

Auditing Course Material

Part 47 of 61 (Chapters 4601-4700)

6. Inference (Anumana)

The inference can be understood through 3 terms - the major, the minor and the middle which are here called as sadhya, paksha and linga/hetu respectively.

Let us understand these terms with an example of hill, smoke and fire. We know that smoke is invariably associated with fire (vyapti) and if we see smoke in a hill we conclude that there must be fire in that hill.



1. **Minor term** is hill which corresponds to the subject of a proposition or statement. It represents the entity or object about which something is affirmed or denied in relation to the major term.

2. **Middle term** is smoke which acts as the reason or evidence for drawing a conclusion about the minor term based on its relationship with the major term.

3. **Major term** is fire corresponds to the predicate of a proposition or statement. It represents the attribute or quality that is being affirmed or denied about the subject term.

From the presence of smoke in the hill as qualified by the knowledge that wherever there is smoke there is fire, we proceed to infer the presence of fire in the hill. This is inference.

The presence of the middle term in the minor term is called **paksadharmata**.

The invariable association of the middle term with the major term is called **vyapti**.

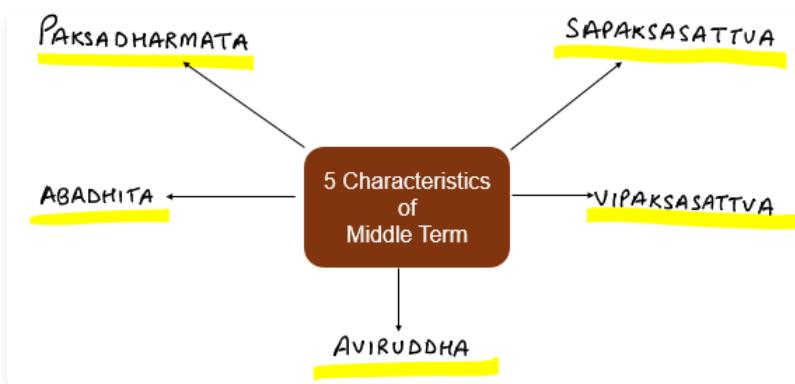
The knowledge of paksadharmata as qualified by vyapti is called **paramarsha** or inference.

Middle Term and its characteristics

The middle term serves as the connecting link between the major term (the predicate of the conclusion) and the minor term (the subject of the conclusion) in a syllogism. Understanding its role elucidates how the conclusion is derived from the premises.

The validity of an inference in Nyaya logic depends on the proper use of the middle term. If the middle term is not appropriately related to both the major and minor terms in the premises, the inference may be invalid. Therefore, knowledge of the characteristics of the middle term enables one to identify fallacies in reasoning.

There are 5 characteristics of the middle term which are discussed below:



1. It must be present in the minor term (**paksadharmata**); e.g., smoke must be present in the hill.
2. It must be present in all positive instances in which the major term is present; e.g., smoke must be present in the kitchen where fire exists (**sapaksasattva**).
3. It must be absent in all negative instances in which the major term is absent; e.g., smoke must be absent in the lake in which fire does not exist (**vipaksasattva**).
4. It must be non-incompatible with the minor term; e.g., it must not prove the coolness of fire (**abadhita**).

5. It must be qualified by the absence of counteracting reasons which lead to a contradictory conclusion; e.g., 'the fact of being caused' should not be used to prove the 'eternity of sound' (*aviruddha*).

6. Inference (Anumana)

In Indian logic, a fallacy is called hetvabhasa. It means that the middle term appears to be a reason but is not a valid reason. All fallacies are material fallacies. We have discussed the 5 characteristics of a valid middle term. When these are violated, we have fallacies.

They are of 5 kinds of Fallacies as explained below.



1. Asiddha or Sadhyasama

This is the fallacy of the unproved middle. The middle term must be present in the minor term (paksadharmata). If it is not, it is unproved. It is of 3 kinds:

- Ashrayasiddha:** The minor term is the locus of the middle term. If the minor term is unreal, the middle term cannot be present in it; e.g., 'the sky-lotus is fragrant, because it is a lotus, like the lotus of a lake'.
- Svarupasiddha:** Here the minor term is not unreal. But the middle term cannot by its very nature be present in the minor term; e.g., 'sound is a quality, because it is visible'. Here visibility cannot belong to sound which is audible.
- Vyapayatvasiddha :** Here vyapti is conditional (sopadhika). We cannot say, e.g., 'wherever there is fire there is smoke'. Fire smokes only when it is associated with wet fuel. A red-hot iron ball or clear fire does not smoke. Hence association with wet fuel is a condition necessary to the aforesaid vyapti. Being conditioned, the middle term becomes fallacious if we say: 'The hill has smoke because it has fire'.

2. Savyabhichara or Anaikeantika

This is the fallacy of the irregular middle. It is also of 3 kinds:

- Sadharana:** Here the middle term is too wide. It is present in both the sapaksa (positive) and the vipaksa (negative) instances and violates the rule that the middle should not be present in the negative instances (vipaksasattva). For example, 'the hill has fire because it is knowable'. Here 'knowable' is present in fiery as well as non-fiery objects'.
- Asadharana:** Here the middle term is too narrow. It is present only in the paksa and neither in the sapaksa nor in the vipaksa. It violates the rule that the middle term should be present in the sapaksa (sapaksasattva); e.g., 'sound is eternal, because it is audible'. Here audibility belongs to sound only and is present nowhere else.
- Anupasamhari:** Here the middle term is non-exclusive. The minor term is all-inclusive and leaves nothing by way of sapaksa or vipaksa; e.g., 'all things are non-eternal, because they are knowable'.

3. Satpratipaksa

Here the middle term is contradicted by another middle term. The reason is counter-balanced by another reason. And both are of equal force; e.g., 'sound is eternal, because it is audible' and 'sound is non-eternal, because it is produced'. Here 'audible' is counter-balanced by 'produced' and both are of equal force.

4. Badhita

It is the non-inferentially contradicted middle. Here the middle term is contradicted by some other pramana and not by inference. It cannot prove the major term which is disproved by another stronger source of valid knowledge; e.g., 'fire is cold, because it is a substance'. Here the middle term 'substance' becomes contradicted because its major term 'coldness' is directly contradicted by perception.

5. Viruddha

It is the contradictory middle. The middle term, instead of being pervaded by the presence of the major term, is pervaded by the absence of the major term. Instead of proving the existence of the major term in the minor term, it proves its non-existence therein; e.g., 'sound is eternal, because it is produced'. Here 'produced, instead of proving the eternity of sound, proves its non-eternity. Here the middle term itself disproves the original proposition and proves its contradictory.

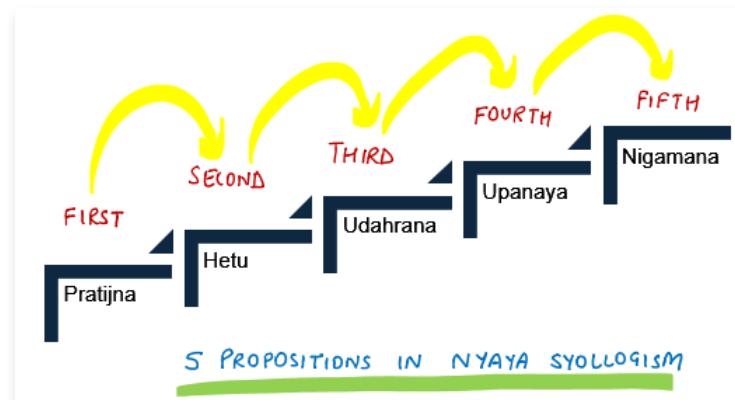
6. Inference (Anumana)

Key Features of Indian Logic viewpoint on Inference is given below.

- Inference is a complex process that involves both deduction (reasoning from general principles to specific instances) and induction (reasoning from specific instances to general principles). Unlike Western approaches that often treat deduction and induction as separate methods of inference, Indian logic sees them as interconnected aspects of the same process. They're not isolated from each other but work together in reasoning.
 - Indian logic doesn't limit itself to the mere formal structures or linguistic expressions of logical arguments. Instead, it explores the nature of thought itself, looking beyond just the forms of thought to understand the process of reasoning.
 - In Indian logic, there's a synthesis of **formal logic** (concerned with the structure of logical arguments) and **material logic** (concerned with the content or substance of reasoning). This integration emphasizes that the verbal expression of a logical argument isn't necessarily crucial for the inference process.
 - Inference, according to Nyāya, is neither from the universal to the particular nor from the particular to the universal, but from the particular to the particular through the universal.
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6. Inference (Anumana)

There are 5 propositions in the Nyaya syllogism as given below.



1. The first is called **Pratijna** or proposition. It is the logical statement which is to be proved.
2. The second is **Hetu** or reason which states the reason for the establishment of the proposition.
3. The third is called **Udarhana** which gives the universal concomitance together with an example.
4. The fourth is **Upanaya** or the application of the universal concomitance to the present case.
5. The fifth is **Nigamana** or conclusion drawn from the preceding propositions. These five propositions are called 'members or avayavas'.

The following is a typical Nyaya syllogism:

- This hill has fire (*pratijna*).
- Because it has smoke (*hetu*).
- Whatever has smoke has fire, e.g., an oven (*udarhana*).
- This hill has smoke which is invariably associated with fire (*upanaya*).
- Therefore this hill has fire (*nigamana*).

6. Inference (Anumana)

If we compare Nyaya syllogism with the Aristotelian syllogism which has only 3 propositions, we will find that this Nyaya syllogism corresponds to the **Barbara (AAA) mood of the First Figure** which is the strongest mood of the strongest figure.

The Barbara mood is the most common and useful syllogistic form, and its mood and figure is AAA-1: All M are P. All S are M. Therefore, All S are P. Instances of this form are especially powerful, since they are the only valid syllogisms whose conclusions are universal affirmative propositions.

It is to be noted that though the Nyaya syllogism has 5 and the Aristotelian has 3 propositions, the terms in both are only 3 - the *sādhyā* or the major, the *pakṣa* or the minor and the *hetu* or the middle.

