is a point on the demand function.

Supply

Supply is a function that states the relationship between the price of a good or service and the amount of that good or service which firms would like to sell during a given time period – the price of that good. The relationship between price and quantity supplied depends on the price of other goods, input costs (including wages), technology and number of firms in the market. We normally express the relationship in its inverse form of quantity supplied as a function of price.

Linear inverse supply function (holding technology, price of inputs and number of firms in a market fixed):

$$Q_s = c + dP$$

where c is the quantity supplied if free ($P=0$) and d reflects the extent to which supply changes with price of the good itself (P). The supply function is for a given level of costs – technology and input prices and given number of firms in a market.

Quantity supplied

Quantity supplied refers to the quantity level firms are willing to sell given a certain price. It is a point on the supply function.

Market Equilibrium

Point in which demand and supply for a good/service meet and all transactions in the market stabilise at this quantity and price. At equilibrium price, the desires of consumers (the marginal willingness to pay, reflecting the marginal benefit) and the desires of producers coincide (the marginal willingness to sell, reflecting the marginal cost).

Consumer surplus

Difference between the maximum price a consumer is willing to pay for a good/service and the price the consumer pays (i.e. market price). The sum of individual consumer surpluses gives the total consumer surplus in the economy. Measured as the area below the demand curve above the market price.

For a linear demand curve $Q=a-bP$ the consumer surplus at equilibrium quantity Q^* and equilibrium price P^* is measured as the area of the triangle below the demand curve and above price. The calculation is:

$$CS(Q^*, P^*) = 0.5 \times Q^* \times \left(\frac{a}{b} - P^* \right)$$

where a/b is the price when $Q=0$ (the top of the demand curve on the Y-axis).

Producer surplus

Difference between the minimum price a producer is willing to sell a good/service and the price the producer sells the good/service at (i.e. market price). The sum of individual producer surpluses gives the total producer surplus in the economy. Measured as the area above the supply curve below the market price. This measure is also equal to the difference between the price and the marginal cost at the equilibrium quantity so the formula used is:

$$PS(Q^*, P^*) = Q^* \times (P^* - \text{marginal cost})$$

Economic welfare

Value to households and firms combined of prices being different to the value placed on the transaction by the agents in that transaction. The value to households comes from price being lower than their willingness to pay (marginal benefit), measured as consumer surplus. The value to firms comes from the price being higher than their willingness to sell (marginal cost). The sum of the two, consumer surplus plus producer surplus, is total economic welfare. Economic welfare does not capture wider impacts on society that are not reflected in market prices, for example costs of pollution or benefit of people volunteering.

The economic welfare function is:

$$W(Q^*, P^*) = CS(Q^*, P^*) + PS(Q^*, P^*)$$

Efficient market outcomes

A market outcome is efficient if economic welfare is maximised. This happens where resources are allocated to uses where they are most valued (allocative efficiency), which happens when the marginal benefit (captured by price) is equal to the marginal cost, and inputs to production are being used in the best way to get as much output as possible (productive efficiency). When we consider efficiency over time, we also consider innovation or dynamic efficiency, the extent to which technology is developed to allow even more output to be produced with a given level of inputs.

Deadweight loss

Missed surplus that arises from the costs of trade not happening that could happen if the market were efficient. In efficient markets, deadweight loss is equal to zero.

Pareto optimal / Pareto efficiency

A situation or outcome of actions, where resources are allocated efficiently, and the only way to make an economic agent better off is to harm another agent (i.e. no one can be made better off without making a trade-off). If the outcome in the economy or a market or an interaction between agents is Pareto Efficient it means that any move away from that outcome could only make someone better off by someone else being worse off. If you can make a move from the outcome that makes all parties better off, the outcome is not Pareto Efficient (it can be improved on to the benefit of all).

2. Consumer decision-making

Acronyms

U: Utility

MU: Marginal Utility

MRS: Marginal Rate of Substitution

MRT: Marginal Rate of Transformation

Key definitions and equations

Consumption bundle

A combination of the quantities consumed of goods/services.

Utility function

The utility function explains the relationship between the level of utility (satisfaction) a household gets from consumption of goods/services. For a two-good situation, good X and good Y, it is expressed as:

$$U = f(Q_X, Q_Y)$$

A particular functional form that is often used for utility is the Cobb-Douglas utility function:

$$U = (Q_X)^a(Q_Y)^{1-a}$$

Where Q_X is the quantity of good X, Q_Y is the quantity of good Y, a is the proportional impact of good X consumption on utility and $1-a$ is the proportional impact of good Y consumption on utility.

Marginal utility

How much additional utility a consumer will get for one unit change in quantity consumed of a good/service. Measured by differentiating the indifference function with respect to the quantity consumed of a good (holding the quantity of other goods fixed). The marginal utility of good X would be calculated as:

$$MU_X = \frac{\delta U}{\delta Q_X}$$

Indifference curve

Indifference curves represent the set of consumption bundles that yield the same utility for a consumer given their preferences towards these goods/services.

Indifference map

A set of indifference curves for a given household's utility function, where the higher indifference curves (to the North East) represent a higher level of fixed utility.

Marginal rate of substitution

The rate at which a consumer is willing to give up some amount of one good in exchange for another good while maintaining the same level of utility. The marginal rate of substitution for good X, in terms of good Y, is given by:

$$MRS = \frac{\delta Q_X}{\delta Q_Y}$$

It is also the slope of a utility indifference curve. It is generally negative, given the trade-off that has to occur for a consumer to have more of a good/service as a result of giving up another good/service.

The formula for the marginal rate of substitution is determined by implicitly differentiating the utility function. On an indifference curve, change in utility is zero by definition so we can get the implicit differential of the utility function and set that equal to zero.

$$\partial U = \frac{\partial U}{\partial Q_X} \times \delta Q_X + \frac{\partial U}{\partial Q_Y} \times \delta Q_Y = MU_X \delta Q_X + MU_Y \delta Q_Y$$

Setting this equal to zero and rearranging we get:

$$MRS_{X,Y} = \frac{\delta Q_X}{\delta Q_Y} = -\frac{MU_Y}{MU_X}$$

Budget constraint

The upper limit on what it is feasible for a household to consume given they spend all their income and taking account of the prices of goods/services. The budget constraint is calculated as the level of income is equal to the total amount spent on all goods. For a two-good situation, good X and good Y, it is represented as:

$$I = P_X Q_X + P_Y Q_Y$$

Feasible set

All the consumption bundles that it is possible for the household to consume. This is the set of consumption bundles that sit on or below the budget constraint. Anything above (outside) the budget constraint is not feasible.

