

Economics

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Preface

About

These notes review the Singapore-Cambridge GCE A-Level H1 Economics ([8843](#)) syllabus.

Candidates taking this subject sit for the H1 Economics Paper 1, which comprises of 2 case studies, each consisting of 2 to 3 pages of data presented in textual, numerical or graphical form. Each case study will present contemporary multifaceted economic issues or policies, which may be from one or more themes in the syllabus. The data for each case study will be followed by 7 to 8 part-questions, including sub-parts. These questions will require candidates to apply relevant economic concepts, theories and principles in analysing, synthesising and evaluating economic issues, perspectives or policies, with reference to the data provided. About 16 marks of each set of case study questions will be allocated to data response questions, and about 24 marks will be for higher-order questions.

Acknowledgements

These notes are largely adapted from the notes provided by Dunman High School's Economics Department.

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Part I.

The Central Economic Problem

1. Scarcity, Choice and Resource Allocation

1.1. Scarcity

Definition 1.1. *Scarcity* is the situation of limited resources in relation to unlimited wants.

Definition 1.2. *Resources* are the inputs used in the production of the things we want. The resources used in production are called **factors of production**.

The total quantity of all resources an economy has at any one point determines the maximum possible output that economy can produce. Resources are limited because the quantity of factors of production are always fixed at any given period of time.

Factors of production can broadly be classified into 4 types:

- **Capital**
 - Man-made factors used in the production of other goods and services.
 - Types
 - * Fixed capital – machinery and buildings
 - * Infrastructure AKA social overhead capital – roads & rail network, telecommunication network, air & sea ports, etc.
- **Entrepreneurship**
 - The factor of production that assumes the risk and faces the uncertainty of combining the other 3 resources and engaging in production.
- **Land**
 - Encompasses all the natural resources that are available from nature, and can be renewable or non-renewable. (e.g. minerals, trees, resources that can be harvested from oceans and even the climate that is favourable to grow certain crops in)
- **Labour**
 - Includes all the productive contributions made by the physical and mental human effort.
 - The quantity of labour available for an economy consists of all those who are willing and able to work.

Definition 1.3. *Goods* are defined as all things from which individuals derive satisfaction. *Economic goods* are scarce goods for which the quantity demanded exceeds the quantity supplied at zero price.

1. Scarcity, Choice and Resource Allocation

Definition 1.4. *Services* are tasks that are performed for someone else. (e.g. laundry, internet access, teaching)

1.2. Resource Allocation

In a world of scarcity, the society, as a whole, is limited by the amount of resources it has to produce the goods and services to satisfy all these wants. **Choices** are hence inevitable, and must be made in the allocation of resources between different uses.

Fundamental questions of resource allocation:

- **What** and **how much** to produce?
- **How** to produce?
- **For whom** to produce?

1.3. Opportunity Cost

Definition 1.5. The *opportunity cost* of any activity is the value of the next-best alternative forgone.

The scarcity of resources puts a limit on how much goods and services the economy can produce to satisfy wants and contribute to the people's standard of living. Every time we make a choice, we are trading off the use of that resource for one or more alternative uses. The extent of the trade off is represented by the opportunity cost.

1.4. Production Possibility Curve (PPC)

Definition 1.6. The *production possibility curve (PPC)* of the production possibility frontier (PPF) is a graph that shows the maximum possible output combinations that the economy can produce in a given period of time (e.g. a year).

The PPC is a boundary or frontier because it shows the maximum production possible. It separates the attainable combination of goods from the unattainable.

Assumptions

The relevant assumptions of the PPC model include:

- 2 goods
- Resources are fully and efficiently employed.
- Within a given period of time, the quantity and quality of the resources remain fixed. Technology also remains constant.

Graphical Illustration

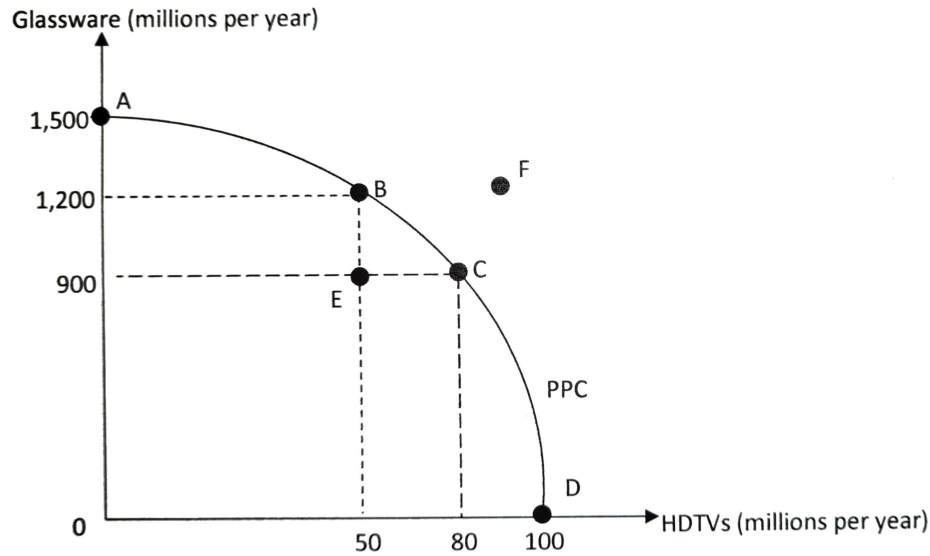


Figure 1.1.: Production Possibility Curve

Interpretation

Figure 1.1 shows the various maximum possible output combinations of glassware and HDTVs that can be produced with the available factors of production and production technology in a given time period of 1 year.

Represented by point A on the PPC, if all the resources were devoted solely to the production of glassware, the country produces 1500 million units of glassware (output of HDTVs = 0). Similarly, represented by point D, if all the resources were devoted solely to the production of HDTVs, the country produces 100 million units of HDTVs (output of glassware = 0).

In between points A and D are the maximum possible combinations of output when the resources are shared between the 2 industries. For example, at point B on the PPC, the country produces 1200 million units of glassware and 50 million units of HDTVs.

What the PPC tells us about scarcity, choice and opportunity cost

Scarcity

Scarcity is illustrated on the PPC as only combinations of goods within and on the PPC are attainable. Points beyond the PPC are unattainable due to limited resources.

- Points *on* the PPF (A, B, C, D)
 - Production can take place on the frontier with the economy producing the maximum possible output only when:
 - * Resources are fully-utilised (fully-employed) and/or
 - * There is productive efficiency – using its given resources to produce the maximum possible output. It is hence impossible to increase the production of one good without reducing the production of the other.

1. Scarcity, Choice and Resource Allocation

- Points *within* the PPF (E)
 - Combinations within the frontier imply that resources are:
 - * Under-utilised (under-employed/unemployed) and/or
 - * Misallocated and the economy is productively inefficient – at point E, output is not maximised. It is hence possible to increase the production of one good without reducing the production of the other (moving from point E to any point on the segment of the PPC bounded by points B and C).
- Points *outside* the PPC (F)
 - Combinations beyond the boundary of the PPC are unattainable with the economy's given resources and current state of technology.

Choice

Choice is illustrated via the choice between the different points on the PPC, depending on the economy's relative preference for the two goods.

Opportunity Cost

Opportunity cost is illustrated as the trade-off between the 2 goods and computed as the slope of the PPC.

The PPC is *downward sloping*, illustrating the fact that scarce resources have alternative uses and the trade-off as we move resources from one industry to the other.

The PPC is drawn *concave to the origin* (bowed outwards). The gradient of the PPC increases in steepness as we move along the horizontal axis, indicating that to produce an additional unit of HDTV, an increasing amount of glassware has to be sacrificed.

The *law of increasing relative cost*/*law of increasing opportunity cost* states that when society takes more resources and applies them to the production of any specific good, the opportunity cost increases for each additional unit produced.

The reason why the law of increasing relative cost works is because certain resources are better suited for producing some goods than they are for other goods. Generally, resources are not perfectly adaptable for alternative uses.