Out of the 5 propositions of Nyaya syllogism, two appear redundant and we may easily leave out either the first two or the last two which are essentially the same. The first coincides with the fifth and the second with the fourth.

If we omit the last two, the first three propositions correspond with the conclusion, the minor premise and the major premise respectively. Or, if we omit the first two, the last three propositions correspond to the major premise, the minor premise and the conclusion of the Aristotelian syllogism. Hence if we leave out the first two members of the Nyaya syllogism which are contained in the last two, we find that it resembles the Aristotelian syllogism in the First Figure:

- (1) All things which have smoke have fire (Major premise).
- (2) This hill has smoke (Minor premise).
- (3) Therefore this hill has fire (Conclusion).

And the typical Aristotelian syllogism may be stated in the Nyaya form thus:

- (1) Socrates is mortal (*pratijna*).
 - (2) Because he is a man (*hetu*).
 - (3) Whoever is a man is a mortal, e.g., Pythagoras (*udaharana*).
 - (4) Socrates is a man who is invariably a mortal (*upanaya*).
 - (5) Therefore Socrates is mortal (*nigamana*).
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6. Inference (Anumana)

There are certain real differences between the Nyaya and the Aristotelian syllogism apart from the nominal difference between the numbers of the propositions in each. These are discussed next.

1. Deductive vs. Deductive-Inductive

Aristotelian Syllogism: Only deductive, relying solely on deductive reasoning and formal logic.

Nyaya Syllogism: Deductive-inductive, integrating both deductive and inductive reasoning along with formal and material aspects.

2. Formal vs. Formal-Material

Aristotelian Syllogism: Strictly formal, emphasizing formal logic and deductive structure.

Nyaya Syllogism: Formal-material, considering both formal logical structure and material aspects, incorporating elements beyond mere formal logic.

3. Relationship between Deduction and Induction

Aristotelian Syllogism: Treats deduction and induction as separate processes.

Nyaya Syllogism: Considers deduction and induction as interconnected, recognizing them as two facets of the same process of inference.

4. Treatment of Terms in Premises

Aristotelian Syllogism: Major and minor terms stand apart in premises, connected by the middle term.

Nyaya Syllogism: All three terms synthesized in the Upanaya, emphasizing a more integrated approach to premises.

5. Verbalism vs. Practical Use of Verbal Form

Aristotelian Syllogism: Often overly verbalistic, focusing heavily on the logical-formal structure of language.

Nyaya Syllogism: Recognizes that verbal form is not essential to inference, as the real essence is in understanding and realization of relationships among real entities along with acquisition of real knowledge.

6. Inference (Anumana)

Inference can be divided into various categories based on a particular context as described below.

Inference based upon psychological process

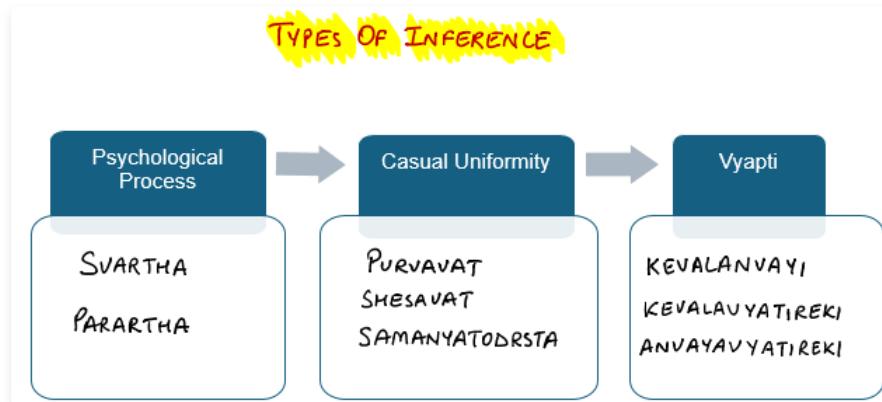
Inference is divided into 2 categories - svartha (for oneself) and parartha (for others).

- **Svartha** inference is seen as a psychological process, where one doesn't need to formally articulate the logical steps because it's an internal, intuitive understanding.
- **Parartha** inference, on the other hand, involves presenting logical arguments in language, primarily to persuade or convince others.

Inference based on causal uniformity

As per Gautama, it is of 3 kind - Purvavat, Shesavat and Samanyatodrsta. The first two are based on causation and the last one on mere coexistence. A cause is the invariable and unconditional antecedent of an effect and an effect is the invariable and unconditional consequent of a cause.

1. **Purvavat** – In this we infer the unperceived effect from a perceived e.g., when we infer future rain from dark clouds in the sky. Purvavat inference is based on previous experience of universal concomitance between two things.
2. **Shesavat** - In this we infer the unperceived cause from a perceived effect e.g., when we infer past rain from the swift muddy flooded water of a river. Shesavat inference is parishesa or inference by elimination.
3. **Samanyatodrsta** - In this inference is based not on causation but on uniformity of co-existence, it is called samanyatodrsta, e.g., when we infer cloven hoofs of an animal by its horns. Samanyatodrsta is inference by analogy.



Inference based upon Vyapti

It is of 3 kind – kevalanvayi, kevala-vyatireki and anvaya-vyatireki inference which is based upon the different methods of establishing it. The methods of induction by which universal causal relationship (vyapti) is established may be anvaya, vyatireka or both.

In relation to Western Logic of Reasoning, the first corresponds to John Stuart Mill's Method of Agreement, the second to his Method of Difference, and the third to his Joint Method of Agreement and Difference or the Method of Double Agreement.

1. **Kevalanvayi** - In this the middle term is always positively related to the major term. Here 'Anvaya' refers to method of agreement in which 'Hetu' is invariably present whenever the Sadhya is present.

The terms agree only in presence, there being no negative instance of their agreement in absence.

For example -

All knowable objects are nameable.

The pot is a knowable object.

The pot is nameable.

2. **Kevalavyatireki** – In this inference, the middle term is the differentium of the minor term and is always negatively related to the major term. Here 'vyatireka' refers to method of difference.

The terms agree only in absence, there being no positive instance of their agreement in presence.

For example -

What is not different-from-other-elements has no smell.

The earth has smell.

The earth is different-from-other-elements.

3. **Anvayavyatireki** - In this inference the middle term is both positively and negatively related to the major term. The vyapti between the middle and the major is in respect of both presence and absence. There is Double Agreement between the terms —they agree in presence in the positive instances and they also agree in absence in the negative instances.

For example -

All things which have smoke have fire

This hill has smoke

This hill has fire

and

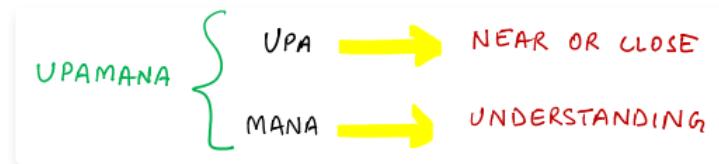
No non-fiery things have smoke

This hill has smoke

This hill is not non-fiery; i.e., This hill has fire.

7. Upama

The third type of valid cognition, Upamiti, utilizes Upamana as its means. Breaking down the term, "Upa" signifies near or close, implying a familiarity or knowledge, while "Mana" denotes understanding. Thus, Upamana refers to knowledge gained by comparing it to a known object. It's a form of cognition derived from comparison, akin to analogy, and often involves understanding the relationship between a word and what it denotes, based on resemblance or similarity.



For instance, consider a person who has never encountered a 'gavaya', or wild cow, and lacks knowledge about it. Upon being informed by someone that a gavaya resembles a cow, they subsequently encounter one in a forest and recognize it as a gavaya. In this scenario, their recognition stems from Upamana. Having heard about the gavaya, associated it with a cow, and then witnessing the actual creature, they connect the word with the object it denotes.

Therefore, Upamana essentially entails understanding the correlation between a name and the object it represents. This comprehension arises from recognizing similarities, such as when an individual identifies a wild cow as a gavaya due to its resemblance to a regular cow, coupled with their memory of the description provided.

In formal terms, the subject of comparison is termed **upameyam**, the object of comparison is referred to as **upamanam**, and the shared attributes are identified as **samanya**. To illustrate, if someone remarks, "her face is like the moon in charmingness," then "her face" becomes the upameyam, the moon serves as the upamanam, and charmingness represents the samanya attribute.

7. Upmana

Nyaya philosophy describes 3 classifications of upamana pramana as below:



1. **Sadrishya / Sadharma Upamana Pramana** (*similarity based comparison*): In this type the knowledge occurs due to the similarity of two articles. Example - The knowledge of Gavaya (Nila Gaya) occurs due to its similarity with cows.
 2. **Vaidharmya Upamana Pramana** (*dissimilarity based comparison*): In this type of knowledge the dissimilarity with the compared article is the base. For example - A boy does not know about camel, he receives information from elders that a camel is dissimilar to a horse, as it contains a long neck and a hump on its back. Remembering this sentence and knowledge and seeing an animal dissimilar to horse on particular points he comes to the conclusion that the animal is camel.
 3. **Asadharan Dharma Upamana Pramana** (*peculiarity based comparison*): It is the peculiarity of a particular object or phenomenon that differentiates it from the rest of phenomena. For example - the rhinoceros bears a horn on its nose is the peculiar sign which helps in its recognition and differentiation from elephants.
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8. Shabda (Verbal Testimony)

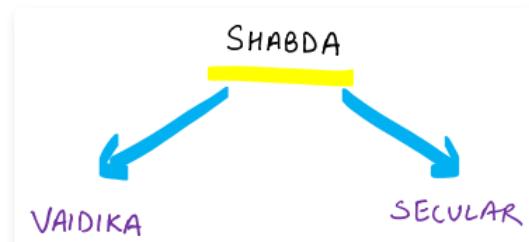
The fourth category of valid knowledge is known as Shabda, Agama, or authoritative verbal testimony. **Aapta upadesha**, which translates to authoritative statement, constitutes this form of knowledge. It involves the verbal communication or testimony of individuals who are considered trustworthy or authoritative in their respective fields. These individuals, referred to as 'aapta,' impart knowledge that is recognized as reliable and credible. Shabda, or statement, is another term for this type of knowledge.