Marginal rate of transformation

The rate at which a consumer can give up some amount of one good in exchange for another good given their income and prices of goods/services. The marginal rate of transformation is the slope of the budget constraint which is equal to the ratio of the prices of the goods:

$$MRT_{X,Y} = -\frac{P_X}{P_Y}$$

Optimal consumption bundle

The optimal consumption bundle is the combination of quantities of goods and services that yields the highest possible level of utility for the household given what is feasible. It is found at the point where the household is on the highest possible indifference curve given their budget constraint. This will be where the two are tangent and therefore where their slopes are equal. The tangency conditions means that the optional consumption bundle is found where the $MRS=MRT$.

Own price elasticity of demand

Measure of the extent to which quantity demanded of a good/services changes in response to a change in the price of that good/service. It is calculated at a starting point on the demand curve as:

$$\text{Own - price elasticity} = \frac{\delta Q_X}{\delta P_X} \times \frac{P_X}{Q_X}$$

As the demand curve is downward sloping it is always negative. If the absolute value is between 0 and 1 it is inelastic (not very price sensitive). If the absolute value is more than 1 it is elastic (price sensitive).

Cross price elasticity of demand

Measure of the extent to which quantity demanded of a good/services changes in response to a change in the price of another good/service. It is calculated at a starting position for the level of quantity and price:

$$\text{Cross - price elasticity} = \frac{\delta Q_X}{\delta P_Y} \times \frac{P_Y}{Q_X}$$

If cross-price elasticity is positive, the goods are substitutes. Increasing the price of good X reduces the demand for good X and household switches to good Y as a substitute increasing the quantity of good Y. If cross-price elasticity is negative, the goods are complements (that is they are consumed together). Increasing the price of good X reduces the demand for good X and household also reduces the demand for good Y which is consumed alongside good X.

Income elasticity of demand

Measure of the extent to which quantity demanded of a good/services changes in response to a change in household income. It is calculated at a starting position for the level of quantity and income:

$$\text{Income elasticity} = \frac{\delta Q_X}{\delta I} \times \frac{I}{Q_X}$$

If income elasticity is positive, the good is a normal good, with more being consumed as household gets more money. If income elasticity is negative, the good is an inferior good, with less being consumed as household gets more money.

Bounded rationality

A form of bias in consumer decision-making, seen as a restricted rational decision-making process as a result of limitations (e.g. missing information on product characteristics).

Bounded self-control

Emotionally-driven decision making (e.g. impulsive buying, procrastination from buying altogether, etc.)

Bounded self-interest

Decision-making beyond consumer's personal preferences (e.g. buying something you may not like but doing it for the sake of others, like a toy for your kids)

3. Profit maximisation

Acronyms

FC: fixed cost

VC: variable cost

TC: total cost

AC: average total cost

AVC: average variable cost

AFC: average fixed cost

SR: short run

LR: long run

L: labour

K: capital

Y: output produced (equates to quantity supplied)

MP: marginal product

MC: marginal cost

TR: total revenue

MR: marginal revenue

π : Profit

^M: superscript or sub-script used to signal the price, quantity, profit, welfare of a monopoly

^{PC}: superscript or sub-script used to signal the price, quantity, profit, welfare from perfect competition

Key definitions and equations

Total Revenue

Amount of money a firm makes from selling its goods/services at their given price. Calculated as price times quantity for one product.

Marginal revenue

Measure of how much total revenue changes given a one-unit change in the quantity produced. Revenue changes directly from a change in quantity and indirectly through the change in price.

Accounting costs

Accounting costs refer to costs or amount of money a firm spends to finance its activities and run its operations. These costs are stated in a company's accounts and deducted from a business's revenues to calculate accounting profit.

Economic costs

Economic costs refer to an amount of money that you may spend if you decide an investment is worth the expenditure. These costs are calculated by economists, who not only account for the accounting (direct) costs of running a business but also the indirect costs and opportunity cost of running that business. The economic cost is the cost of the next best forgone alternative that the money could have been spent on. For example if a firm spends money on a factory, the accounting cost is the price paid for the factory but the economic cost is the value of the money that could have been made investing the money in a savings account (assuming the only other option was this). We simply refer to 'cost' but we are always referring to economic cost.

Variable costs

Costs that vary as the quantity produced changes. For example, the energy used to produce cars increases the more cars are produced because more machines have to be running or existing machines have to be run for longer.

Fixed costs

Cost that do not vary as the quantity produced changes. The costs are usually fixed over a given range of output. For example, a cost of buying a factory for car production does not vary with the amount of cars produced, up to the maximum capacity of the factory. At some point a second factory building may be needed to expand production but for one factory, if the quantity of cars produced goes from 10 to 11 the cost of the factory does not change.

Sunk cost

A type of fixed cost that cannot be recouped once incurred. That is, the input purchased cannot be sold on for another use. Sunk costs are fixed (they don't depend on output) but not all fixed costs are sunk.

Total Costs

Variable costs plus fixed costs. The cost of all inputs used to produce a good/service.

$$TC = VC + FC$$

Cost function

Equation expressing how cost depends on quantity produced. For example, a linear cost function with a constant marginal cost would be:

$$C(Q) = A + cQ$$

where A is fixed costs (not dependent on quantity), c is the marginal cost and Q is the quantity produced. cQ is variable cost.

Cost functions can also be quadratic or polynomials depending on how technology determines the relationship between output and cost of inputs.

Marginal cost

Measure of how much total costs have changed given a one-unit change in the quantity produced. As fixed costs do not change with quantity, this is the change in variable costs from a one-unit change in quantity produced. It is calculated as:

$$MC(Q) = \frac{\partial C(Q)}{\partial Q}$$

Depending on technology, marginal cost can be constant, decreasing or increasing. Decreasing marginal cost means that each additional unit adds less extra cost than the previous additional unit. Increasing marginal cost means that each additional unit adds more extra cost than the previous additional unit. Constant marginal cost means that each additional unit adds the same extra cost as the previous additional unit.

Average total cost (also average variable and average fixed)

Average cost is the cost of producing a unit of a good/service on average. It is calculated as the total cost divided by the quantity produced.

$$AC(Q) = \frac{C(Q)}{Q}$$

Average cost generally refers to average total cost. Average variable cost is total variable cost divided by quantity and average fixed cost is total fixed cost divided by quantity.

Profit

Amount of money a firm is left with after covering its costs with the revenue it has accumulated from its activity, in other words, the difference between Total Revenue and Total Costs.

Accounting and economic profit is calculated deducting accounting and economic costs from total revenue, respectively. Usually, economic profit tends to be lower, as economists include both accounting and economic costs in their calculations.