- For instance, to increase the production of HDTV, resources have to be diverted away from the production of glassware. Initially, producers will draw on the resources that are most suited to the production of HDTV and least suited to the production of glassware (e.g. workers with engineering and technical training). Hence, the economy does not have to give up that many units of glassware to produce the first batch of HDTVs.
- However, if the production of HDTV continues to increase, firms will have to draw on the remaining pool of resources, which are less suited to the production of HDTV. Hence, more resources will be required in the production of the next batch of HDTVs, resulting in a greater loss in glassware production.
- Eventually, firms will have to draw on the resources best suited to glassware production and least suited to HDTV production such as the artisans, professional glass blowers and designers. The loss of output in glassware production will hence be the greatest in producing the last batch of HDTVs.

Effect of a Recession on the PPC

When firms experience falling demand for their goods and services, they scale back production and lay off workers. Among the workers who are retrenched, some are able to find another job, though not necessarily their ideal job (e.g. accepting a position below what they are qualified to do/going on part-time) – under-employed workers. Others who cannot find alternative employment remain unemployed.

This is represented by a movement from a point on/close to the PPC to a point within the PPC. Referring to **Figure 1.2**, this is depicted as a movement from **point A** on the PPC to **point B**, a point within the PPC. **Actual output falls but potential output does not.** Resources do not get destroyed and technology does not regress. The potential to produce has, therefore, not diminished. The situation is just one of the resources not being put to use. Once the economy recovers from the recession, resources will be re-employed to produce goods and services again.

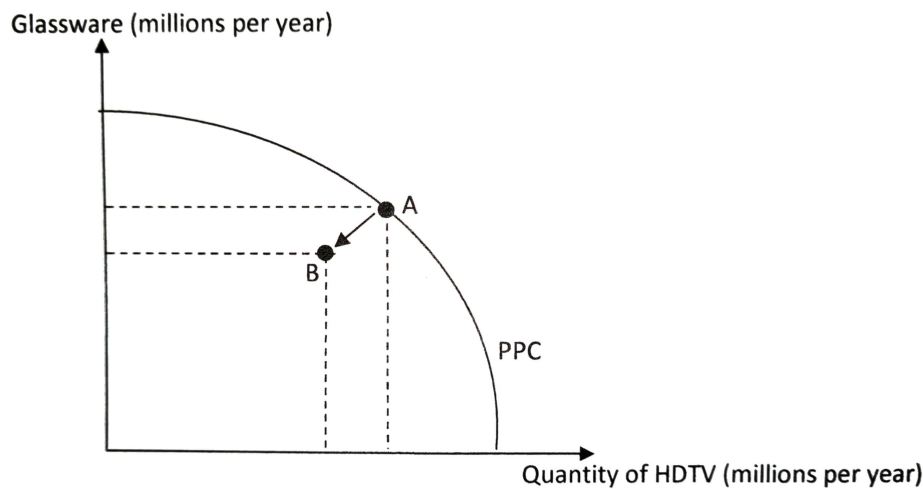


Figure 1.2.: Effect of a Recession

Effect of Changes in the Quantity and/or Quality of Resources & Technology

Take the enhancement of programmes such as the Productivity Solutions Grant (PSG) and the SkillsFuture Credit Top-up as an example.

Firms are able to tap on the government grant to adapt "productivity solutions" (e.g. purchase robots). In doing so, they are in fact adding to the economy's capital stock – increasing factor quantity, capital being 1 of the 4 factors of production. The use of robots also has a productivity enhancing effect, enabling more output to be produced per worker. Together, the increase in factor quantity and quality bring about an expansion in the economy's productive capacity, shifting the entire PPC outwards. The new efficient frontier is now PPC_1 , with points inside PPC_1 as inefficient and points outside PPC_1 unattainable. Initial efficient points on PPC_0 are now regarded as inefficient.

However, there may also be a pivotal shift in the PPC. Assuming that a technological improvement has occurred in the glassware industry without any direct impact on HDTV, there will be a pivotal shift of the PPC, with the maximum possible output for glassware increasing and that for HDTVs remaining the same.

1. Scarcity, Choice and Resource Allocation

In any case, when the PPC shifts outwards as a result of an increase in the quantity of resources, an improvement in the quality of resources and the advancement in technology, potential economic growth is said to have taken place.

2. Decision-making Process of Economic Agents

The scarcity of resources necessitates choice and leads to decision making by economic agents in various economic processes – production, consumption, distribution.

Definition 2.1. *Economic process* refers to activities through which goods and services aimed at satisfying human needs and wants are produced, distributed and used.

One of the fundamental characteristics of activities defined as economic processes is that they involve relations between various agents.

Definition 2.2. *Economic agent* refers to a person or legal entity that plays an active role in an economic process.

The groups of economic agents include:

- **Households**, as consumers of goods and services
- **Firms**, as producers of goods and services intended for sale to generate profit
- **Government**, which in addition to fulfilling its political responsibilities and role of economic regulation, produces principally non-market services (possibly goods) for individual or collective consumption and redistributes income and wealth

These agents interact with each other in a system to determine the outcome of resource allocation.

Regardless of the group of economic agent, the decision-making process includes the same key aspects, as follows.

2.1. Rationality Assumption

Individuals act as if motivated by self-interest and respond predictably to opportunities for gain, making use of available information. The rationality assumption of economics is simply stated as we assume that individuals do not intentionally make decisions that would leave them worse off.

This requires individuals to possess:

- Unlimited information-processing capabilities – having the ability to weigh the benefits and costs of possible decisions.
- Unbounded willpower (i.e. complete self-control) – having the self-control to make right choices consistent with their goals.

These conditions have come under criticism (behavioural economics – cognitive biases).

2.2. Goal Orientation

Rational decisions are goal-oriented – decisions made are consistent with the goal of the economic agent:

- Consumers are assumed to act in a way such that their utility is maximised.
- Firms seek to maximise their profits/minimise their losses.
- Governments pursue a range of policy objectives:
 - Microeconomic objectives: efficiency and equity
 - Macroeconomic objectives: inclusive and sustainable growth, full employment/low unemployment and price stability
 - Ultimate goal: improve the standard of living

2.3. Constraints

Due to the fundamental problem of scarcity, choices have to be made. Hence, economic agents consider the constraints that they are currently experiencing to determine the choices available to them.

The following are sources of constraints.

Budget or the Availability of Funds

For **consumers**, not all combinations of goods and services they desire are available as choices. As consumers strive for the highest level of utility, they face budget constraints. With limited income, they need to decide how best to allocate their budget to maximise their utility.

For **governments**, not all projects that would improve society's welfare is available. Governments too face budget constraints. Government spending is constrained by the amount of tax revenue it collects. While the government, like firms, can take on loans, there is a limit to how much it is able to borrow without pushing up interest rates and adding to debt, financing burden that would undermine future living standards. The government has to decide how to allocate its budget to competing social, economic and security needs.

Government Regulations

Individuals and organisations are bounded by the laws of the land. For **consumers**, government regulations such as age limit on tobacco and alcohol consumption, bans or legislation on certain types of drugs, etc. would determine what individuals can or cannot purchase.

Political Support

Government policy-making is subjected to the political process – government policies need political support.

2.4. Information

For economic agents to make good decisions, they need to have the relevant information, including information on:

- All options/alternatives
- Constraints – separate the feasible from the unfeasible
- Benefits and costs of each option

The better the quality of the information – accurate, complete, timely – the better the decision-making in terms of making the highest net benefit.

In reality, quality information, rather than being readily available, is often difficult and costly to obtain. For instance, a consumer, in deciding the best brand and model of laptop to purchase, needs to devote time to research on the brands and models that are available in the market, the specifications of each model, the prices offered by various merchants, etc. In other words, expending time to gather information to make better decisions is part of the cost of decision-making. Apply the marginalist principle, economic agents will continue to source for information only for as long as the expected marginal benefit of data gathering \geq expected marginal cost.

2.5. Weighing the Benefits and Costs

Having narrowed down the options/alternatives to those that are permitted within the constraints, economic agents weigh the benefits and costs of each cost of action to arrive at the best outcome.

Marginalist Principle

Rational consumers and producers, driven by their self-interest (utility/profit maximisation), would consume/produce up to the point where

$$\text{marginal private benefit (MPB)} = \text{marginal private cost (MPC)}$$

of the last unit consumed/produced.