This form of knowledge acquisition relies on expertise passed down through generations, often through verbal communication. It serves as a fundamental source of literary knowledge and primary information on various subjects. Examples of sources include manuscripts, published documents like samhitas, articles, and journals. Shabda forms the cornerstone of other means of knowledge acquisition, providing a solid foundation for further learning.

In essence, Shabda is the understanding of statements made by trustworthy individuals (**aptavakyas**). It involves grasping the meaning behind their words. According to ancient Nyaya philosophy, the power of a word to convey meaning is attributed to divine origin, while later Nyaya philosophy attributes it to long-established convention. Testimony, in this context, is always personal and relies on the credibility of the individual providing it, whether human or divine.

8. Shabda (Verbal Testimony)

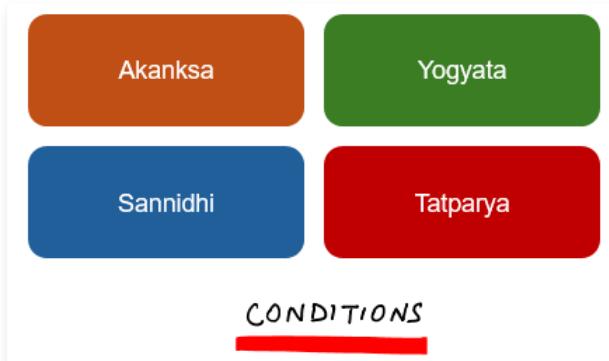
Shabda is of 2 kinds — Vaidika (Alaukika) and secular (laukika).



- (i) **Vaidika** testimony is perfect and infallible because the Vedas are spoken by God.
 - (ii) **Secular** testimony are the words of human beings who are liable to error, is not infallible. Only the words of trustworthy persons who always speak the truth are valid; others are not.
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8. Shabda (Verbal Testimony)

A word is a potent symbol which signifies an object and a sentence is a collection of words. But a sentence in order to be intelligible must conform to certain conditions. These conditions are 4 - akanksa, yogyata, sannidhi and tatparya.

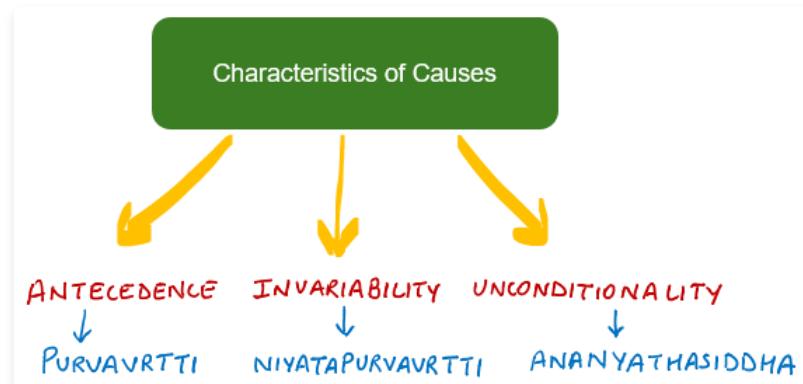


1. **Akanksa** is mutual implication or expectancy. The words of a sentence are interrelated and stand in need of one another in order to express a complete sense. A mere aggregate of unrelated words will not make a logical sentence. It will be sheer nonsense, e.g., 'cow horse man elephant'.
 2. **Yogyata** is that the words should possess fitness to convey the sense and should not contradict the meaning. For instance, 'Water the plants with fire is a contradictory sentence'.
 3. **Sannidhi** is the close proximity of the words to one another. The words must be spoken in quick succession without long intervals. For instance, if the words 'bring,' 'a,' and 'cow' are uttered at long intervals they would not make a logical sentence.
 4. **Tatparya** is the intention of the speaker if the words are ambiguous. For example, the word 'saindhava' means 'salt as well as a 'horse. Now, if a man who is taking his food asks another to bring 'saindhava, the latter should not bring a horse.
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9. Nyaya Theory of Causation

A cause is defined as an unconditional and invariable consequence of a cause. The same cause produces the same effect and the same effect is produced by the same cause. Plurality of causes is ruled out.

The essential characteristics of a cause are 'antecedence', 'invariability' and 'unconditionality'.



1. **Antecedence** - the fact that it should precede the effect (Purvavrtti).
2. **Invariability** - it must invariably precede the effect (Niyatapurvavrtti).
3. **Unconditionality or necessity** - it must unconditionally precede the effect (Ananyathasiddha). It is immediate and direct antecedence and excludes the fallacy or remote cause.

Thus, the Nyaya definition of a cause appears to be the same as that in western inductive logic. Hume defines a cause as an invariable antecedent. A cause, therefore, is an unconditional, immediate and invariable antecedent of an effect.]

Effect

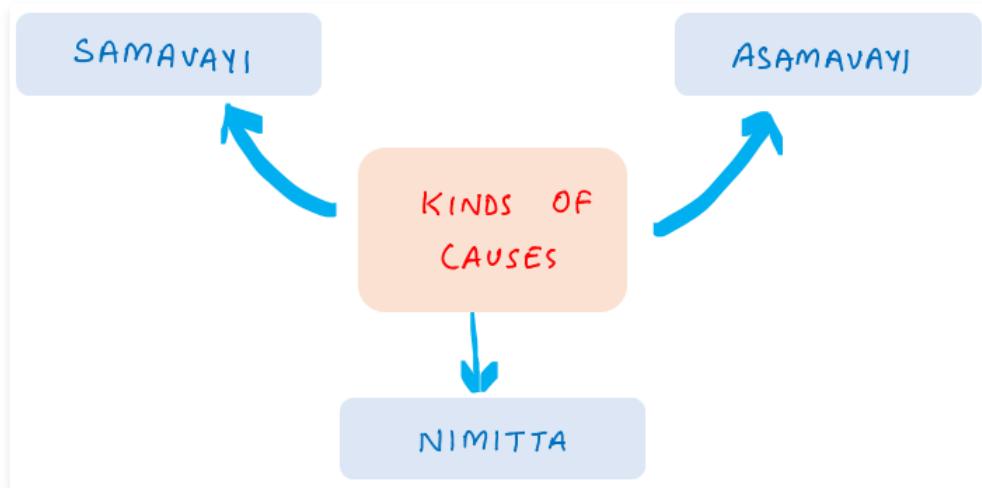
An **effect** is defined as the counter-entity of its own prior non-existence. It is the negation of its own prior-negation. It comes into being and destroys its prior non-existence. It was non-existent before its production. It did not pre-exist in its cause. It is a fresh beginning, a new creation.

The effect is non-existent before its creation and is a new beginning (arambha), a fresh creation, an epigenesis. It is distinct from its cause and can never be identical with it. It is neither an appearance nor a transformation of the cause. It is newly brought into existence by the operation of the cause.

9. Nyaya Theory of Causation

There are 3 kinds of causes – Samavayi, Asamavayi and Nimitta.

1. **Samavayi or the inherent cause** - It is the substance out of which the effect is produced. For example, the threads are the inherent cause of the cloth and the clay is the inherent cause of a pot. The effect inheres in its material cause or upadan. The cloth inheres in the threads. The effect cannot exist separately from its material cause, though the cause can exist independently of its effect.



2. **Asamavayi or non-inherent cause** - It inheres in the material cause and helps the production of the effect. For example, the conjunction of the threads which inheres in the threads is the non-inherent cause of the cloth of which the threads are the material or the inherent cause. The color of the threads is the non-inherent cause both co-inhere in the material cause. The non-inherent cause is always a quality or an action.

3. **Nimitta or efficient cause** - It is the power which helps the material cause to produce the effect. For example, the weaver is the efficient cause of the cloth. The efficient cause includes the accessories, e.g., the loom and shuttle of the weaver or the staff and wheel of the potter. The efficient cause may be a substance, a quality or an action.

It is to be noted that the inherent cause, the non-inherent cause, the efficient cause and the purpose seem to correspond to Aristotle's material, formal, efficient and final causes.

10. Purva Mimamsa - Introduction

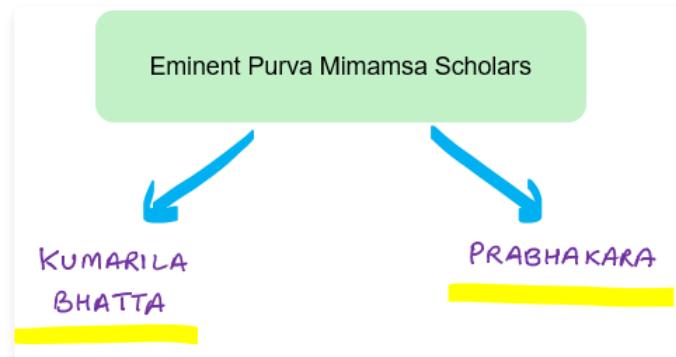
As Nyaya philosophy delves into the exploration of knowledge through its 4 pramanas, it encounters inherent boundaries in fully elucidating the nuances of perception, inference, comparison, and testimony. Recognizing these limitations sparks a pivotal shift towards Purva Mimamsa, where the epistemological framework broadens with the addition of two further pramanas—arthapatti (presumption) and anupalabdhi (non-apprehension).

These novel pramanas, distinct to Purva Mimamsa, offer fresh pathways for comprehending and deciphering the profound depths of Vedic scriptures and rituals. The transition from Nyaya to Purva Mimamsa signifies a progression in philosophical inquiry, unlocking new vistas for deeper insights and interpretations.



The word **Mimamsa** literally means revered thought and was originally applied to the interpretation of the Vedic rituals which commanded highest reverence. The school of Mimamsa justifies both these meanings by giving us rules according to which the commandments of the Veda are to be interpreted and by giving a philosophical justification for the Vedic ritualism.