Factors of production (inputs to production)

Labour (L) and capital (K) used to produce output, combined by technological process.

Marginal product (labour/capital)

Measure of the change in output (Y) given a change of unit in an input. In the case of MPL ('marginal product of labour'), it measures the change in output (Y) as a result of an additional employee. In the case of MPK ('marginal product of capital'), it measures the change in output (Y) as a result of a marginal increase in capital assets.

Returns to scale

How total costs for a unit vary with the level of the output produced.

Increasing returns to scale means the cost per unit (AC) decreases as quantity produced increases. It is cheaper to produce a good/service on average if the firm increases production. This is also called *economies of scale*.

Similarly, *decreasing* returns to scale would mean an increase in cost per unit as quantity produced increases. AC increases as quantity produced increases making it more expensive to produce a good/service on average if the firm increases production. This is called *diseconomies of scale*.

Constant returns to scale mean cost per unit is constant (does not change) as production increases. AC is constant as quantity produced increases.

Product differentiation

A business strategy that sets a good/service apart from its competitors. The product is fundamentally the same as rival products but has something to make consumers see it as a bit different (eg, all mobile phone handsets do the same thing for the customer but they are considered different). Differentiation could be on the basis of quality or on the basis of the characteristics or features of the product. Producing a product with characteristics that consumers value compared to the characteristics of rival products can increase the willingness to pay for the 'niche' product.

Network effects

A business principle that describes how the value of a product or service increases as the number of its users increases (e.g. the value of being on Instagram increases the more people that on Instagram, for users and advertisers). Similar to product differentiation, this may also lead to a higher willingness to pay (and join the network).

Market structures

Refers to how different industries are classified and differentiated based on their degree and nature of competition for services and goods.

Perfect competition

A theoretical model that assumes all firms price at marginal cost because there is intense rivalry with many firms and low barriers to entry and many consumers who shop around based on price only as all products are considered the same. The model assumes all consumers and firms have perfect information. We don't observe perfect competition in the real world, but we use it as the benchmark that effective competition is aiming towards.

Effective competition

A definition of competition to better reflect how competition works in the real world (compared to the perfect competition model). There is effective competition in a market if rivals in the market, potential entrants and/or consumers limit the extent to which a firm can price above the marginal cost of supply.

Monopolistic competition

Markets with many firms and many consumers with high levels of product differentiation that give each firm niche market power for their specific brand of good. The firms have niche market power, making them price makers for their specific brand. It is often assumed that

the niche market power is temporary as if there are low barriers to entry, a rival can produce a close product and persuade consumers that prefer that product that come to them.

Oligopoly

Few firms, potentially just two called a duopoly, and barriers to entry. Consumers do shop around if the goods produced are the same but less so if there is product differentiation. These firms are price makers able to charge well above marginal cost over time.

Monopoly

One firm with high barriers to entry and hence no constraint from rivalry and many consumers. This is the highest level of market power that can be achieved but it is not that common in practice as it requires one firm in the market operating without threat of rivalry.

Market power

The opposite of effective competition. Broad concept that encompasses the ability of a firm or few firms to be price makers in the market they operate in (higher prices, lower quantity produced). Market power can also result in lower quality products, poor customer service, low innovation as there is limited rivalry putting pressure on a firm. The more market power a firm, or firms, have the further we move away from effective competition.

Lerner index

The size of margin or price mark-up that a firm earns in a market, that is the extent to which price is above marginal cost (normalised for a given price level). The margin depends on what the market shares are (the constraint from rivalry) and how sensitive consumers are to price changes (the constraint from consumers). The formula is:

$$\frac{P - c}{P} = \frac{f(\text{market shares})}{\text{elasticity of demand}}$$

Price discrimination

A sales strategy of selling the same product or service to different customers for different prices. The alternative is uniform pricing (or pooled pricing) where every consumer pays the same price for every unit. Price discrimination occurs when firms have market power, as any pricing strategy, which is setting a price different from the market price, would have been eroded by competition. Price discrimination also happens when there is variation in willingness to pay and in elasticity of demand, enabling firms to charge different prices. There needs to be no opportunity for resale (otherwise the customers paying a lower price

could offer to sell to other customers at a slightly higher price, but lower than what the firm would charge them).

Personalised pricing (first-degree price discrimination) involves selling a product at the exact price that each customer is willing to pay. This type is challenging to implement because it requires knowing each buyer's willingness to pay (e.g. A car dealership negotiates prices with each buyer based on how much they're willing to pay, adjusting the final sale price accordingly).

Group pricing (third degree price discrimination) sets different prices based on the demographics of subsets of a client base (e.g. student or senior discounts at movie theatres, where specific age groups get a lower ticket price).

Versioning (second degree price discrimination, extended) offers different 'versions' of a product at different prices to all consumers. The pricing varies depending on how the product is sold (e.g. bulk discounts at grocery stores, where larger quantities have a lower price per unit; selling goods together in bundles) or on the extent to which there are versions with different features (eg, a car with sports seats and normal seats). This is done to attract different groups of consumers that have different willingness to pay for the product, which gives them the opportunity to 'self-select' their product based on their preferences and how much they are willing to pay for it (e.g. While the base model that automakers offer may appeal to cost-conscious consumers, the higher-end versions of a car with exclusive add-ons cater to those willing to pay for luxury features like leather seats, advanced safety features, and enhanced performance.)

4. Strategic interaction

Acronyms

NE – Nash Equilibrium

Key definitions and equations

Game theory

A mathematics framework, which finds great usage in economics among many other disciplines and aspects of life, that studies strategic actions of two or more '*players*' (i.e. in economics, economic agents) in a given situation defined by a set of rules and outcomes (i.e. '*payoffs*', which in economics can mean many things, like their utility, their profits, etc.).

A '*game*' can be defined as a situation that defines such hypothetical rules and outcomes under given circumstances (e.g. "the Prisoner's Dilemma"), which helps players in their decision-making process.

Strategic interaction

The essence of game theory, which encompasses situations where each participant's choice not only affects them but also others (e.g. the pricing strategy of each firm in an oligopoly affects its own profits and the profits of its competitors).

Cooperative vs non-cooperative games

In the former, players are allowed by the given rules to form binding agreements and collaborate to achieve a better outcome for all. In the latter, such agreements are not allowed and each player chooses a strategy to maximise their own payoff.