Application to Consumers

The aim of rational consumers is to maximise their utility/satisfaction from the consumption of goods and services within their given budgets. Referring to [Figure 2.1](#), the rational consumer will consume up to q_e units where, for the last unit consumed,

$$\text{marginal utility/consumer's MPB} = \text{price/consumer's MPC}$$

At a quantity below q_e , say at q_1 , the last unit consumed brings the consumer more benefit/utility (a_{q_1}) than it costs the consumer (b_{q_1}). The rational consumer should hence increase consumption to increase net utility.

At a quantity below above q_e , say at q_2 , the last unit consumed brings the consumer less benefit/utility (d_{q_2}) than it costs the consumer (c_{q_2}). The rational consumer should hence decrease consumption to increase net utility.

2. Decision-making Process of Economic Agents

At q_e , where marginal utility = price, the last unit consumed brings the consumer as much utility as it costs the consumer in terms of the value of the alternative good forgone. At this point, the consumer cannot increase utility further by increasing/decreasing the units consumed – utility is maximised.

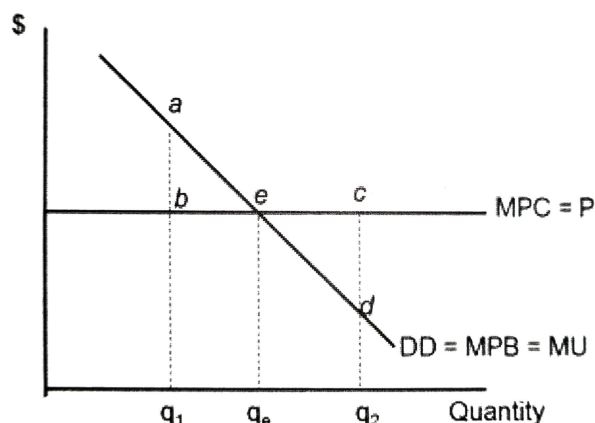


Figure 2.1.: Rational Decision-making at the Individual Consumer Level

Application to Governments

Governments, in pursuit of maximising society's net welfare, would steer consumption/production up to the point where

$$\text{marginal social benefit (MSB)} = \text{marginal social cost (MSC)}$$

of the last unit consumed/produced.

Referencing **Figure 2.2**:

At output below Q_e , say at Q_1 , the last unit consumed/produced adds more to society's benefit (aQ_1) than it does to society's cost (bQ_1). Society's welfare can be increased by raising consumption/production from Q_1 to Q_e , as it would add as much as aeQ_eQ_1 to society's benefit but only beQ_eQ_1 to society's cost, yielding net social benefit/economic welfare of abe . From another perspective, restricting consumption/production to Q_1 would mean forfeiting society's economic welfare/welfare loss of abe .

At output above Q_e , say at Q_2 , the last unit consumed/produced adds more to society's cost (cQ_2) than it does to society's benefit (dQ_2). Society's welfare can be increased by lowering consumption/production from Q_2 to Q_e as it would create as much as ecQ_2Q_e of cost savings for society while only forgoing edQ_2Q_e of social benefit, avoiding a potential welfare loss of cde .

At Q_e , marginal social cost = marginal social benefit = eQ_e . At this point, it is not possible to increase society's net benefit/economic welfare further by adjusting the level of output. This is the point of optimisation where society's economic welfare is maximised.

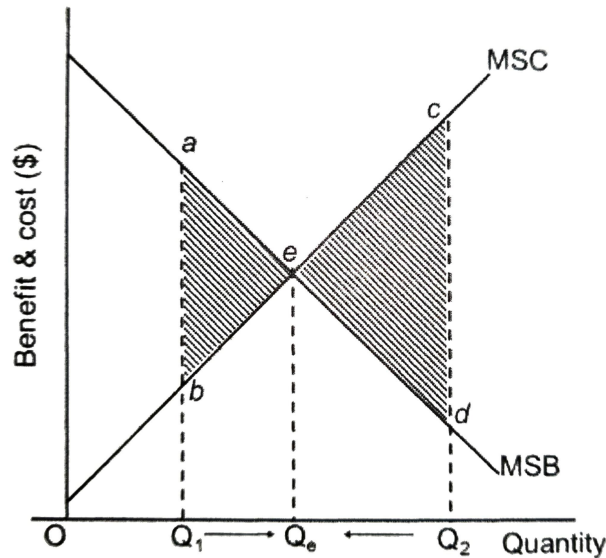


Figure 2.2.: Rational Decision-making by the Government

2.6. Intended and Unintended Consequences

The decisions, once made and acted upon, can give rise to both intended and unintended consequences. Take for example, the consideration of whether to raise tobacco taxes by the government:

- Intended benefits:
 - Achieve allocative efficiency (correcting the market failure) by tackling the over-consumption of tobacco arising from imperfect information and negative externality
 - Increase tax revenue for the government
- Unintended consequences:
 - Increase in smuggling of contraband cigarettes
 - Reduction in profits for cigarettes producers and retailers which could force them to lay-off their workers

Economic agents would have to anticipate and look out for the unintended consequences, in particular those which have a bearing on their own cost-benefit calculus. Having anticipated the unintended consequences, they are better able to put in place responses to:

- Take advantage of any positive impact and
- Manage the adverse impact

2.7. Perspectives

The decisions, once made and acted upon, will impact not only the economic agent making the decision, but also other economic agents. Whether the impact is positive or negative depends on the perspective. Economic decisions, once taken, will invariably create winners and losers. (Consider the consumer decision of purchasing a car and the government decision of raising tobacco taxes.)

2.8. Trade-offs

Decisions often involve trade-offs. The most straightforward trade-off arises from the **alternative uses of scarce resources and budget**. (e.g. a consumer, in deciding to spend on home development, has to cut back on foreign holidays; a government, in deciding to spend more on healthcare, has to cut back its support for the arts and culture).

Trade-offs can also be framed in terms of **competing goals**. (e.g. an individual, in choosing to enrol in training, could see a decline in current income in exchange for higher lifetime income and hence utility; a government, in raising tobacco taxes to correct market failure, could be achieving efficiency at the expense of equity (tobacco taxes are regressive)).

2.9. Dynamic Nature of Decision-making

Economic decisions are seldom one-off. At the **decision-making stage**, the economic agent is only able to make estimates of the benefit and cost of the decision – decisions are made based on **expected values** of benefits and costs.

Once the **decision is made**, the **actual** benefit and cost, including the **unintended** consequences, become apparent. External changes (e.g. changes in market conditions and the broader macroeconomy) that could also have occurred during this time would further change benefit and cost and generate unintended consequences.

The aims, constraints, costs, benefits, information and perspectives of economic agents can **change over time**. When changes occur, the economic decision undertaken by an agent may no longer be optimal, calling for a revisit of the decision-making process to ensure that the intended outcomes can be achieved.

The economic agent would then **review decisions** using the available data, revise their expected values of benefits and costs, and assess whether a course correction is necessary. At this point, the economic agent could realise that the initial decision has been regrettable or mistaken and change course, taking on a different decision or at least making adjustment to the original plan. The **cycle then repeats itself**.

2.10. Cognitive Biases

Behavioural economics reminds us that economic agents do not always behave rationally. They make "mistakes" in decision-making which may leave them worse-off and make them susceptible to manipulation.

Examples of Cognitive Biases

Loss Aversion

Human beings experience losses asymmetrically more severely than equivalent gains. This being the case, humans tend to prefer avoiding a loss over making an equivalent or greater gain.

Sunk Cost Fallacy

Thinking at the margin means to let the past go and to think forward to the **next unit** consumed/produced, the **next dollar** spent, the **next worker** hired, etc. It means to **ignore sunk costs**. Sunk costs are bygone and should not be taken into consideration when making purchasing decisions but often are.

Economic agents do now, however, always behave rationally. Sunk cost fallacy occurs when a person's decision is affected by sunk costs.

Salience Bias

Generally, humans avoid stressful and demanding cognitive strain, often making them vulnerable to many biases. This "laziness" and desire for cognitive ease can lead individuals to a world of irrationality where they make decisions according to elements that appear the most salient.

Applications

Design of Strategies/Policies

In the later themes, we will see how governments are able to harness cognitive biases to enhance the effectiveness of their policies to correct market failure and achieve a more efficient allocation of resources. (e.g. Nutri-Grade on the front of beverage packaging and on menus) If individuals are aware of their cognitive biases which are causing them to make bad decisions, they can design mechanisms to overcome them.