Just as Sankhya and Yoga, Vaishesika and Nyaya are regarded as allied systems, similarly Mimamsa and Vedanta are also treated as allied systems of thought. Both are based on and both try to interpret the Veda. The earlier portion of the Veda, i.e., the **Mantra** and the **Brahmana** portion, is called **Karmakanda**, while the later portion, i.e., the Upanisads is called **Jnanakanda**, because the former deals with action, with the rituals and the sacrifices, while the latter deals with the knowledge of reality.



Mimamsa deals with the earlier portion of the Veda and is therefore called **Purva-Mimamsa** and also **Karma-Mimamsa** (founded by Jaimini), while Vedanta deals with the later portion of the Veda and is therefore called **Uttara-Mimamsa** and also **Jnana-Mimamsa** (founded by Badarayana). The former deals with Dharma and the latter with Brahma and therefore the former is also called **Dharma-Mimamsa**, while the latter is also called **Brahma-Mimamsa**.

These teachers held that Karma (action) and Upasana (meditation) were absolutely essential to hasten the dawn of true knowledge. In this connection it is also important to remember that it is the great Mimamsaka **Kumarila Bhatta** himself who may be rightly regarded as the link between the Purva and the Uttara Mimamsa.

Tradition makes **Prabhakara**, a pupil of Kumarila who nicknamed him as Guru on account of his great intellectual powers. Prabhakara engaged in philosophical debates with Kumarila Bhatta. Their debates, particularly on issues related to ritual interpretation and the nature of linguistic communication, contributed to the refinement and elaboration of Mimamsa doctrines.

Ramanuja and Bhaskara believe that the Purva and Uttara Mimamsas together form one science and the study of the former is necessary before undertaking the study of the latter. Purva Mimamsa regards the Veda as eternal and authorless and of infallible authority.

The aim of the Mimamsa is to supply the principles according to which the Vedic texts are to be interpreted and to provide philosophical justification for the views contained therein. It undertakes a thorough investigation into the nature and validity of knowledge and into the various means which produce valid knowledge and also into other metaphysical problems. The Mimamsa has been much influenced by the Nyaya-Vaisesika school and many important doctrines of which it has either borrowed or rejected.

11. Purva Mimamsa - Validity of Knowledge

The Mimamsaka follows the theory of Svatahparmanyavada - self validity or intrinsic validity of knowledge.

Prabhakara and Kumarila both uphold the intrinsic validity of knowledge. Prabhakara says, 'all cognitions as cognitions are valid; their invalidity is due to their disagreement with the real nature of their objects.' Kumarila says, 'the validity of knowledge consists in its apprehending an object; it is set aside by such discrepancies as its disagreement with the real nature of the object'.

The Mimamsa upholds a theory that all knowledge is valid by itself. It is not validated by any other knowledge. It is not due to any extraneous conditions. A need for explanation is felt only when knowledge fails to be valid. And its invalidity is inferred either from some defect in the instrument of knowledge like a person suffering from jaundice sees a conch yellow or from a subsequent contradicting knowledge - if a rope is mistaken for a snake, the knowledge of the rope snake is invalidated by the subsequent knowledge of the rope.

In other words, according to Mimamsa, knowledge is intrinsically valid, though its invalidity is due to extraneous conditions. On the other hand, the Nyaya theory follows Pratahpramanya-theory of extrinsic validity of knowledge which says that knowledge is neither valid nor invalid but it is neutral. Both the validity and invalidity of knowledge is due to extraneous conditions.

Scholars of Mimasaka advocates the validity of knowledge in two respects; its origin (*uttpatti*), and ascertainment (*jnapti*). The validity of knowledge together arises with that knowledge and it is also known as soon as that knowledge is known. But it criticizes so called neutral knowledge which is impossibility as we either experience either valid or invalid knowledge. There is no third alternative like neutral knowledge as said by scholars of Nyayaikas.

Both Prabhakara and Kumarila regard knowledge itself as pramaṇa or means of knowledge. Jaimini admits 3 pramaṇas - perception, inference and testimony. Prabhakara adds 2 more - comparison and implication. Kumārila further adds non-apprehension.

These are discussed next.

11. Purva Mimamsa - Validity of Knowledge

Mimamsa broadly agrees with Nyaya in its view of perception. It means the self comes into contact with the mind (manas); the mind comes into contact with the sense-organ; and the sense-organ comes into contact with the external object.

11. Purva Mimamsa - Validity of Knowledge

Anumana means inference. It is described as reaching a new conclusion and truth from one or more observations and previous truths by applying reason. Observing smoke and inferring fire is an example of Anumana. All schools of Indian Philosophy except Charvaka accept this as a valid and useful means to knowledge.

The meaning of Anumana in Mimamsa agrees with Nyaya in its view of perception, however, there are certain minor differences between the two. For example - the Mimamsaka recognizes only 3 members of the syllogism, either the first three or last three, thus bringing the Indian syllogism in conformity with Aristotelian one.

The Carvakas accept Perception as the only means of valid knowledge. The validity of other means of knowledge like Anumana, Shabda etc., is rejected by them. In the case of Perception they speak about two types of it (i) external and (ii) internal. External perception arises due to the contact of the five sense organs with their concerned objects. Internal perception depends upon the external existence of objects and organs. It will not keep off the external sense organs. According to them the perceptible world is the only reality.

11. Purva Mimamsa - Validity of Knowledge

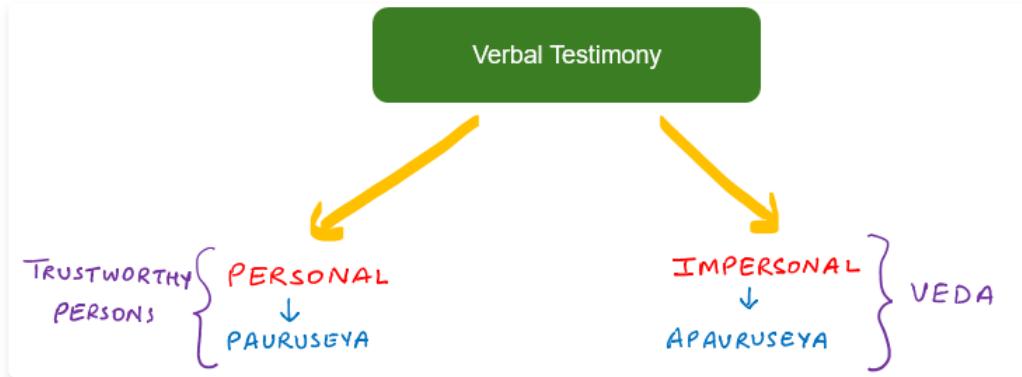
The Mimamsa view of comparison or Upamana differs from the Nyaya view. According to Nyaya, comparison is the knowledge of the relation between a word and the object denoted by that word (samjnasamjnisanambandhajnana). It is the knowledge of similarity of an unknown object like a wild cow with a known object like a cow. The knowledge is like this—‘the perceived wild cow is like the remembered cow’.

Mimamsaka refutes this account of comparison. He points out that the knowledge of the relation between a word and the object denoted by that word is derived by verbal authority (e.g., by the words of the person who tells that a wild cow is similar to a cow) and not by comparison. It is known through the recollection of what was learnt from the verbal authority of the person. And the knowledge of the wild cow itself is due to perception and not comparison. Hence comparison, according to Mimamsa, apprehends the similarity of the remembered cow to the perceived wild cow. A person need not be told by anyone that a wild cow is similar to a cow. Any person who has seen a cow and happens to see a wild cow himself remembers the cow as similar to the wild cow he perceives. This knowledge of similarity is comparison. It is distinguished from inference because the vyapti or the invariable concomitance is not needed here.

11. Purva Mimamsa - Validity of Knowledge

Shabda-Pramana has got the greatest importance in Mimamsa. Testimony is verbal authority. It is the knowledge of supra-sensible objects which is produced by the comprehension of the meanings of words. The viewpoint of Kumarila and Prabhakara are discussed below.

Kumarila divides testimony into personal (pauruseya) and impersonal (apaauruseya). The former is the testimony of the trustworthy persons (aptavakya). The latter is the testimony of the Veda (Vedavakya). It is valid in itself. It has intrinsic validity. But the former is not valid in itself. Its validity is inferred from the trustworthy character of the person. It may be vitiated by doubt and error and may be contradicted afterwards.



The school considers the Veda as eternal and authorless. It is not the work of any person, human or divine. The sages are only the 'seers' not the authors of the Veda. The Veda is not composed or spoken even by God. The Veda deals with Dharma and the objects denoted by it cannot be known by perception, inference, comparison or any other means of valid knowledge. Hence the Vedic injunctions can never be contradicted by any subsequent knowledge.

Prabhakara admits only Vedic testimony as real testimony and reduces human testimony to inference because its validity is inferred from the trustworthy character of the person. Again, testimony may give us knowledge of the existent objects (siddhartha vakya) or may command us to do something (vidhayaka vakya).

Testimony is verbal cognition and is derived from the meanings of words which compose sentences. To uphold the eternity and the authorlessness of the Veda, the Mimamsaka puts forward the theory that words and meanings as well as their relation are all natural and eternal.

The Naiyayika also believes in the authority of the Veda, but he regards the Veda as the work of God and so challenges the eternity and authorlessness of the Veda. According to him, words are not eternal and language is due to the divine will or to convention. The Mimamsaka refutes this view and points out that only the sounds and the symbols are created and destroyed, while the real words are eternal. Words are manifested through human efforts. The sounds and the symbols are the vehicles of the manifestation of the eternal words.

11. Purva Mimamsa - Validity of Knowledge

Prabhakara and Kumarila, unlike the Naiyayika, admits Arthapatti as an independent means of knowledge. It is presumption, postulation or implication. The expression "arthapatti" is a combination of two words namely 'arth' and 'apatti'. The term **arth** means fact and **apatti** means **kalpana** this is understood as 'supposition' in English. Thus, etymologically speaking, arthapati is that knowledge which resolves the conflict between two facts. It entails a presupposition which solves the problem that occurred between two facts.



Arthapatti is an assumption of an unperceived fact in order to reconcile two apparently inconsistent perceived facts. When a known fact cannot be accounted for without another fact, we have to postulate the existence of a third fact. The valid and justified knowledge of the third fact is known as Arthapatti.