Simultaneous vs sequential games

In the former, players 'play' the game (make decisions) at the same time without knowledge of the others choices, which may be represented by a *payoff matrix*. In the latter, players make decisions in a specific order, which may be seen as a form of asymmetric decision-making, that is, because a player or set of players can wait for the other player's or set of players' decisions before they make their own. The latter may be represented through a decision tree, and actions (and, therefore outcomes) may be predicted using *backward induction*.

Symmetric vs. asymmetric games

In the former, all players have identical strategies and payoffs. In the latter, players have different strategies and payoffs. This categorisation puts emphasis on the importance of the players' positions or resources that could impact the game.

One-shot vs. Repeated games

A one-shot game is played only once, the players never expect to play again and they have never played before. With a repeated game, the game is played multiple times, which usually results in players adjusting their strategies compared to their previous ones based on past outcomes and expectations of future play.

Finite vs. infinite games

In the former, players have a limited number of moves and the game ends after it is played for a defined (finite) number of rounds. In the latter, interactions occur continuously. When calculating payoffs, players are more likely to cooperate in the latter, as the gained long-run payoffs from working together are greater than the short-term gain of 'cheating' a deal and not cooperating for the next rounds of the game (i.e. net present value of cooperation is higher than the net present value of deviating).

Self-interested preferences

Players preferences are self-interested if they choose the strategy that gives them the highest payoff. This is the standard assumption in most games (ie, players look for the highest payoff for themselves). An alternative assumption could be altruism, where players choose strategies that yield a higher payoff for others (even if worse off themselves in terms of their own payoffs), or spite, where players choose strategies because they yield a lower payoff for others (even if worse off themselves in terms of their own payoffs).

Perfect information

If players in a game have perfect information they know everything there is to know about the game and they know that the other players also know everything there is to know about the game. If some players have different information to others we have asymmetric information and if some or all players have partial information we have uncertainty. There are game theory models that look at strategic interactions with uncertainty and asymmetric information but we do not cover them in this module.

Dominant strategy

An action of a player that refers to the best course of action, which maximises their payoff given other potential outcomes dependent on other players.

E.g. in a two-player prisoner's dilemma game, although both players might benefit more from collaborating, in most cases a player will instead tend to follow their dominant strategy (i.e. not collaborate) as they fear that the other player might do the same as well.

Strictly dominant strategy

A strategy is strictly dominant, if it is always a player's best response no matter what the other player's strategies.

Eg, If two players can choose Left or Right in a game and Player 1's payoff from choosing Left is always higher than choosing Right, whether Player 2 chooses Left or Right, then Left is a strictly dominant strategy.

Outcome

The outcome of a game is the set of strategies that all players would play having considered what their best option is. Outcomes are expressed in terms of the strategies (eg, High, Low) not in terms of the payoff.

Nash equilibrium

Outcomes where all players are playing their best response (following their '*dominant strategy*'). There may be more than one Nash equilibrium (NEs) in a game.

Pareto (optimal) outcome

This is an outcome where if any player changes their strategy, to get to a different outcome, at least one player would be made worse off. That is, you cannot move from the outcome without making at least one player worse off. A Nash Equilibrium is often not Pareto Optimal, but it can be.

Prisoner's Dilemma

A classic example of a game, which mainly highlights the idea that players are more likely to not cooperate, in pursuit of their self-interest and maximisation of their welfare. The Nash Equilibrium is not optimal as both players could be better off if they were to cooperate and work together ('*Pareto optimal*'). The rules of the Prisoner's Dilemma game (one-shot, non-cooperative) don't facilitate this Pareto improving outcome, but changing the rules can get to that outcome.

Tacit coordination (tacit collusion)

An (unspoken and informal) agreement between players to choose cooperative strategies, in order to achieve a mutually beneficial outcome ('*Pareto optimal*').

For instance, competing firms in an oligopoly might keep prices stable without formal agreements to avoid starting a price war, say one decides to lower their price to capture more of the market, which could lead to a ‘race to the bottom’.

Collusion

A market outcome that arises when two or more firms agree to act cooperatively as if they are a monopoly. They will agree to charge the monopoly price and each produce a share of the monopoly output (or they may agree to fix the outputs and price accordingly). Customers are always worse off if firms collude.

Grim trigger strategy

If firms are in a collusion agreement, they will specify upfront what will happen during the repeated pricing game what will happen if a firm deviates from the agreement (does not stick to the terms). A Grim Strategy involves the firms moving to a competitive strategy for all periods after the firm has deviated. This strategy is used as a means to enforce an agreement, or at least prevent it from falling apart.

5. Assessing competition

Acronyms

There are not acronyms relevant to this part of the course material – the ones from earlier sections are relevant.

Key definitions and equations

Antitrust laws / competition laws

Government regulations to promote competition and prevent monopolistic behaviour in markets, in order to protect consumers, ensure fair competition, and prevent companies from abusing their market power to harm competitors, restrict innovation, or manipulate prices. Competition Law in the UK and EU covers anti-competitive agreements (joint ventures/collusion) and abuse of dominant position concerns (one firm on their own). There is also legislation for Mergers and for Market Studies.

Dominant position

A firm has a dominant position in a market if it is able to price above the competitive level for a sustained period of time because there is limited constraint from existing rivals in the market and/or high barriers to entry and/or consumers do not shop around. Having a dominant position does not mean that a firm will always act in an anti-competitive manner. It needs to be assessed if they have the ability and the incentive to 'abuse' that position.

Market study

A form of competition investigation that involves examining multiple features or characteristics of the market which together may be constraining the extent of competition in a market.

Market structure

The market structure is the description of how many firms are in a market, what consumers they serve, what type of products they produce, what technology they use for production and how high barriers to entry are.

Market concentration

Concentration is a measure of how much rivalry there is in a market at the point of time that data relates to. It can be simply a count of the number of firms, data on market shares of the main (biggest) firms or information on the distribution of the market shares in a measure called the Herfindahl Index (HHI). A market being concentrated – few firms and/or most of the market share being held by a few firms – does not mean there is necessarily a detrimental impact on competition. The threat of entry and consumer behaviour also have to be considered.

Market behaviour

Description of the different strategies that firms in a market use to compete (or to limit competition). Strategies can relate to pricing, how much to produce (quantity), characteristics of products (differentiation), technology and input purchases (costs), investment (capacity), R&D expenditure, advertising/marketing, and quality of service. All angles of behaviour are considered in a competition analysis.

Market outcomes (performance)

Description of the impact of strategic interaction on customers and firms in the market. Outcomes include price levels (absolute and compared to costs), price trends, cost levels,

profits/margins, extent of innovation, extent of advertising, levels of investment and financial market returns. All these outcome measures provide an indication of how the market compares, in terms of outcomes, to the benchmark of perfect competition. They do not provide an explanation of how the outcomes are determined and hence whether there is a competition problem. That requires examining structure, conduct and performance all together.