Part II.

Markets

3. Price Mechanism and its Functions

The price mechanism allocates scarce resources in the free market by performing the following 3 functions.

3.1. Signalling Function

Prices perform a signalling function. This means that market prices will adjust to demonstrate where resources are required and where they are not.

3.2. Incentive Function

Market prices act as an incentive to raise output/production because the supplier stands to make a higher profit. As a result, resources move out of these other industries into a more profitable one. When demand falls *ceteris paribus*, the price of the good falls, disincentivising production.

3.3. Rationing Function

The price mechanism rations out the goods produced according to the willingness and ability to pay. Buyers who desire the good and can afford to pay the price obtain the item and those who cannot, go without.

The price mechanism, through the signalling, incentive and rationing functions, answer the fundamental questions of resource allocation in the **product market**:

- What to produce?
- For whom to produce?
- How much to produce?

To understand how the price mechanism answers the question of "how to produce", we need to look at the **factor market**:

The price mechanism **signals** the relative abundance of certain factors of production and **incentivises** firms to employ these factors of production that are more abundant and economise on the use of those factors of production that are less abundant, answering the question of "How to produce?". (e.g. labour-intensive method of production VS capital-intensive method of production)

4. Demand and Supply Analysis and its Applications

4.1. Demand

Definition 4.1. *Demand* is defined as the quantity of a good/service that a consumer is both willing and able to buy at each possible price during a given time period, *ceteris paribus*.

The *Marginalist Principle* can be used to explain the points on the demand curve. When thinking at the margin, consumers assess the costs and benefits of consuming one more unit of a good or service, where:

- **Marginal benefit (MB)** is the additional benefit from consuming an additional unit of the good/service.
- **Marginal cost (MC)** is the additional cost from consuming an additional unit of the good/service, which is its price.

Consumers will maximise their utility only when they consume a good/service up to where $MB = MC$. This is because:

- When $MB > MC$, consuming an additional unit of good benefits the consumer more than it costs the consumer. Hence, the rational decision is to consume the next unit.
- When $MB < MC$, consuming an additional unit of good costs the consumer more than it benefits the consumer. Hence, the rational decision is to not consume the next unit.

Definition 4.2. *Quantity demanded* is defined as the quantity of a good/service that a consumer is willing and able to buy at a given price over a given period of time.

Quantity demanded is hence a particular point on the demand curve.

Market Demand

The market demand is the sum of the demands of all the consumers in the market.

4.2. Price Determinants of Demand

The **Law of Demand** states that in a given period of time, the quantity of a good demanded is inversely proportional to its price, *ceteris paribus*. This means that the higher the price of the good, *ceteris paribus*, the less the willingness and ability to buy the good and hence the smaller the quantity demanded. The converse is also true – at lower prices, a larger quantity is demanded.

The demand curve is generally downward sloping, reflecting the inverse relationship between the price of the good and the quantity demanded. Referring to Figure 4.1, as the price of the good declines from P_0 to P_1 , the quantity demanded rises from Q_0 to Q_1 . Graphically, this is represented as a movement from point A to point B along the same demand curve.

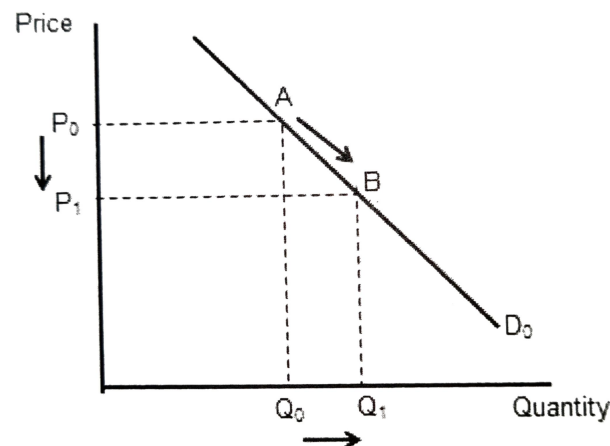


Figure 4.1.: Effect of a Price Change

4.3. Non-price Determinants of Demand

Level and Distribution of Income

Definition 4.3. A *normal good* is a good whose demand rises as consumers' income rises, whereas an *inferior good* is a good whose demand falls as consumers' income rises.

As consumers' income rises, their ability to buy goods and services increases, and as rational utility maximisers, they will increase their demand for most goods. However, this is only true if we assume that the good is a normal good and not an inferior good.

Applying to the situation of a rise in income to the market for tea leaves and assuming tea leaves to be a normal good, an increase in income brings about an increase in the market demand. Referring to Figure 4.2, the increase in demand will lead to a rightward shift of the demand curve from D_0 to D_1 , indicating an increase in the quantity demanded at each and every price. At the same price of P_0 , the quantity demanded of the good by consumers increases from Q_0 to Q_1 .

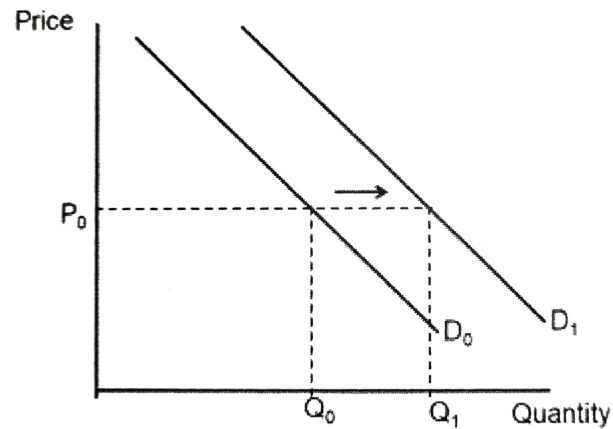


Figure 4.2.: Increase in Demand

Price and Availability of Related Goods

Substitutes

Definition 4.4. Substitutes are defined as a pair of goods considered by consumers to be alternatives to each other, with the level of utility/satisfaction derived from consuming either good being relatively similar.

A pair of goods considered to be substitutes will be tea and coffee. When the **price** of coffee falls, *ceteris paribus*, the quantity demanded for it will rise as rational consumers who aim to maximise their utility with their given income will switch away from tea and buy coffee instead. Demand for tea will thus decrease. For this reason, substitute goods are also called goods in **competitive demand**.

Figures 4.1 and 4.3 depict the relationship between substitutes. Referring to Figure 4.1, when the price of coffee falls from P_0 to P_1 , the quantity demanded increases from Q_0 to Q_1 , represented by a movement from point A to point B along the same demand curve D_0 . Referring to Figure 4.3, holding the price of tea constant at P_2 , the switch to coffee causes the quantity demanded of tea to fall from Q_2 to Q_3 , as represented by the leftward shift of the entire demand curve from D_2 to D_3 .

Besides changes in the prices of substitutes, changes in the **availability** of substitutes will also change the demand of a good, vice versa. For example, now that there are other types of tea like chamomile, mint and rose available in the market, the demand for traditional tea leaves will fall, *ceteris paribus*.

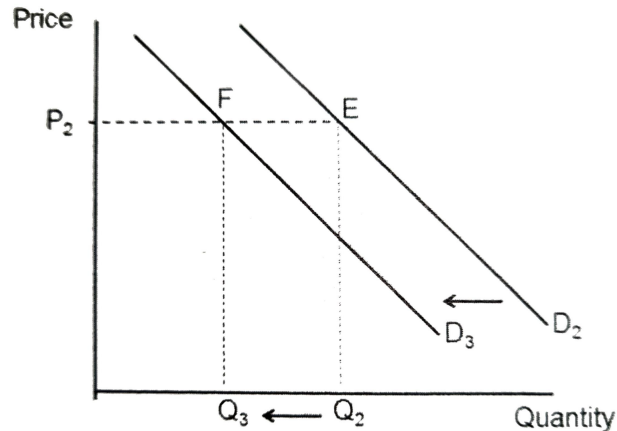


Figure 4.3.: Demand for Tea

Complementary Goods

Definition 4.5. *Complementary goods* are defined as a pair of goods consumed together to satisfy the same want.

A pair of goods commonly consumed together is car and petrol. When the **price** of cars rises, *ceteris paribus*, the potential car buyers would reconsider their decision to buy a car and some among them would choose not to buy one. The quantity demanded for cars will fall, and consequently the demand for petrol will also fall. Complementary goods are hence also called goods in **joint demand**.