For example, Devadatta is a fat man by fasting in the day. In this proposition we find two facts. One, Devadatta is a human being alive and he is fat. Second, he is not eating during the day. In order to resolve this conflict, i.e. how a person will be fat and not eating anything in day time, we postulate the existence of a third fact, i.e. he must be eating at night.

Another example, "Abdul is living and who is not at home". The problem observed here is how Abdul is alive and is not found in his home. To resolve this conflict, we postulate the fact, i.e. he may be staying in a rented house outside his home.

The Naiyayika reduces presumption to inference. Prabhakara holds that element of doubt distinguishes presumption from inference. In presumption, there must be a doubt regarding the truth of two perceived facts which is removed by presumption, while in inference there is no such doubt. Kumarila believes that doubt is not the basis of presumption. The basis is mutual inconsistency of two perceived thoughts. This inconsistency is removed by presumption.

Prabhakara and Kumarila both agree in holding that in presumption there is no middle term at all which is the basis of inference. Neither of the two perceived or apparently inconsistent facts can separately serve as a middle term.

Therefore, Mimamsa grants the status of an independent Pramāna to Arthapatti.

11. Purva Mimamsa - Validity of Knowledge

According to Kumarila Bhatta, non-apprehension (Anupalabdhi) is the sixth independent source of knowledge. It consists in the presentative knowledge of negative facts. In other words, negative facts are cognized by a special instrument (*karana*) called non apprehension. Only positive facts are apprehended through positive sources like perception, inference, etc. but negative facts are apprehended through non apprehension i.e. the absence of the jar on the ground is apprehended through anupalabdhi. Kumarila admits this but Prabhakara rejects it. It is related to the category of abhava.

ANUPALABDHI → NON - APPREHENSION

For example an umbrella which is expected to be seen in a particular corner of a room is not seen there. We know about the non-existence of the umbrella through a separate pramana, Anupalabdhi.

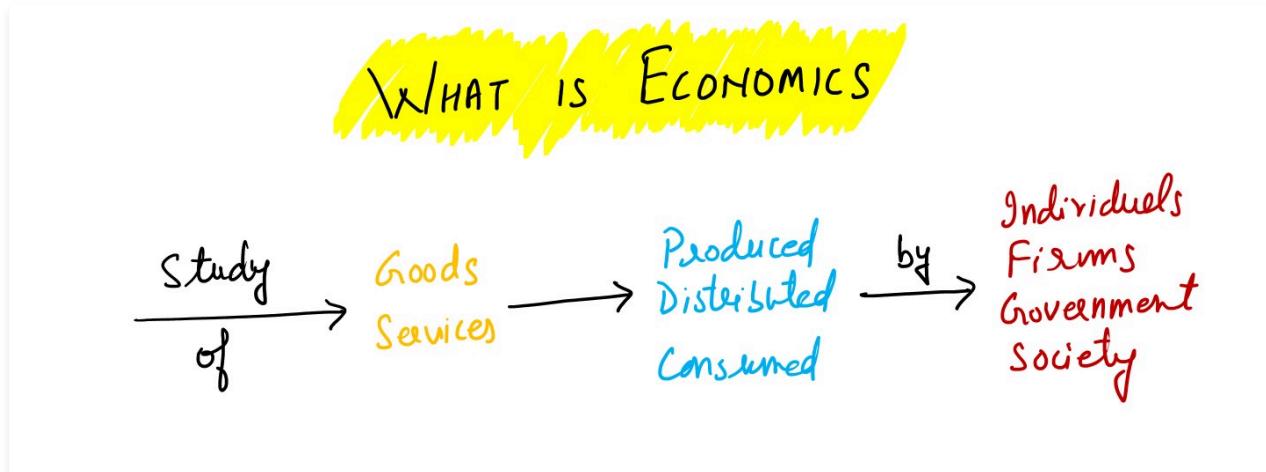
Nyaya, though it accepts non-existence as a category, has no separate Pramana to understand it. According to them, the non-existence of an object can be known by perception itself as in the case of perceiving the bare floor. But according to Mimamsa since there is no sense object contact, we require a new Pramana to know the non-existence of an object. This is a unique feature of Mimamsa epistemology.

Another example-'there is no book on the table'. Here, an individual does not perceive the book directly through his/her sense organs. But the knowledge of the absence or non-existence of the book on the table arises because of the non-perception of the perceivable object. The absence of an object from the situation in which it should be available is said to be its non-existence.

Kumarila also refutes the Nyaya view that non-apprehension is the same as perception or inference. Negation is never perceived, for there is no sense-object contact in it. Our senses function only in the cognition of the ground, but we do not perceive the non-existence of the jar. It is also not reasonable to hold that the absence of the jar is a qualification and the ground is the qualified object. It is not possible to perceive the qualified object without perceiving the qualification.

Negation cannot be inferred also for the invariable relation is not known there. Negation cannot be known by testimony, for there is no verbal cognition. Nor it can be known from comparison or presumption. Hence Kumarila concludes that non-existence is a distinct category which is cognized by non-apprehension only.

1. Economics



Economics is the study of how goods and services are produced, distributed, and consumed by various entities within an economy, including individuals, society, government, and firms.

Here's a breakdown of these aspects:

- **Production:** Economics examines how goods and services are created or manufactured. It delves into the factors of production—land, labor, capital, and entrepreneurship—and how these inputs are combined to produce the goods and services that satisfy human wants and needs. It explores various production methods, technologies, and efficiency in utilizing resources.
- **Distribution:** This aspect of economics focuses on the allocation of goods and services among different individuals, groups, or entities. It studies how resources, income, and wealth are distributed among different factors of production, such as wages to labor, rent to land, interest to capital, and profits to entrepreneurship.
- **Consumption:** Economics analyzes how individuals, households, firms, and governments utilize the goods and services that are produced. It examines consumer behavior, preferences, choices, and the factors influencing these decisions, including income, prices, tastes, and expectations. Additionally, it explores the concept of utility, which measures the satisfaction or happiness derived from consuming goods and services.

The entities involved are:

- **Individuals:** Individuals play a crucial role in economics as consumers, workers, entrepreneurs, and savers. Their choices and behaviors impact markets and the overall economy.
- **Society:** The collective preferences, norms, and societal needs influence economic activities. Economics studies how societal factors affect production, distribution, and consumption patterns.
- **Government:** Governments intervene in economies through various policies and regulations to influence economic activities. They may implement fiscal policies (like taxation and spending) or monetary policies (such as controlling interest rates) to stabilize economies or achieve specific economic goals.
- **Firms:** Firms or businesses are instrumental in the production of goods and services. Economics examines how firms operate, compete, and make decisions regarding production, pricing, and investment.

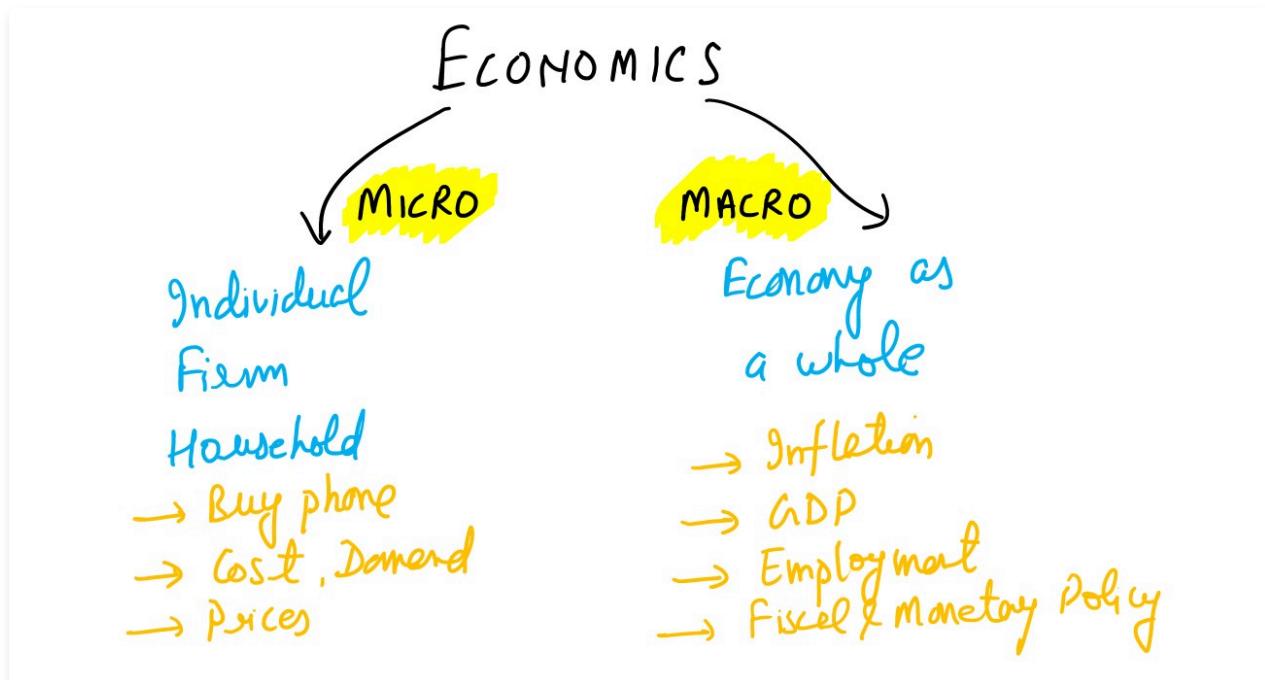
2. Managerial Economics

The terms Managerial Economics and Business Economics are often synonyms and are used interchangeably in managerial studies. It is also known as **Economics for Managers**.

Basically, Managerial Economics is an Applied Economics in the sphere of business management. It is an application of economic theory and methodology to decision-making problems faced by business firms. Thus, it is the economics and tools of economics to solve the managerial problems of business organizations.

3. Macro Economics and Micro Economics

Economics has been broadly divided into two major parts i.e. Micro Economics and Macro Economics.