Merger and acquisition

A merger happens when two or more firms agree to become a single new entity.

An acquisition refers to a firm acquiring or taking over another firm (including its assets, obligations, etc.). The impact is the same as for a merger, it is just how the combined entity was created that is different.

Horizontal and vertical mergers

Horizontal mergers refer to two or more firms of the same level of a supply chain merging (e.g. two retailers or two manufacturing businesses), while vertical mergers refer to two or more firms of different levels of a supply chain merging (e.g. a retailer and a manufacturing business).

Tying

A pricing strategy (form of versioning) where two or more goods/services are 'tied' to each other and form complements, meaning one cannot consume a good/service without the other good(s)/service(s) (e.g. console and video game specific to that console, printer and ink).

Exclusionary anti-competitive behaviours

Strategies that a dominant firm uses to prevent competitors from entering the market or to drive existing competitors out. Also referred to as 'abuse of a dominant position' in competition law. Vertical and horizontal foreclosure, both exclusionary behaviour, occur when a company with substantial market power at one stage (vertical) or the same stage (horizontal) of the supply chain (such as production or distribution) denies competitors operating at other stages of the same supply chain access to vital resources, services, or clients.

Exploitative anti-competitive behaviours

Strategies that a dominant firm uses that directly worsens the outcome for consumers. This can include selling at excessive prices, restricting the quantity supplied, reducing quality and reducing choice. It can also involve mis-leading consumers about what they are buying or what the price is.

6. Market failure

Acronyms

MEC – marginal external cost

MSB – marginal social benefit

MSC – marginal social cost

t- tax rate

T – lump sum tax

Key definitions and equations

Market failure

The inability of a market to efficiently allocate goods/services, leading to a loss of economic and social welfare. Classified into natural monopoly, externalities, public good and asymmetric information categories. Expect governments to intervene given the market itself cannot resolve the failure. Abuse of market power is a different situation where governments also intervene, but to make competition to work more effectively which is different to market failure situations where competition is never expected to work in a way that maximises economic or social welfare.

Government failure

The inability of a government to efficiently allocate goods/services and correct market failures, leading to a loss of economic and social welfare. Reasons for such failures include: *information asymmetry* (particularly as governments may have a hard time to fully understand markets and the needed incentives), *multiple objectives* (unlike consumers or firms who wish to maximise their own utility or profits, governments care about the

outcomes of many groups of people, which may make decision-making even harder), prone to capture and lobbying (governments are run by humans, which may become partial).

Natural monopoly

Production technology is such that there are very high fixed costs, often sunk, to setting up a firm and once established the running costs are low. The cost function will have high fixed costs relative to variable costs which means that there is a declining average cost curve that is always above marginal cost. Examples generally relate to large infrastructure sectors like electricity and gas transmission and distribution networks, railway tracks, water and sewerage networks and fixed line communications network. We refer to 'pipes and wires' industries. Because of the technology it is more cost efficient to have one firm producing the good/service than multiple.

The cost function would be:

$$C(Q) = F + cQ \text{ where } F \text{ is large and } c \text{ linear marginal cost is small}$$

And average cost is:

$$AC(Q) = \frac{C(Q)}{Q} = \frac{F}{Q} + c \text{ where } F \text{ is large and } c \text{ is small}$$

To check it is natural monopoly we have to calculate average cost (AC) and show it is (a) declining and (b) always above MC, over the range of Q relevant for demand

Average cost conditions for natural monopoly are (assuming linear marginal cost):

$$\frac{\partial AC(Q)}{\partial Q} = \frac{-F}{Q^2} < 0 \text{ and } AC(Q) > c \forall Q \text{ along the demand function}$$

Excludable goods

A seller can put conditions on who can access or consume a good or service, including requiring the consumer to have to pay before consuming the good or service.

Rivalrous goods

If one agent consumes a good or service, no one else can consume it.

Private goods

Goods that are excludable and rivalrous. For example, if an individual consumes a cookie no one else can consume it (rivalrous) and the individual can only consume if they have bought the cookie (excludable).

Common resources

Common resources are considered rivalrous but not excludable goods - e.g. a fish at the lake belongs to the fisher that caught it, but the fisher cannot prohibit others from catching fish in the lake.

Club goods

Club or artificially-scarce goods are excludable but not rivalrous - e.g. a Netflix subscription has to be paid for it and will belong to the buyer, but their subscription does not limit others ability to buy their own subscription.

Public goods

A good that is non-excludable and non-rivalrous - e.g. a resident having a defence system that protects them does not limit others from benefiting from the same service and they cannot be excluded from this service (even if they don't pay taxes).

Externalities

Situations where the decisions made by an individual effect others but these wider effects (externalities) are not considered by the decision-maker. The effects on others, not considered in market transactions and therefore not reflect in price can be negative (external costs) or positive (external benefits).

Positive externalities lead to increased marginal social benefit ($\text{marginal social benefit} = \text{marginal private benefit} + \text{positive externalities}$) and are reflected as a downward sloping MSB curve, parallel to the demand (MB) curve. Too little of a good or service is produced. Example: a government opening a school does not only educate and empower people, but may also reduce criminality

Negative externalities lead to a higher marginal social cost ($\text{marginal social cost} = \text{marginal private cost} + \text{negative externalities}$) and are reflected as an upward sloping MSC curve, related to the upward sloping Supply (MC) curve. Too much of a good or service is produced. Example: a firm lowers its costs by choosing cheaper but higher carbon emitting inputs, but may damage the environment and other people's health.

Information asymmetry

One party in a transaction knows more than another party, which may create an advantage for the former in their decision-making and in the trade. Seen as causes of market failure, as such asymmetries lead to non-optimal outcomes.

Adverse selection

Adverse selection is a type of information asymmetry, where one agent knows more about the hidden attributes of a good/service than the other and this hidden information affects the value of the good/service. For example, a second hand car seller knows more about the quality of cars, with some high quality and some low quality, than the buyers. Without the information, the buyer will only pay their average willingness to pay across all qualities and the seller will only be willing to sell low quality cars at this price. The asymmetry of information leads to some transactions not happening that would happen with perfect information.

Moral hazard

Moral hazard is a type of information asymmetry, where one agent knows more about their behaviour than the other and their behaviour affects the cost of, or returns on, the transaction. For example, once some individuals have comprehensive auto insurance, they may drive more recklessly because they know that damages or losses will be covered by the insurer, leading to the insurance company bearing the costs. Ideally, the insurance company would have this information and charge the individual for their risky tendencies.