Besides the changes in price of complements, changes in the **availability** of complements will also change the demand for a good, *vice versa*. For example, with the development and introduction of the many portable devices that use Secure Digital (SD) memory card for data storage, the demand for SD memory cards is likely to increase, *ceteris paribus*.

Derived Demand

The demand for one good occurs as a result of the demand for another. We do not want steel for itself. Rather, the demand for steel stems from the demand for the final product – cars. When the demand for cars rises, profit-motivated producers will want to step up the production of cars and thus increase the demand for inputs like steel. The demand for factor inputs is hence described as derived demand.

Joint demand – The 2 goods are bought by the **same** economic agent. (e.g. the buyer of motor vehicles is also the buyer of petrol)

Derived demand – The 2 goods are bought by 2 **different** economic agents. (e.g. household consumers demand for motor vehicles, creating the demand by car manufacturers for steel)

Taste and Preference

The more desirable consumers find a good, *ceteris paribus*, the more of it they will consume at any given price to maximise their utility. Changing tastes are affected by a variety of influences including advertisements. For example, with a successful advertising campaign that emphasises the health benefits of tea, consumers might be influenced to perceive that tea is superior to other beverages and would hence increase demand for tea, *ceteris paribus*.

Expectation of Future Prices

If consumers anticipate that the price of a good will rise significantly in the near future, *ceteris paribus*, the current demand for the good is likely to increase. This is because rational consumers, seeking to maximise their utility with their given budget, want to avoid paying a higher price to consume the same good in the future.

However, this is only possible if the good is non-perishable. For example, consumers cannot store up fruits and vegetables for long periods of time. Hence, they will not increase their demand for these perishables in the current period significantly even though they expect prices to increase in the near future.

Government Policies

The government can influence demand through a number of policies introduced into the market. Such policies may take on forms such as:

- **Control-and-command** measures that improve/reduce access to specific types of goods directly. Examples of such measures include:
 - Raising/Lowering the income ceiling for families qualifying to purchase HDB flats
 - Raising/Lowering the legal age for alcohol/tobacco consumption
- Measures that improve/reduce access to specific types of goods through **altering the credit conditions**. Examples of such measures include:
 - Rules on loans to finance motor vehicles/properties
 - Rules on the use of credit cards

Changes in the Demography of the Population

Changes in the demography of the population, such as the size and distribution will lead to changes in the demand for goods and services.

A rise in population will result to an increase in market demand for most goods and services, *ceteris paribus*.

The demand for specific types of goods and services will also change according to changes in the structure of the population. For example, with the proportion of elderly in the population increasing, there will be an increase in the demand for geriatric healthcare services and products.

4.4. Supply

Definition 4.6. *Supply* is defined as the quantity of a good/service that a producer is both willing and able to sell at each possible price during a given period of time, *ceteris paribus*.

Similar to the demand curve, the *Marginalist Principle* can also be used to explain the points on the supply curve. Producers will assess the costs and benefits of producing one more unit of a good or service, where:

- **Marginal benefit (MB)** is the additional benefit from supplying an additional unit of the good/service, which is its price.
- **Marginal cost (MC)** is the additional cost from supplying an additional unit of the good/service.

Producers will maximise their profits only when they supply a good/service up to where $MB = MC$. This is because:

- When $MB > MC$, supplying an additional unit of good benefits the producer more than it costs the producer. Hence, the rational decision is to produce the next unit.
- When $MB < MC$, supplying an additional unit of good costs the producer more than it benefits the producer. Hence, the rational decision is to not produce the next unit.

Definition 4.7. *Quantity supplied* is defined as the quantity of a good/service that a producer is both willing and able to sell at a given price during a given period of time, *ceteris paribus*.

Market Supply

The market supply is the sum of the supply of all the producers in the market.

4.5. Price Determinants of Supply

The *Law of Supply* states that in a period of time, there is a direct relationship between the price and the quantity supplied, *ceteris paribus*. This means that the higher the price of the good, the greater the quantity that a producer is willing and able to supply to the market in a given period of time, *ceteris paribus*.

Graphically, this is depicted as an upward-sloping supply curve. Referring to [Figure 4.4](#), as the price of the good increases from P_0 to P_1 , the quantity supplied rises from Q_0 to Q_1 , represented as an upward movement from [point A](#) to [point B](#) along the same supply curve.

4. Demand and Supply Analysis and its Applications

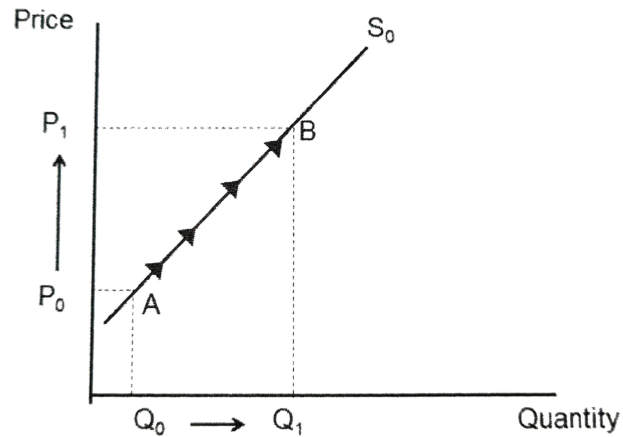


Figure 4.4.: Effect of a Price Change

4.6. Non-price Determinants of Supply

Marginal Cost of Production

When the marginal cost (MC) or cost of producing an additional unit of output rises, firms reduce supply. Conversely, when MC falls, firms increase supply. The increase in supply can be explained by the rightward shift of the supply curve.

Holding the selling price of the good constant, a reduction in marginal cost leaves firms with positive marginal profits, incentivising firms to increase production to capture the additional profits. Referring to Figure 4.5, at the same price of P_0 , the quantity supplied rises from Q_0 to Q_1 , represented by a rightward shift of the supply curve from S_0 to S_1 .

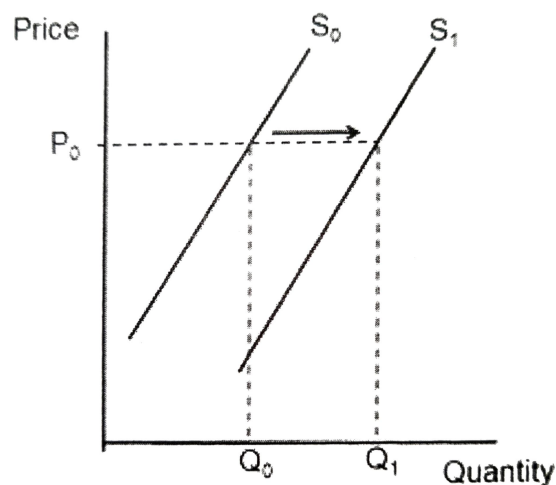


Figure 4.5.: Increase in Supply

Factors Affecting Marginal Cost

- **Price of Factor Inputs**
 - A change in the price of variable inputs such as wages and raw material prices will cause a change in the cost of producing an additional unit of good.
 - For example, if the price of fertiliser falls, *ceteris paribus*, the marginal cost of producing an additional unit of tea leaves falls relative to the marginal revenue, incentivising profit-maximising firms to increase supply to capture the marginal profit.
- **Technology**
 - Improvement in scientific knowledge and organisational changes such as automation, better management practices and mergers can also bring about productivity increase, reducing the input required for each additional unit of output. This lowers the marginal cost of production relative to the marginal revenue, incentivising profit-maximising firms to increase supply to capture the marginal profit.

Government Policies

Indirect Tax

Definition 4.8. *Indirect tax* is a levy imposed by the government on the production of goods and services.

Indirect tax can be broad-based such as the Goods and Services Taxes (GST) in Singapore or on specific types of goods such as the 'sin tax' on alcohol and tobacco. The immediate effect of an indirect tax would be to increase the marginal cost of production. For rational and profit-maximising producers, they will now be willing and able to supply the same units of output only at higher prices. This is shown by a shift of the entire supply curve upwards.

Indirect tax can take the form of:

- **Specific Tax**

Definition 4.9. *Specific tax* is tax levied at a fixed rate per unit of output.