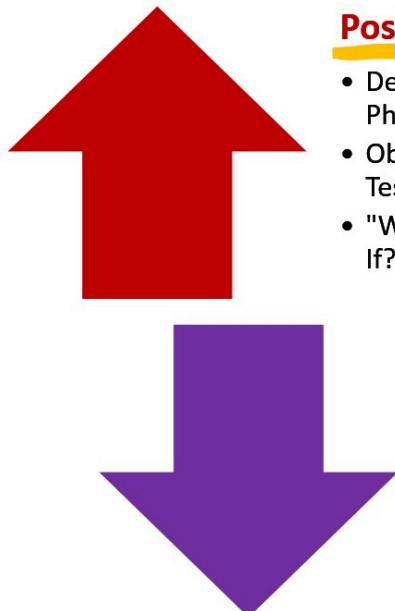
Microeconomics is the branch of economics that studies the economic behavior of individuals and firms in making decisions regarding the allocation of resources. It examines the factors that influence individual economic choices and how these choices interact in markets to determine the prices and quantities of goods and services exchanged. For example, microeconomics explains why consumers choose to buy certain goods and services, how businesses determine their prices, and how competition affects market outcomes.

On the other hand, **macroeconomics** is the branch of economics that studies the overall performance of the economy as a whole. It focuses on the economy-wide measures, such as total production, employment, and economic growth. Macroeconomics examines how the different sectors of the economy, such as households, businesses, and governments, interact to determine these measures. For example, macroeconomics analyzes the effects of fiscal and monetary policy on inflation, employment, and economic growth. It also studies international trade, exchange rates, and balance of payments.

Micro Economics	Macro Economics
It studies the individual unit.	It studies the whole economy or large groups.
Laws related to Marginal analysis are included in its scope.	Problems related to whole economy like employment, public finance, national income, etc. are included in its scope.
Microeconomics provides the information relating to the individual prices, individual consumption and production.	Macroeconomics provides the information relating to National Income, total output, total consumption and general price level.
Microeconomics analysis is simple.	Macroeconomics is complex due to the study of large groups.
Microeconomics particularly focus on price analysis.	Macroeconomics particularly focus on income analysis.
Microeconomics studies individual problems and it is less important for comparative study.	Macroeconomics studies the problems relating to the economy and its importance is growing.

4. Positive economics and Normative economics

In addition to micro and macroeconomics, there are two different approaches to studying economics: positive economics and normative economics.



Positive Economics

- Description of Economic Phenomena
- Objective Statements that are Testable
- "What Is?" or "What Will Happen If?"

Normative Economics

- Value Judgments on Desirable Outcomes
- Subjective Opinions on What Should Be Done
- "What Should Be?" or "What Is the Best Course of Action?"

Positive economics

Positive economics is concerned with describing and explaining the economic phenomena that exist in the world. Positive statements are objective statements that can be tested and proven true or false. For example, "an increase in the price of a good will result in a decrease in the quantity demanded" is a positive statement. Positive economics aims to answer questions like "what is?" or "what will happen if?".

Normative economics

Normative economics deals with the study of how things ought to be. It is based on subjective judgments and opinions about what is good or bad, right or wrong, desirable or undesirable. Normative statements express value judgments and cannot be tested. For example, "the government should increase taxes on the wealthy to reduce income inequality" is a normative statement. Normative economics aims to answer questions like "what should be?" or "What is the best course of action?".

To summarize, positive economics deals with what is and can be tested while normative economics deals with what should be and is based on subjective judgments.

Positive Economics	Normative Economics
is based on data and facts	is based on opinions and values
Descriptive	Narrow
Explains cause and effect relationships between variables	Pass value conclusions
Objective	Subjective
Ask "what actually" is	Ask "what ought to be"
Statements can be tested or proved	Statements can not be tested
Describe economic issues	Provide solutions based on value

5. Nature of Managerial Economics

The following points will describe the nature of Business Economics/Managerial Economics:

- **Business Economics is a Science:** Science is a systematized body of knowledge which establishes cause and effect relationships. Business Economics integrates the tools of decision sciences such as Mathematics, Statistics and Econometrics with Economic Theory to arrive at appropriate strategies for achieving the goals of the business enterprises. It follows scientific methods and empirically tests the validity of the results.
 - **Based on Micro Economics:** Business Economics is based largely on Micro-Economics. A business manager is usually concerned about achievement of the predetermined objectives of his organisation so as to ensure the long-term survival and profitable functioning of the organization. Since Business Economics is concerned more with the decision making problems of individual establishments, it relies heavily on the techniques of Microeconomics.
 - **Incorporates elements of Macro Analysis:** A business unit does not operate in a vacuum. It is affected by the external environment of the economy in which it operates such as, the general price level, income and employment levels in the economy and government policies with respect to taxation, interest rates, exchange rates, industries, prices, distribution, wages and regulation of monopolies. All these are components of Macroeconomics. A business manager must be acquainted with these and other macroeconomic variables, present as well as future, which may influence his business environment.
 - **Business Economics is an art:** It involves practical application of rules and principles for the attainment of set objectives.
 - **Use of Theory of Markets and Private Enterprises:** Business Economics largely uses the theory of markets and private enterprise. It uses the theory of the firm and resource allocation in the backdrop of a private enterprise economy.
 - **Pragmatic in Approach:** Micro-Economics is abstract and purely theoretical and analyses economic phenomena under unrealistic assumptions. In contrast, Business Economics is pragmatic in its approach as it tackles practical problems which the firms face in the real world.
 - **Interdisciplinary in nature:** Business Economics is interdisciplinary in nature as it incorporates tools from other disciplines such as Mathematics, Operations Research, Management Theory, Accounting, Marketing, Finance, Statistics and Econometrics.
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6. Scope of Managerial Economics



Managerial economics is a branch of economics that applies economic theory and quantitative methods to business decision-making. It helps managers to understand and analyse economic data and provides tools to make informed decisions. The scope of managerial economics encompasses various concepts that are essential for running a business. Here are some of the key concepts.

a) Demand and Elasticity of demand

Demand is the willingness and ability of a consumer to buy a product at a given price. Elasticity of demand measures the responsiveness of demand to changes in price, income, or other factors. Understanding demand and elasticity of demand is crucial for pricing decisions and market strategy.

b) Demand forecasting

Demand forecasting is the process of estimating future demand for a product or service. Accurate demand forecasting helps in inventory planning, production scheduling, and pricing decisions.

c) Production Theory

Production theory deals with the relationship between inputs and outputs in the production process. It helps managers to understand the most efficient ways to produce goods and services.

d) Cost Analysis

Cost analysis is the process of examining the costs of producing a product or providing a service. It involves identifying and measuring all the costs involved in production and helps managers to make decisions on cost reduction and profit maximization.

e) Revenue Analysis

Revenue analysis is the process of examining the revenue streams of a business. It helps managers to identify the most profitable products or services and the most effective pricing strategies.

f) Price determination under different market conditions/structures

Different market structures, such as perfect competition, monopoly, oligopoly, and monopolistic competition, have different pricing strategies. Understanding these structures and their implications is essential for pricing decisions.

Pricing methods in actual practice Pricing methods vary from industry to industry and depend on various factors such as competition, market demand, and cost structure. Managers need to understand different pricing methods and their advantages and disadvantages to make informed pricing decisions.

g) Break-even analysis

Break-even analysis is the process of determining the point at which a company's revenue equals its total costs. This analysis helps managers to make decisions on pricing, cost reduction, and profit maximization.

h) Game Theory

Game theory is a branch of mathematics that deals with decision-making in situations where two or more players have conflicting interests. It helps managers to understand the behaviour of competitors and make strategic decisions.

i) Product and Project Planning

Product and project planning involves identifying, developing, and launching new products or services. It requires a thorough understanding of market demand, cost structure, and competition.

j) Capital Budgeting and Management

Capital budgeting and management involve decisions on investment in long-term assets such as buildings, machinery, and equipment. It requires a thorough analysis of the expected returns and risks associated with these investments.

k) Criteria for public investment decisions

Public investment decisions involve investing in public infrastructure such as roads, bridges, and schools. Managers need to consider various criteria such as economic growth, environmental impact, and social welfare when making these decisions.

7. Objectives of Business firms

Business firms have various objectives that they aim to achieve to ensure their survival, growth and sustainability. We will discuss some of the most common objectives of business firms in managerial economics.

1) Profit Maximisation

The primary objective of most firms is to maximise profit. This objective assumes that firms aim to earn the highest possible profit by producing and selling goods or services. A higher profit enables firms to pay higher dividends to shareholders, finance research and development, and provide higher salaries to workers. For instance, a company producing smartphones would aim to maximise profit by selling more units at a higher price.

2) Profit Satisfaction

Although profit maximisation is the primary objective of firms, in reality, the separation of ownership and control may lead to a lack of incentive for managers to maximise profits. Therefore, managers may create a minimum level of profit to keep shareholders happy, but focus on other objectives, such as enjoying work or maintaining good relationships with workers. This is known as the *agency problem*, which can be overcome by giving managers share options and performance-related pay.

3) Sales Maximisation

Firms may also aim to maximise sales, even if it means less profit. This objective is driven by the desire to increase market share, which increases monopoly power and enables firms to raise prices in the long run. Additionally, managers prefer working for bigger companies, and increasing market share may force rivals out of business. For example, supermarkets often engage in predatory pricing to drive out smaller competitors.

4) Growth Maximisation

Similar to sales maximisation, firms may aim to maximise growth through mergers and takeovers. By increasing in size, firms gain more market share, increasing their monopoly power and ability to set prices. This objective may lead firms to accept lower levels of profit to increase their market share.