Uncertainty

One or all parties in a transaction are unsure about the costs or returns (value) of a good or service. Trade is based on expectations which can result in too much or too little being traded depending on the nature of the uncertainty and the expectations. If only one party in the transaction is uncertain then we have asymmetry but if both are uncertain (with the same expectations) we can have symmetric expectations but still sub-optimal outcomes relative to what would happen with perfect information.

Time inconsistency

Uncertainty commonly arises when consumers are making decisions for the future (eg, investment in education, making contributions to a pension scheme). These decisions are also often distorted by biases in decision-making, particularly focusing on the short-term rather than over time or being overly risk averse about the future. This bias leads to decisions

that are time inconsistent, that is not consistent with what a decision-maker with perfect information about the past, present and future and equal focus on all relevant time periods for the decision would do. Can result in too much being bought (eg, gym membership) or too little (eg, savings for retirement).

7. Well-being of the economy

Acronyms

GDP: Gross Domestic Product

C: consumption level

I: investment level

G: government or public spending

X: level of exports

M: level of imports

NX: level of exports minus imports

S: savings level

MPC: marginal propensity to consume

MPS: marginal propensity to save

U: unemployment rate.

NAIRU: non-accelerating inflation rate of unemployment

GCF: gross capital formation

r: market interest rate

r^p: policy interest rate (or Bank/Fed rate)

L^s: labour supply

L^d: labour demand

L^f: labour force

w: nominal wages

w/p: real wages

Key definitions and equations

Closed v Open Economy

A closed economy is an economy where everything that is produced is consumed in the country and everything that is consumed has been produced in that country. There is no trade. An open economy is one that trades, so goods consumed and used for production can come from other economies (imports) and goods produced can be sold to households and firms in other economies (exports).

GDP

GDP is the total value of all goods and services produced in a country during a given time. It can be measured based on the level of production (output), the level of expenditure or the level of income in the economy. It is calculated as the sum of Consumption, Investment, Government Expenditure and Net Exports. For a closed economy, there are no Net Exports.

The GDP formula (also equal to Aggregate Demand) is: $Y = C + I + G + NX$

GDP per capita

The ratio between GDP and the number of people in that economy (i.e. value of goods/services produced per person), allowing for comparisons over time and across countries that controls for the scale of activity in the economy to allow for a focus on the value of the activity.

Nominal and real

Both are key concepts that refer to the way a measure (or set of measures) are being adjusted for price levels. Nominal measures (e.g. nominal GDP, nominal wage level) refer to the 'face value' or value in the market for something given market prices. Unlike nominal measures, real measures (e.g. real GDP, real wage level) adjust for price levels / inflation. The latter is best to use when making comparisons over time or across countries so the focus is on the value of what is being produced without distortions from different inflation rates.

Consumption

The act of using up resources to satisfy current needs and wants. Compared to investments and savings, consumption satisfies short-term needs and wants. What separates consumption from the two is that everyone must consume in order to survive and live. A level of consumption that is higher than one's level of income is reflected as dissaving or negative savings, with households borrowing to finance the extra consumption. A level of consumption that is below income is Savings, stored away for future consumption.

Marginal propensity to consume and marginal propensity to save

MPC is the amount of income allocated to consumption. It depends on the preferences for consumption today relative to the future and related to this on the expectation of future upward or downwards shocks to output/income which influence the incentive to save or spend.

MPS is the amount of income allocated to saving.

Disposable income that is not consumed is saved, which means that the marginal propensity to consume (MPC) plus the marginal propensity to save (MPS) equal to 1 as combined consumption and savings uses up all income/output.

Consumption function

The consumption function shows the relationship between aggregate consumption and aggregate output (GDP/income). The formula is:

$$C(Y) = c_0 + c_1(Y - t)$$

where C_0 is the level of autonomous consumption (what is consumed to stay alive, independent of income/output), c_1 is the marginal propensity to consume out of disposable income, Y is income/output and t is the level of tax. $Y-t$ is disposable income.

Investment

The act of using up resources with the goal to yield a return in the future. Investing is a broad term that is applicable to many fields of life, from investing in human capital (ie, training the workforce to yield higher returns from labour) to investing in real estate (i.e. buying a property at a lower price today to yield the benefits of a higher price, and thus greater value, of the same property in the future), and much more. Investment as measured in GDP captures expenditure that increases the level of capital stock in the economy, or Gross Capital Formation (GCF)

Investment function

The investment function shows the relationship between aggregate investment and the market interest rate. The formula is:

$$I(r) = a_0 - a_1r$$

where a_0 is the level of autonomous investment (what is invested from retained earnings, independent of interest rate), a_1 is the marginal propensity to invest which depends on confidence in the economy/attitude to risk/expected return, and r is the market interest rate.

Gross capital formation

A measure of how much of an economy's new value is invested, rather than consumed. It relates to some form of new capital being created because of investment activity, specifically in physical assets. GCF fails to account for depreciation of existing capital stock and underrepresents the importance of intangible investments (e.g. investment in R&D, intellectual property, etc.)

Economic growth vs economic development

Although closely related to one another, the former refers to an increase (if negative, decrease) of real output (GDP) between two time periods (usually a year-to-year comparison), whilst the latter is an improvement in the standard of living beyond just the aspect of income growth. Economic development is an umbrella term linked to other indicators of development besides GDP growth, like literacy, health care, human rights, quality of life. Among many measures, a popular one is the Human Development Index (HDI). Policymakers aim to achieve economic development; economic growth is an aspect of that agenda.

Labour force

Number of people of working age who are actively seeking work or who are working.

Unemployment rate

The ratio between the number of unemployed people and the number of people in the labour force (e.g. 5% unemployment rate means 5% of the labour force is unemployed).

NAIRU

Refers to the non-accelerating inflation rate of unemployment, which is the unemployment rate when an economy is producing its full employment output and inflation is stable. At this

rate, the economy is at potential output (highest level of GDP that the economy can sustain in the long-run). According to the business cycle theory, if the economy is above potential output, the unemployment rate is lower than the optimal NAIRU but inflation increases, and if the economy is below potential output, inflation tends to decrease but unemployment is higher than NAIRU. NAIRU is not equal to zero, given that there will always be a presence of frictional unemployment (people moving between jobs) in the economy.

Unemployment, employment, economically inactive, and the labour force

An unemployed person refers to someone who is eligible (a physically and mentally capable adult, but not a pensioner or retiree) and willing to work that is actively pursuing employment but is not currently employed. An employed person is someone who is eligible to work and already has a job. The two account for the labour force. People that are not in the labour force and are not working or willing to work are considered economically inactive. This refers to groups like (but not exclusively) school children, students, pensioners, etc.