(e.g. tax of \$1 for every unit of output) This will lead to a parallel upward shift of the supply curve with the vertical distance between the 2 supply curves being the amount of tax per unit of output.

- **Ad-valorem Tax**

Definition 4.10. *Ad-valorem tax* is tax levied at a percentage of the price per unit of output.

(e.g. 9% GST) This means that the absolute amount of tax (in dollars and cents) is lower at lower price level than it is at higher price level. Graphically, this is represented by a pivotal shift of the supply curve.

4. Demand and Supply Analysis and its Applications

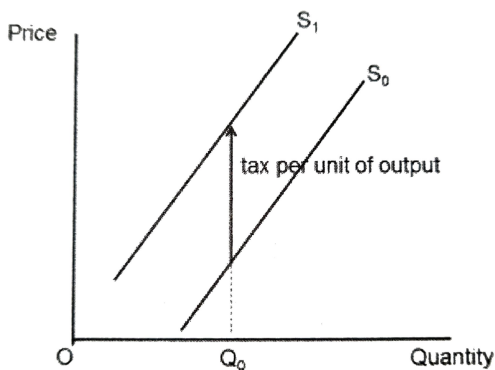


Figure 4.6.: Specific Tax

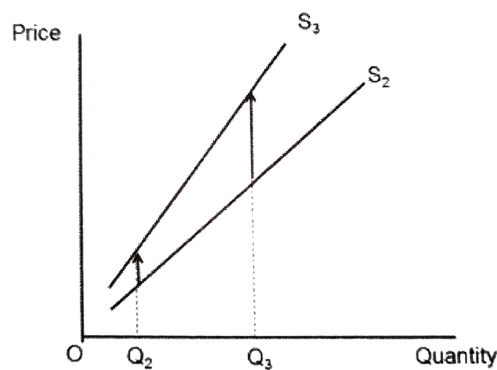


Figure 4.7.: Ad-valorem Tax

Subsidy

Definition 4.11. *Subsidy* is the provision of money and other resources by the government to support a person or business activity.

Indirect subsidies such as wage subsidy help to reduce the marginal cost of production, which in turn shifts the supply curve downwards.

Indirect subsidies can take the form of:

- **Specific Subsidy**

Definition 4.12. *Specific subsidy* is given at a fixed rate per unit of output.

This will bring about a parallel downward shift of the supply curve, with the vertical distance between the 2 supply curves being the amount of subsidy per unit of output.

- **Ad-valorem Subsidy**

Definition 4.13. *Ad-valorem subsidy* is given as a percentage of the price of the good.

This will bring about a pivotal shift of the supply curve.

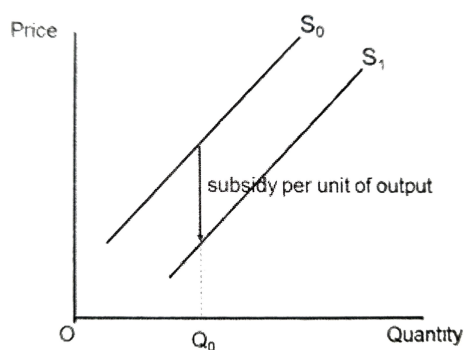


Figure 4.8.: Specific Subsidy

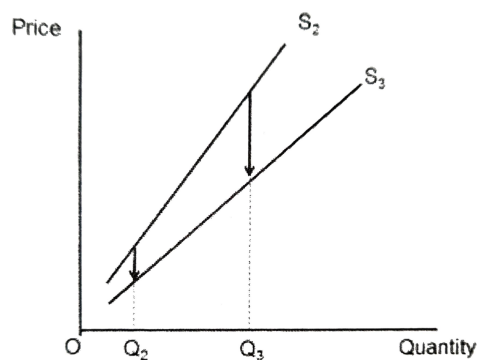


Figure 4.9.: Ad-valorem Subsidy

Apart from taxes and subsidies, governments also rely on directives and legislation, extend financing schemes to firms, provide technical support, etc., measures which would also have an effect on the market supply.

Prices of Related Goods

Goods in Joint Supply

Where the production of more of one good leads to the production of more of the other. Take cow hide and beef steak as an example. When profit-maximising firms, in response to higher leather prices, slaughter more cows, they will simultaneously increase the supply of beef steaks into the market.

Referencing [Figure 4.4](#), in the market for cow hides, the change is represented as an upward movement along the same supply curve S_0 as quantity supplied increases from Q_0 to Q_1 , in response to the increase in the price of cow hides from P_0 to P_1 . Referring to [Figure 4.5](#), in the market for beef steak, the change is represented as a rightward shift of the entire supply curve from S_0 to S_1 . Without the price of steak changing, the act of slaughtering more cows to produce more hides will increase the quantity supplied for beef steak from Q_0 to Q_1 at price P_0 .

Goods in Competitive Supply

Where the increased production of one good means diverting resources away from producing the other. A pair of goods which share a competitive supply relationship is corn as food and ethanol. In the US, corn which could have been used for food is diverted to the production of ethanol through the implementation of laws and provision of ethanol subsidies by the federal government. The increase in supply of ethanol is hence at the expense of the supply of corn for food.

Expectations of Future Prices

If the price of a good is expected to rise, producers may temporarily hold back the amount of goods they release into the market. Rational producers are likely to build up their stocks so as to sell at a higher price in the future. Hence, the current supply of the good falls as the willingness to supply at the current time period falls.

Sellers in the Market

The number of sellers in the market can affect the supply of goods and services. For instance, the potential for supernormal profits, combined with the lowering of barriers to entry into an industry, attract more firms to enter the market. As a result, at every price level, with more producers willing and able to enter the market, the market supply increases, shown by a rightward shift of the supply curve.

Nature, Random Shocks and Other Unpredicted Events

Adverse weather (e.g. droughts and floods) can greatly reduce agricultural output. Wars and natural disasters (e.g. earthquakes and tsunamis) can kill many people, including workers, destroy capital (buildings and machineries) and reduce production capacity. Events (e.g. industrial dispute and political unrest) will disrupt production.

These will reduce the ability of producers to supply goods and services in the market and the supply curve hence shifts leftwards.

4.7. Market Equilibrium

In perfectly competitive markets, prices will adjust until the point where **quantity demanded by buyers exactly equals quantity supplied by producers**. At this point, there is no further pressure on price and quantity to adjust. The market is said to have reached a point of equilibrium.

Shortages and surpluses are denoted by horizontal distances (not areas) in demand-supply diagrams.

4.8. Market Disequilibrium

Annotate the shortage/surplus on the diagram.

Effect of Demand Change

An **increase in demand** may arise from a change in any of its non-price determinants. Graphically, this is represented by a rightward shift of the entire demand curve from D_0 to D_1 (Figure 4.10). The increase in demand, holding supply constant, creates a shortage of Q_0Q_2 at the original equilibrium price P_0 . Buyers, competing for the good, bid up prices.

As the price rises, quantity demanded decreases while quantity supplied increases. This process continues until the price eventually reaches P_1 where quantity demanded exactly balances quantity supplied and the shortage is eliminated, removing further pressure on the market to adjust. The equilibrium quantity rises from the original Q_0 to a higher Q_1 .

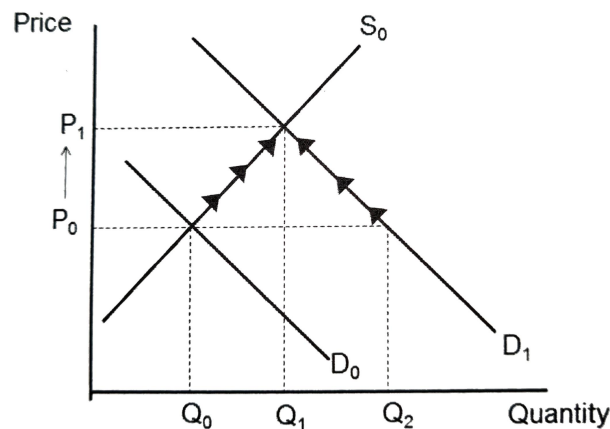


Figure 4.10.: Effect of Demand Change

Effect of Supply Change

An increase in supply may arise from a change in any of its non-price determinants. Graphically, this is represented by a rightward shift of the supply curve from S_0 to S_1 (Figure 4.11). The increase in supply, holding demand constant, creates a surplus of Q_0Q_2 at the original price P_0 . To remove the surplus, firms cut prices.