5) Social/Environmental Concerns

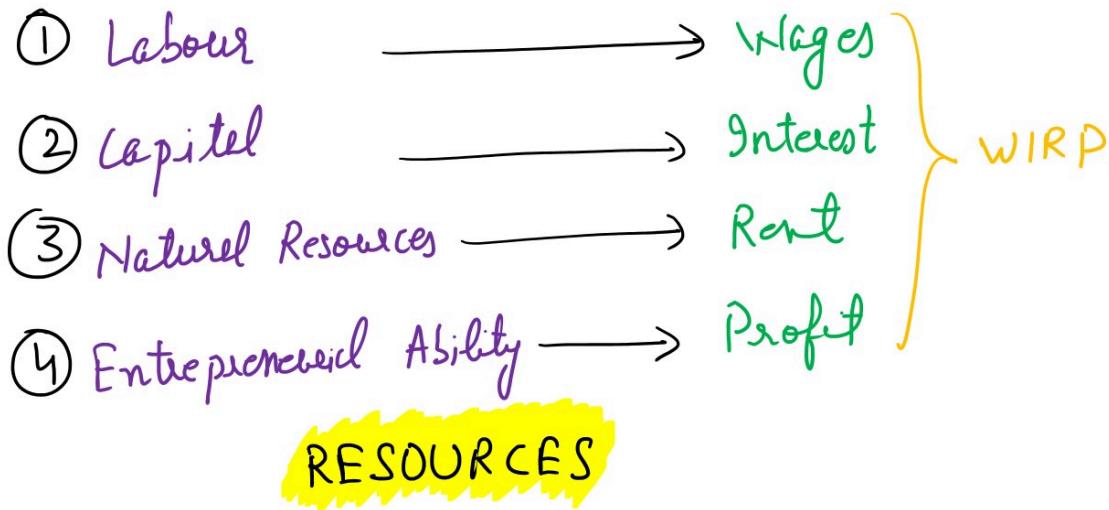
In recent years, firms have become increasingly concerned with social and environmental issues. Firms may choose to produce goods that do not harm the environment or engage in social initiatives to support local communities. For example, a clothing company may opt for organic cotton to reduce its carbon footprint.

6) Co-operatives

Co-operatives have different objectives than profit-making firms. They aim to maximise the welfare of all stakeholders, especially workers. For instance, worker co-operatives aim to provide good working conditions and a fair distribution of profits among all workers.

In conclusion, firms have different objectives, depending on their size, industry, and ownership structure. While profit maximisation is the primary objective, firms may also aim to maximise sales, growth, and social/environmental concerns. Co-operatives have different objectives altogether, aiming to maximise the welfare of all stakeholders.

8. Resources



Resources are the essential ingredients used to produce the goods and services that satisfy people's wants, and they fall into 4 main categories: labour, capital, natural resources, and entrepreneurial ability.

1. **Labour** comprises both physical and mental human effort, which is sourced from time, the fundamental resource that enables us to allocate our time to various activities like work, leisure, or sleep.
2. **Capital** comprises all human-made goods and services used in the production process. It is further divided into physical capital, which includes factories, machines, and buildings, and human capital, which includes the knowledge and skills acquired to enhance productivity.
3. **Natural resources**, such as bodies of water, minerals, and animals, are gifts from nature and are either renewable or exhaustible. Renewable resources can be replenished through conservation, while exhaustible resources, such as coal and oil, are finite and limited.
4. **Entrepreneurial ability** refers to the unique skills required to come up with innovative ideas and profitable opportunities. Entrepreneurs hire resources and take on the risk of business success or failure, with profit being the reward for their efforts.

Resource owners are compensated for their labour, capital, and natural resources through *wages*, *interest*, and *rent*, respectively. The entrepreneur's effort is rewarded by *profit*, which is the difference between revenue and the cost of resources employed in production. Resource payments are usually based on time, such as wages per hour, interest per year, or rent per month.

Resources are combined in a variety of ways to produce **goods and services**.

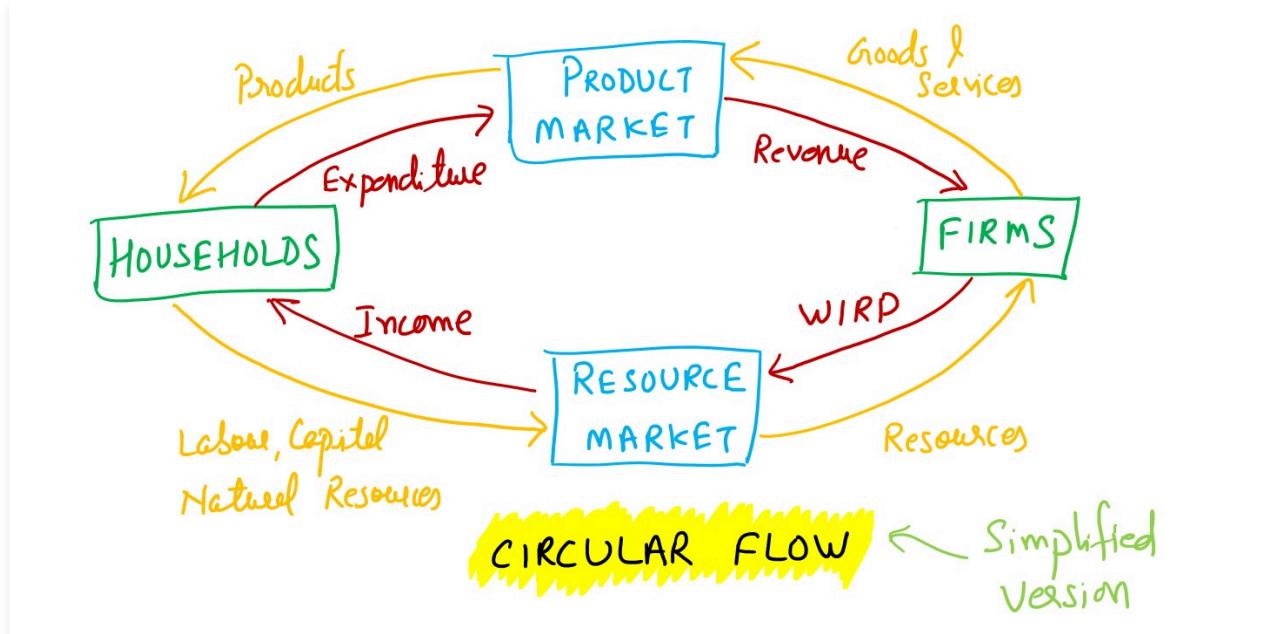
The economy consists of four main decision makers: households, firms, governments, and the rest of the world. These participants interact with each other to allocate resources in the economy.

Households are the primary consumers and resource owners, supplying labour, capital, natural resources, and entrepreneurial ability to firms, governments, and the rest of the world, who then use these resources to provide goods and services that households demand. The rest of the world includes foreign households, firms, and governments that supply resources and products to Indian markets and demand resources and products from Indian markets.

Buyers and sellers exchange goods and services through **markets**, which determine the price and quantity of products. Markets can be physical locations like stores or online platforms, and they provide information about the products offered for sale. **Product markets** are where goods and services are bought and sold, while **resource markets** are where resources such as labour, capital, and natural resources are bought and sold. The most important resource market is the labour market, which is similar to the experience of looking for a job.

9. Circular Flow Model

The circular flow model is a simplified economic model that describes the flow of resources, products, income, and revenue among economic decision-makers. It shows how households and firms interact in a market economy. In this model, households supply labour, capital, natural resources, and entrepreneurial ability to firms through resource markets, and in return, they demand goods and services from firms through product markets. Firms demand resources from households through resource markets and supply goods and services to households through product markets.



Money flows in the opposite direction, with households receiving income in the form of resource prices and firms receiving revenue from the sale of goods and services. The circular flow model demonstrates that the flow of resources and products is supported by the flow of money and that these flows are interconnected in a continuous cycle.

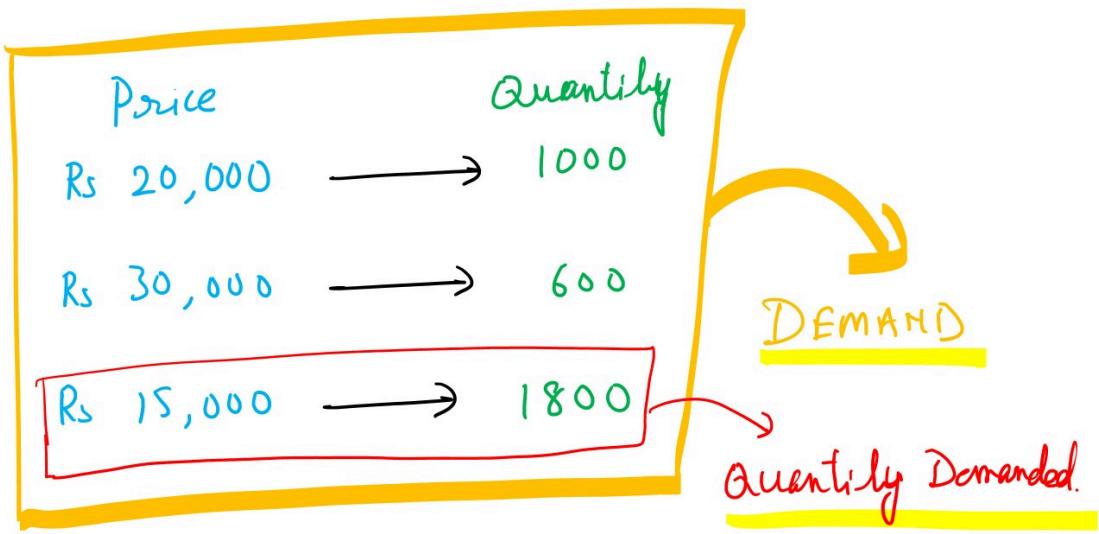
Let's consider a small town where there are only two types of economic decision-makers - **households** and **local businesses**.

Households in the town are the suppliers of labour, capital, and natural resources. They work for the local businesses and receive wages and salaries in return. These wages and salaries are the households' source of income, which they use to buy goods and services produced by the local businesses.

On the other hand, the **local businesses** are the suppliers of goods and services that the households demand. They use the labour, capital, and natural resources provided by households to produce goods and services. The local businesses receive revenue from the sales of these goods and services, which they use to pay the wages and salaries of the households who work for them.