Equilibrium wage

The level of wage where what workers are willing to work for (labour supply) is equal to the what firms are willing to pay (labour demand). The equilibrium wage is normally nominal (not inflation-adjusted). In our macroeconomy model we allow for wages and the employment level to adapt to shocks in the economy. If we assume flexible prices and wages these adjustments are automatic (as per neoclassical or Ricardian model assumptions). If we assume sticky prices and wages (as per the Keynesian model assumptions) these adjustments happen over the medium-term as wage contracts are renegotiated and businesses adjust prices at particular times in the cycle (eg, seasonally).

Consumption smoothing and permanent income

Consumption smoothing is the concept of balancing spending and saving over time to achieve a consistent standard of living, which suggests that an optimal consumption rate (how much one consumes given their available income) should be relatively similar over the course of their lives rather than fluctuate wildly. Permanent income is the average annual income someone expects to have considering the working years of their life. Permanent

income is linked to consumption smoothing, as people adjust their consumption behaviour based on how much they expect to earn over time.

(Keynesian) Multiplier effect

An increase in government spending or investment that leads to growth in output (GDP) can have a bigger knock-on impact through the effect on consumption. The additional effect is referred to as a multiplier. In the case of an increase in Government Expenditure it is referred to as the fiscal multiplier.

Replacing Y with $C+I+G$ in the consumption function gives:

$$Y = \frac{c_0}{(1 - c_1)} + \frac{1}{(1 - c_1)}(I + G - c_1 t)$$

Which means that the multiplier for a change in government spend or a change in investment is:

$$\frac{\partial Y}{\partial G} = \frac{\partial Y}{\partial I} = \frac{1}{(1 - c_1)}$$

Note that the multiplier effect of a change in the tax rate is larger.

Fiscal budget

In the context of economics and public policy, a fiscal budget is a financial, strategic plan of public spending a country's government plans to adhere to and follow for a year. A fiscal budget specifies the amount of money a government will spend on different parts of the economy, and how it will finance this spending, namely how it will generate public revenue (via taxes, etc.).

Fiscal budget surplus / deficit

The difference between government expenditure (including debt repayments) and government revenue (from taxes and borrowing). A government can have a budget surplus (public revenue is greater than public spending) or a budget deficit (public spending is greater than public revenue). The latter is usually the case for most economies. There is a balanced budget if public spending is equal to public revenue. To put in relative terms and compare across economies of different sizes, economists calculate the ratio of budget deficit and GDP.

Public debt

The debt a government and public institutions owe to lenders (domestic or foreign). To put in relative terms and compare across economies of different sizes, economists calculate the ratio of public debt and GDP.

Austerity

In economic policy, it refers to government measures that aim to reduce the cost of borrowing by reducing public spending or increasing taxation. Comparable to a household 'tightening their belt' to balance their household budget when they are in debt.

8. Economic growth

Acronyms

K: capital, a factor of production

L: labour, a factor of production

TFP: total factor productivity

Y: output.

MPK: Marginal product of capital

MPL: marginal product of labour.

Key definitions and equations

Hockey stick effect

A graphical representation of data that shows a stable trend with neither growth nor decline for a long period of time, and is then followed by a significant increase or decrease in a very relatively short period of time. The concept gets its name as it looks like a hockey stick. Figuratively speaking, the hockey's flat blade would represent past nearly flat trend, whereas the hockey's curve would represent the point when a huge increase or decrease started. An example of this effect is the real GDP per capita of countries. Historically, GDP growth was very low and changes in prosperity were not as significant from year to year. However, since the industrial revolution, and other following technological advancement, income per capita has increased significantly. This has happened in a very short period of time, when compared to how long humans, and thus economies, have been around.

Production function

A firm's level of investment depends on the expected returns and the expected costs of investments. The expected returns can be estimated by a production function, that links factors of production (K and L), productivity (technology) and level of output (Y).

Cobb-Douglas production function

A particular functional form for the production function, often used in economics to examine the relationships between inputs and outputs in the economy. The formula for a Cobb-Douglas production function is:

$$Y = AL^aK^{1-a}$$

where A is total factor productivity (TFP, capturing technology), L is labour supply, K is the level of capital supply, a is the proportion of inputs that are labour and 1-a is the proportion of inputs that are capital. For a labour intensive economy, a is higher. For a capital intensive economy, a is lower.

Capital (K)

A factor of production that is combined with labour to produce output. A broad term that refers to anything that is used to produce something else. This can include financial capital (stocks, bank deposits, etc.), assets (inventory, machinery, plants, properties, etc.), human capital (education and knowledge, set of skills, etc.), and more.

Labour (L)

A factor of production that combines with capital to produce output. Generally measured in terms of number of human workers (including self-employed and owner-workers) or numbers of hours worked by workers.

Total Factor Productivity (TFP)

A measure of how much additional output is produced when inputs to production are increased. Captures factors that impact production but are not inputs themselves (i.e. factors of production, K and L). This can be many things like technological progress, human capital, institutional quality, etc. Labour productivity relates to the amount of extra output in the economy from increasing the quantity of labour. Capital productivity relates to the amount of extra output in the economy from increasing the quantity of capital. Total factor productivity captures the combined effect of increasing either or both inputs, recognising the interaction between the two inputs and their impact on output for a given technology.

Marginal product of capital (marginal return on capital)

The additional output a firm produces as a result of increasing capital by one unit, for a given level of labour and technology (total factor productivity).

Marginal product of Labour (marginal return on labour)

The additional output a firm produces as a result of increasing labour by one unit, for a given level of capital and technology (total factor productivity).

Trade unions

Organisations made up of members (usually, workers) that protect their rights. The main goal of trade unions is to increase workers' bargaining power, since being part of a collective that demands the same work conditions (e.g. higher wages, shorter work shifts, etc.) is more likely to result in a successful agreement between workers and employers (firms) than if only one worker demands such changes.

Total trade

The amount of goods/services (measured in some currency) that are exported and imported.

Migration

Flows of labour into and out of countries. Immigration is flow of labour into a country. Emigration is flow of labour out of a country.

Green growth

The idea of sustainable economic growth, or growth based on environmentally friendly resources, reduces pollution, and accounts for environmental impacts (e.g. climate change).

Gini index or Gini coefficient

One of the most popular measures of inequality (how much income different income groups have). It is calculated as the sum of the income (or wealth) gaps between individuals in the economy, capturing the difference between the cumulative distribution of income (represented by the Lorenz curve) and situation of perfect equality (where every percentage of the population corresponds to an equal percentage of total income). For example, if the bottom 50% of the population owns only 23% of total income, the Gini index reflects this deviation from perfect equality.