As the price falls, quantity demanded increases while quantity supplied declines. This process continues until the price eventually reaches P_1 where the quantity demanded exactly balances the quantity supplied and the surplus is eliminated, removing further pressure on the market to adjust. The equilibrium quantity rises from the original Q_0 to a higher Q_1 .

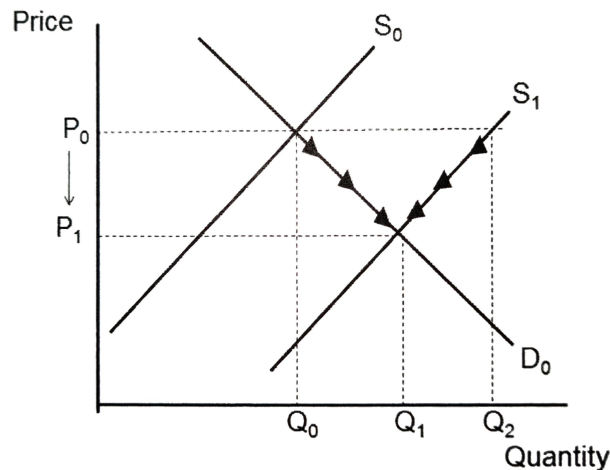


Figure 4.11.: Effect of Supply Change

Effect of Simultaneous Demand and Supply Changes

Increase in Both Demand and Supply

With consumers entering the market to demand for more units of the good and simultaneously producers entering the market to supply more units of the good, the equilibrium quantity must necessarily increase.

The effect on the **equilibrium price** is, on the other hand, indeterminate. It depends on the relative magnitude of the increase in demand and supply:

- **Case 1:** When demand increases by a larger magnitude than does supply, a shortage is created at the original equilibrium price level. Buyers, competing for the good, bid up prices.
- **Case 2:** When the supply increases by a larger magnitude than does demand, a surplus is created at the original equilibrium price level. To remove the surplus, firms cut prices.
- **Case 3:** When demand and supply both increase by the same extent, quantity demanded exactly equals quantity supplied, leaving neither shortage nor surplus. There is therefore no pressure on prices to adjust.

4. Demand and Supply Analysis and its Applications

Expounding on Case 1:

Referring to Figure 4.12, when demand increases by a larger magnitude (D_0 to D_1) than does supply (S_0 to S_1), a shortage of Q_2Q_3 is created at the original equilibrium price level P_0 . Buyers, competing for the good, bid up prices.

As the price rises, quantity demanded decreases while quantity supplied increases. This process continues until the price eventually reaches P_1 where the quantity demanded exactly balances the quantity supplied and the shortage is eliminated, removing further pressure on the market to adjust.

With the increase in both demand and supply, the new equilibrium quantity increases from the original Q_0 to a higher Q_1 .

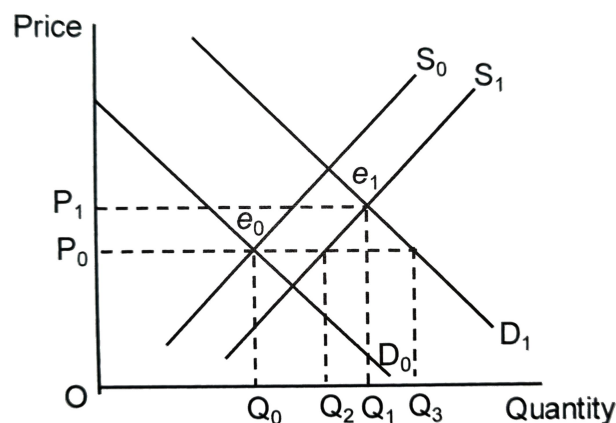


Figure 4.12.: Magnitude of Increase in Demand > Magnitude of Increase in Supply

Increase in Demand and Decrease in Supply

An increase in demand with a simultaneous decrease in supply will give rise to a shortage at the original market price. In such an instance, the market price must necessarily increase as buyers, competing for the good, bid up prices.

The effect on **equilibrium quantity**, on the other hand, is indeterminate. It depends on the relative magnitude of the demand and supply changes:

- **Case 1:** Where the magnitude of the increase in demand exceeds the magnitude of the decrease in supply, there would be an overall increase in the number of units of the good exchanged – the equilibrium quantity increases.
- **Case 2:** Where the magnitude of the decrease in supply exceeds the magnitude of the increase in demand, there would be an overall decrease in the number of units of the good exchanged – the equilibrium quantity decreases.
- **Case 3:** Where the magnitude of the increase in demand exactly equals the magnitude of the decrease in supply, the number of units of the good exchanged will remain unchanged – the equilibrium quantity remains constant.

Expounding on Case 1:

Referring to Figure 4.13, with a simultaneous increase in demand (D_0 to D_1) and decrease in supply (S_0 to S_1), a shortage of Q_2Q_3 is created at the original equilibrium price level P_0 . Buyers, competing for the good, bid up prices.

As the price increases, quantity demanded decreases while the quantity supplied increases. This process continues until the price eventually reaches P_1 where quantity demanded exactly balances quantity supplied and the shortage is eliminated, removing further pressure on the market to adjust.

Given that the magnitude of the increase in demand is more than the magnitude of the decrease in supply, the new equilibrium quantity rises from the original Q_0 to a higher Q_1 .

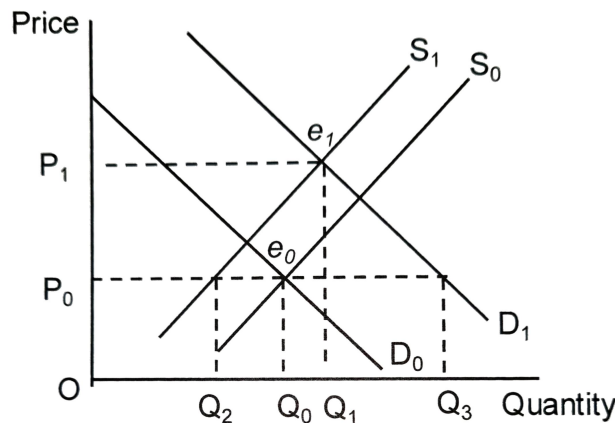


Figure 4.13.: Magnitude of Increase in Demand > Magnitude of Decrease in Supply

4.9. Price Elasticity of Demand

Definition 4.14. *Price elasticity of demand (PED)* is a measure of the degree of responsiveness of the quantity demanded for a good to a change in the price of the good itself, ceteris paribus.

$$PED = \frac{\% \text{ change in quantity demanded for a good}}{\% \text{ change in price of the good itself}}$$

The sign of PED is **negative** because the **Law of Demand** states that quantity demanded is inversely proportional to the price. An increase in the price of the good will lead to a decrease in quantity demanded, ceteris paribus.

Accepting that the sign of PED is negative most of the time, we often drop the negative sign and look at the absolute value when studying PED, simply for convenience.

Magnitude of PED

Price Elastic Demand

Definition 4.15. Demand is said to be *price elastic* when a given change in the price of a good results in a more than proportionate change in quantity demanded in the opposite direction, ceteris paribus.

$$|PED| > 1$$

Price Inelastic Demand

Definition 4.16. Demand is said to be *price inelastic* when a given change in the price of a good results in a less than proportionate change in quantity demanded in the opposite direction, ceteris paribus.

$$|PED| < 1$$

Referring to Figure 4.14, for the same price decrease from P_1 to P_2 , the given price reduction results in a larger magnitude of increase in the quantity demanded (Q_1 to Q_3) along the more price elastic demand curve, D_1 , than that in the quantity demanded (Q_1 to Q_2) when demand is less price elastic (along D_2), ceteris paribus.

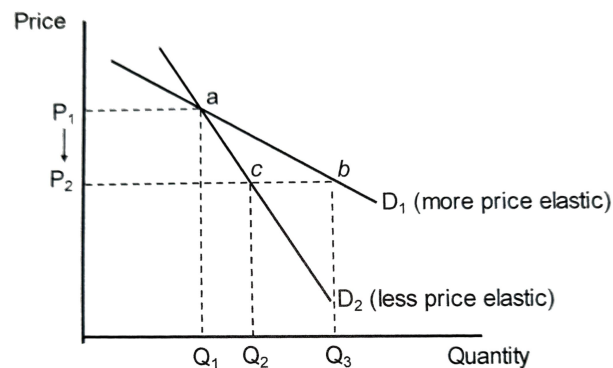


Figure 4.14.: Demand Curves with Different PED at the Same Pivotal Point

Unitary Price Elastic Demand

Definition 4.17. Demand is *unitary price elastic* when a change in price of the good results in a proportionate change in the quantity demanded of the good in the opposite direction, ceteris paribus.

$$|PED| = 1$$

Perfectly Price Inelastic Demand

Definition 4.18. Demand is *perfectly price inelastic* when a given change in price of the good itself produces no change in the quantity demanded of the good, ceteris paribus.

There is total unresponsiveness of quantity demanded to price changes and the demand curve is a vertical line.

$$PED = 0$$

Perfectly Price Elastic Demand

Definition 4.19. Demand is *perfectly price elastic* when a given change in price of the good itself leads to an infinitely large change in quantity demanded, ceteris paribus.

There is perfect/infinite responsiveness of quantity demanded to a change in price and the demand curve is a horizontal line.

$$|PED| \rightarrow \infty$$

Determinants of PED

Availability and Closeness of Substitutes

The greater the availability of substitutes and the closer these substitutes are for a particular good/service, the more price elastic will be its demand, ceteris paribus.

A good/service with many close substitutes, compared to another with fewer close substitutes, will experience a larger proportionate fall in quantity demanded with a rise in its price, as consumers readily switch to other products to satisfy the same want.

Consider the example of apples (many substitutes) and flour (few substitutes).

Proportion of Income Spent on the Good

The greater the proportion of a person's income that is spent on a good, the more price elastic will be its demand, ceteris paribus.

Consider the example of overseas holidays (larger proportion of income) and salt (minute proportion of income).

Degree of Necessity

Necessities are goods/services that we consider to be essential in our lives and have to be consumed despite price changes. Hence, demand for necessities is relatively price inelastic compared to that for non-necessities.

Consider the example of rice (a staple food in Asian culture) and jewellery (non-necessity).

4. Demand and Supply Analysis and its Applications

Addiction

The greater the degree of addiction to a substance such as drugs, cigarettes, etc., the more price inelastic the demand, *ceteris paribus*.

Consumers who are severely addicted to a good/service would be highly dependent on it and will be willing to pay a higher price to continue to consume the substance.

For example, a given % increase in the price of both cigarettes and nachos may be expected to produce a smaller % decrease in the quantity demanded for cigarettes than nachos, the latter being an item that is not addictive in nature.

Time Period

The longer the time period in which a consumer makes a purchasing decision, the more price elastic the demand, *ceteris paribus*.

As time goes by, consumers have the opportunity to get information on the availability of substitutes, compare prices and adapt their tastes and preferences.

Consider the example of the increase in the price of flour (short run: may not be able to switch to alternative forms of staple food immediately; long run: more able to adapt to other alternatives and acquire a taste for rice and other types of grains). A given % increase in the price of flour may be expected to produce a larger % decrease in quantity demanded in the long run than the short run, *ceteris paribus*.

4.10. Price Elasticity of Supply

Definition 4.20. *Price elasticity of supply (PES)* is a measure of the responsiveness of the quantity supplied of a good to changes in its price, *ceteris paribus*.

$$PES = \frac{\% \text{ change in quantity supplied of a good}}{\% \text{ change in price of the good itself}}$$

The sign of the PES is **positive** because the **Law of Supply** states that quantity supplied of a good is positively related to its price, *ceteris paribus*.

Magnitude of PES

Price Elastic Supply

Definition 4.21. Supply is said to be **price elastic** when a given change in the price of a good results in a more than proportionate change in the quantity supplied in the same direction, *ceteris paribus*.

$$PES > 1$$

Price Inelastic Supply

Definition 4.22. Supply is said to be *price inelastic* when a given change in the price of a good results in a less than proportionate change in the quantity supplied in the same direction, ceteris paribus.

$$0 < PES < 1$$

Referring to Figure 4.15, the same price increase from P_0 to P_1 results in a larger magnitude of increase in the quantity supplied (Q_0 to Q_2) along the more price elastic supply curve, S_2 , than that in the quantity supplied (Q_0 to Q_1) when supply is less price elastic (S_1), ceteris paribus.

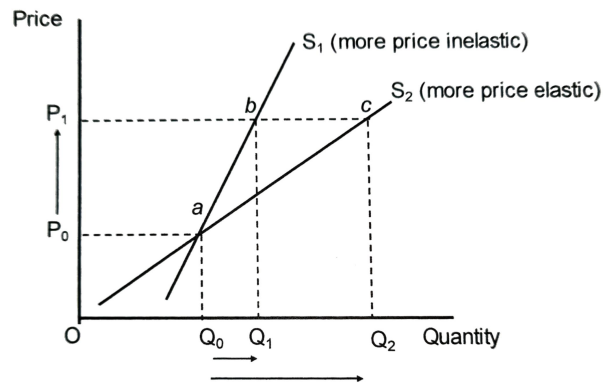


Figure 4.15.: Supply Curves with Differing PES at the Same Pivotal Point

Unitary Price Elastic Supply

Definition 4.23. Supply is said to be *unitary price elastic* when a given change in the price of a good results in a proportionate change in quantity supplied in the same direction, ceteris paribus.

$$PES = 1$$

Perfectly Price Inelastic Supply

Definition 4.24. Supply is *perfectly price inelastic* when a given change in the price of the good itself produces no change in the quantity supplied, ceteris paribus.

There is total unresponsiveness of quantity supplied to price changes and the supply curve is a vertical line.

$$PES = 0$$

Perfectly Price Elastic Supply

Definition 4.25. Supply is *perfectly price elastic* when a given change in the price of the good leads to an infinitely large change in quantity supplied, *ceteris paribus*.

There is perfect/infinite responsiveness of quantity supplied to a change in price and the supply curve is a horizontal line.

$$PES \rightarrow \infty$$

Determinants of PES

Availability of Stock

Firms with larger availability of stock are more able to respond to price changes. Hence, supply of goods with longer shelf life (e.g. canned food) is more price elastic than the supply of perishable goods (e.g. fresh vegetables). This is because perishable goods cannot be stored for long periods of time. Given an increase in the price of vegetables, producers cannot increase the quantity of vegetables supplied into the market easily as they are unable to draw from their stocks/inventories.

The larger the availability of stocks, the larger the increase in quantity supplied that firms will be able to bring into the market when its price increases, accounting for the larger PES value.

Existence of Spare Capacity

Firms have the ability to increase production when existing capacity is not fully utilised. On the other hand, should firms be already operating close to full capacity, it will be difficult for them to increase quantity supplied in response to a price raise.

The greater the spare capacity, the higher is the PES and the more price elastic the supply.

Mobility of Factors of Production

Definition 4.26. *Mobility of factors of production* measures the degree to which a factor of production is willing and able to switch between different locations or uses.

- **Geographical Mobility:**

- The ease with which factors of production can move between different physical locations.
- Consider the example of the geographical mobility of construction workers (to other provinces/places to increase the quantity of new housing supplied) – offer wages and accommodation to facilitate these workers' relocation → higher PES for new housing

- **Occupational Mobility:**

- Is the ease with which factors of production can move between different industries. For industries that use factor inputs that can easily switch from one use to another, the supply of their goods will be more price elastic.
- Consider the examples of textile production and medical service provision. (textile production: does not require workers to be highly skilled; medical industry: requires highly-specialised set of skills)

Time Period

The ability of firms to respond to price changes by altering their quantity supplied varies over time. The longer the time allowed for adjustment, the more resources can flow into/out of an industry through expansion/contraction of existing firms.

For example, in the short run, even when rising oil prices provide the incentive for petroleum refiners to increase quantity supplied, their ability to expand output will be limited by fixed factors such as the refining plant and equipment they have at their disposal. Over time, however, some refining companies might be able to recondition old equipment that had fallen into disuse. They can also place orders for new petroleum-refining equipment and acquire the physical land they need to set up a larger plant that can handle more crude oil. The same given price increase will bring about a larger increase in quantity supplied in the long run than in the short run. Hence, supply is relatively more inelastic in the short run than in the long run.