9. Monetary policy

Acronyms

PC: Phillips curve

M: quantity of money

V: velocity of money

P: price level (economy)

Y: output level (economy)

Key definitions and equations

Monetary and fiscal policy

Monetary policy refers to a set of policies and decisions the central bank of a country takes to grow the economy whilst maintaining stable inflation. Fiscal policy refers to policies drafted and implemented by the government, with parliamentary approval in democracies, that are generally focused on growing the economy and increasing employment.

Inflation

The year-to-year average increase of prices of goods/services in an economy.

Deflation

The year-to-year average decrease of prices of goods/services in an economy. Note that this is different to a reduction in inflation, which still involves prices increasing but at a lower rate.

Philips Curve

A popular model introduced by Alban Philips in the 1960s that initially depicted the relationship between wage growth and the unemployment rate, but was later readjusted to inflation rate and unemployment rate. Philips argued that the unemployment rate and inflation rate in the short run are negatively correlated. This means a positive relationship between inflation and output (which is how we have depicted the Phillips Curve to allow for the growth-inflation trade-off to be considered). If the economy is performing above its potential because of an increase in aggregate demand (growth), there is pressure on price increases as consumption and investment are now greater relative to the unchanged supply of goods/services and unemployment is below the NAIRU. On the other hand, a decrease in

the aggregate demand curve will result in decrease economic output or GDP (a recession), which will lead to decrease inflation rates but increased unemployment rates. The Phillips Curve illustrates the relationship between inflation and growth/unemployment for a given level of inflation expectations. If expectations change, normally with a lag in response to actual inflation, the Phillips Curve shifts.

Quantity theory of money

A school of thought linked to Milton Friedman and the monetarists. They argued that inflation is caused primarily because of changes in the supply of money in the economy. They believe increased amounts of money circulating in the economy would lead to lower interest rates, given unchanged demand for money, which in turn leads to an increase in aggregate demand and increases inflation pressure on goods/services ('more money chasing less goods/services'). Despite its huge impact on economics and in policymaking (controlling money supply in some economies is still a popular tool), many economists believe money supply and inflation rates were not always so strongly correlated.

The quantity theory is based on the framework that the value of money in circulation is equal to the value of goods produced/consumed. The model equation is that:

$$MV = PY$$

Where M is the quantity of money supply, V is the velocity of money in circulation (how much each note/coin is used for a transaction), P is the average price level and Y is the level of output.

Taking a rate of change with this equation we find that the level of inflation (change in price) is:

$$\Delta P = \Delta M + \Delta V - \Delta Y$$

The quantity theory of model assumes that the rate of change in velocity is zero (ie, it does not change over time) and that the change in output is exogenous (not determined by the level of money supply). This reduces the relationship to:

$$\Delta P = \Delta M$$

which led to the result that the rate of inflation depends on the change in the level of money supply.

Policy interest rate

The interest rate level that the central bank sets in order to regulate and stabilise the economy. This is the interest rate central banks charge to retail banks when lending them out money and the rate that central banks pay to deposits that retail banks hold on reserve at the central bank.

Quantitative easing

An unconventional monetary policy that central banks use to stimulate the economy when interest rate targeting fails. Central banks buy government bonds, which increases their price and decreases their returns, leading firms, banks, and other bondholders to move money away from those assets and into other assets that may stimulate economic activity.

Quantitative easing is known as an OMO-type ('open market operations') monetary policy, implying that central banks will purchase assets (e.g. long maturity sovereign bonds, firm bonds, etc.) in the market and thus increase the supply of money in circulation.

Forward guidance

The provision of information regarding the context or circumstances that affect the central bank's decision about whether and when to change the policy rate, which helps shape incentives in and expectations of the economy.

10. Macroeconomic crisis

Acronyms

As this section uses models and concepts from earlier in the course there are no new acronyms.

Key definitions and equations

Business cycles

According to the theory of business cycles, we understand the economy's growth path following a long-term trend, which is its potential output. Economic output oscillates from year-to-year, sometimes above potential output when an economy expands and sometimes below it when an economy contracts. These fluctuations away from potential output is what we call business cycles.

Economic boom and peak

An economic boom or recovery is when output is growing substantially for more than two quarters. After a certain point, a peak will be achieved, which is the maximum economic output an economy experiences relative to previous periods or the last few years. This is where the economy is now above potential output and inflationary pressure is very high.

Recession and trough

A period of decreasing economic output or negative growth and increasing unemployment rate, which lasts more than two quarters, is diffused across the economy (ie, not just in one sector) and is deep in terms of the level of negative growth. The economy will reach a minimum level of output, or a trough, after which it will eventually start growing again. We also refer to a recession as a macroeconomic crisis.

Depression

A period of long-term and significantly more severe economic downturn or decreasing economic output, compared to a recession. There is a myriad of definitions for depressions, however two measures to categorise a period in the business cycle as a depression would be a negative real economic growth rate of 10%, and/or a recession lasting for two or more years.

Economic bubble

A term that is used to describe the phenomenon of significant increase of the price of a certain asset (e.g. stock, real estate, etc.) Bubbles are often driven by manias or irrational consumer trends of buying something, which leads to a sharp increase in demand for the asset and in subsequent high price relative to the asset's fundamental value. After reaching its peak or the asset's highest pricing, a bubble will 'burst' and the price of the asset will decrease. The impact of the bubble's collapse is substantially negative on the wealth of people holding the asset, which is why policymakers often fear bubbles forming to begin with.

Automatic stabilisers

Adjustments built into the tax and benefits system that dampen the impact of a downturn in the economic cycle on income/wealth or profit expectations, containing the extent to which households reduce consumption and firms reduce investment. The main examples are progressive income tax systems, corporation tax that varies with profit levels and payment of welfare benefits when income falls below particular thresholds.

Fiscal stimulus

A set of government fiscal policies aimed at boosting the recovery of an economy after a recession. This may include increasing government spending to stimulate consumption, investment, and increase employment and decreasing tax rates to stimulate consumption and investment, increasing confidence in the economy. These work alongside automatic stabilisers.

Stagflation

A rare but severe phenomenon characterised by simultaneous great economic downturn with increased high unemployment rates and high inflation rates. Decreases in supply chains and thus (short-run) aggregate supply are one of the main causes of stagflation that lead to increase in price and fall in economic output. Particularly, energy crises are a cause to aggregate supply shocks, which have been witnessed in history many times.