Therefore, we can see that the households and local businesses are interdependent. The households supply the resources needed for local businesses to produce goods and services, while the local businesses supply the goods and services that the households need. The circular flow model shows us how the resources, products, income, and revenue flow between households and local businesses in this small-town economy.

1. Introduction



Demand is an essential concept in economics that explains the relationship between the price of a product and the quantity of that product that people are willing and able to buy during a given period, assuming that other factors remain constant. It is the willingness and ability of a consumer to buy a specific quantity of a product at a given price. The demand for a product is influenced by various factors, including consumer preferences, income, prices of related goods, and demographic factors.

The **quantity demanded** refers to the specific amount of a product that consumers are willing and able to buy at a given price during a specified period.

2. Law of Demand



The Law of Demand states that the quantity of a product demanded by consumers decreases as its price increases, assuming that other factors remain constant. Similarly, as the price of a product decreases, consumers will demand more of that product. The Law of Demand can be represented graphically as a downward-sloping demand curve.

For example, let's consider the demand for Pepsi. Suppose the price of a six-pack of Pepsi is Rs 300, and consumers are willing to purchase 100 six-packs each month. If the price of Pepsi were to decrease to Rs 200, we might expect that consumers would be willing to purchase more six-packs of Pepsi, say 200 six-packs per month. Conversely, if the price of Pepsi were to increase to Rs 400, we might expect that consumers would be willing to purchase fewer six-packs of Pepsi, say 50 six-packs per month.

The **Law of Demand** is intuitive and makes sense. Suppose a company raises the price of its product. In that case, consumers will likely look for alternatives, switch to a competitor's product, or reduce their overall consumption. On the other hand, if a company lowers its prices, consumers are likely to purchase more of that product, leading to higher sales and potentially increased profitability.

The law of demand is based on the following important *ceteris paribus* assumptions:

1. The money income of the consumer should remain the same.
2. There should be no change in the scale of preference (taste, habit & fashion) of the consumer.
3. There should be no change in the price of substitute goods.
4. There should be no expectation of price changes of the commodity in near future.
5. The commodity under question should not be prestigious or of snob appeal.

The law of demand explains how the quantity of goods demanded changes with changes in their prices. The substitution effect and the income effect are two key factors that help to explain this relationship. The substitution effect arises due to changes in relative prices, while the income effect arises due to changes in real income.

2. Law of Demand

The law of demand indicates that the quantity of goods demanded decreases as the price increases and increases as the price decreases. One reason behind this is the substitution effect of a price change. When the price of a good falls, other things being constant, the relative price of that good compared to other goods decreases. This, in turn, causes consumers to substitute the relatively cheaper goods for other goods. For instance, If the price of pizza declines while other prices remain constant, consumers will be more willing to buy pizza instead of other food items, leading to an increase in the quantity of pizza demanded. On the other hand, if the price of pizza increases, consumers will reduce the quantity of pizza demanded and may substitute it for other goods.

The substitution effect can be seen in everyday situations. For example, If the price of petrol rises, consumers may start using public transportation or switch to hybrid or electric vehicles. Similarly, if the price of coffee increases, some consumers may switch to tea or other beverages that are relatively cheaper. Thus, the substitution effect plays a crucial role in determining the quantity of goods demanded.

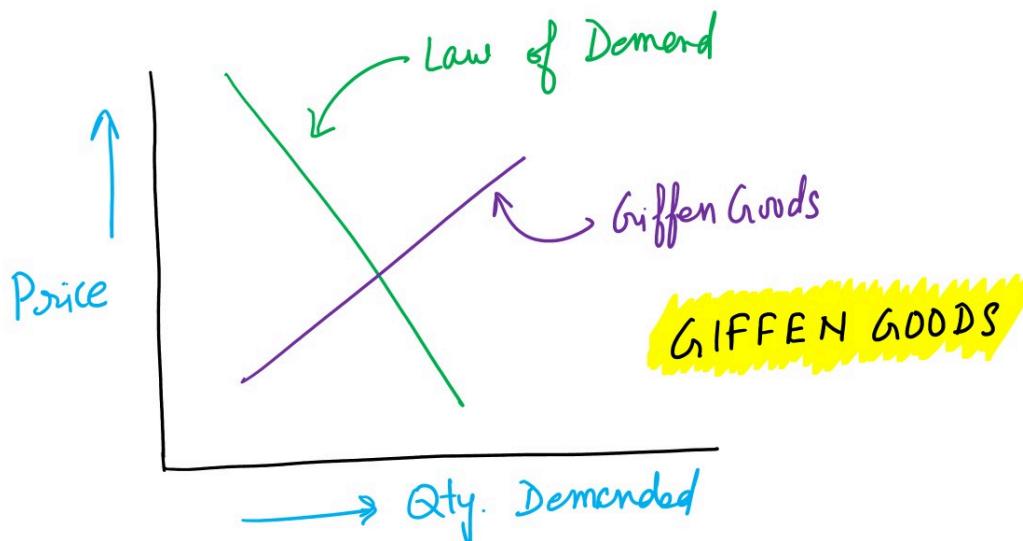
2. Law of Demand

Another factor that influences the quantity of goods demanded is the income effect of a price change. The income effect refers to the change in the quantity demanded of a good due to a change in real income caused by a price change. Real income refers to the amount of goods and services that can be purchased with a given amount of money. When the price of a good falls, other things remaining constant, consumers' real income increases, making them able to buy more goods and services, including the relatively cheaper good.

For example, suppose a consumer's weekly income is Rs 3000, and they spend all of it on pizza, buying 3 pizzas per week for Rs 1000 each. If the price of pizza falls to Rs 600, the consumer's real income increases, allowing them to buy more pizza. With the same Rs 3000, they can now buy 5 pizzas instead of 3. This increase in real income can also enable consumers to buy other goods that they previously could not afford.

Conversely, if the price of a good increases, other things being constant, consumers' real income decreases, making them less able to buy goods and services. Therefore, consumers tend to reduce their quantity demanded as the price increases. This is the income effect of a price change.

2. Law of Demand



Giffen goods stand as a unique anomaly, contradicting the fundamental law of demand that asserts an inverse relationship between the price of a good and the quantity demanded. In the case of Giffen goods, as their price increases, demand paradoxically rises instead of falling.

The exceptional nature of Giffen goods arises from specific circumstances where the income effect outweighs the substitution effect. Typically, as the price of a good increases, consumers tend to substitute it with cheaper alternatives. However, with Giffen goods, this substitution effect is overpowered by the income effect.

When the price of a Giffen good rises, consumers, who often rely heavily on this good as a staple, perceive it as indispensable. Consequently, they allocate a larger portion of their limited budget to this necessity, even at the elevated price, forgoing other alternatives.

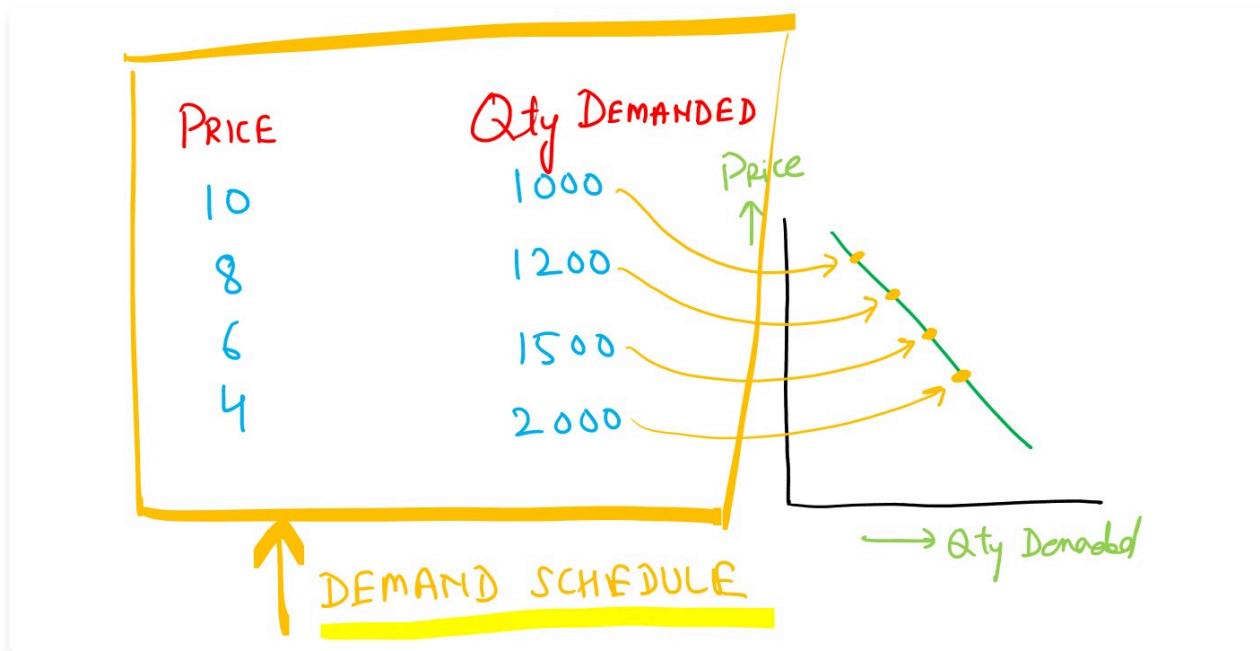
Typically associated with lower-income individuals, Giffen goods represent essential items for survival, such as basic food staples. In situations where these goods serve as the primary source of sustenance and no comparable substitutes are available within the same price range, consumers continue purchasing more, even as the price escalates.

Veblen goods share similarities with Giffen goods but differ in their nature and target audience. Veblen goods are luxurious items whose demand rises with their price due to their perceived status or luxury value. Unlike Giffen goods, Veblen goods are associated with conspicuous consumption and ostentatious display, where higher prices are often seen as indicative of higher quality or social status.

3. Demand Schedule and Demand Curve

Demand can be expressed as a demand schedule or as a demand curve.

A **demand schedule** is a tabular presentation of different prices of a commodity and its corresponding quantity demanded per unit of time. A hypothetical annual demand schedule for shirts is given below:

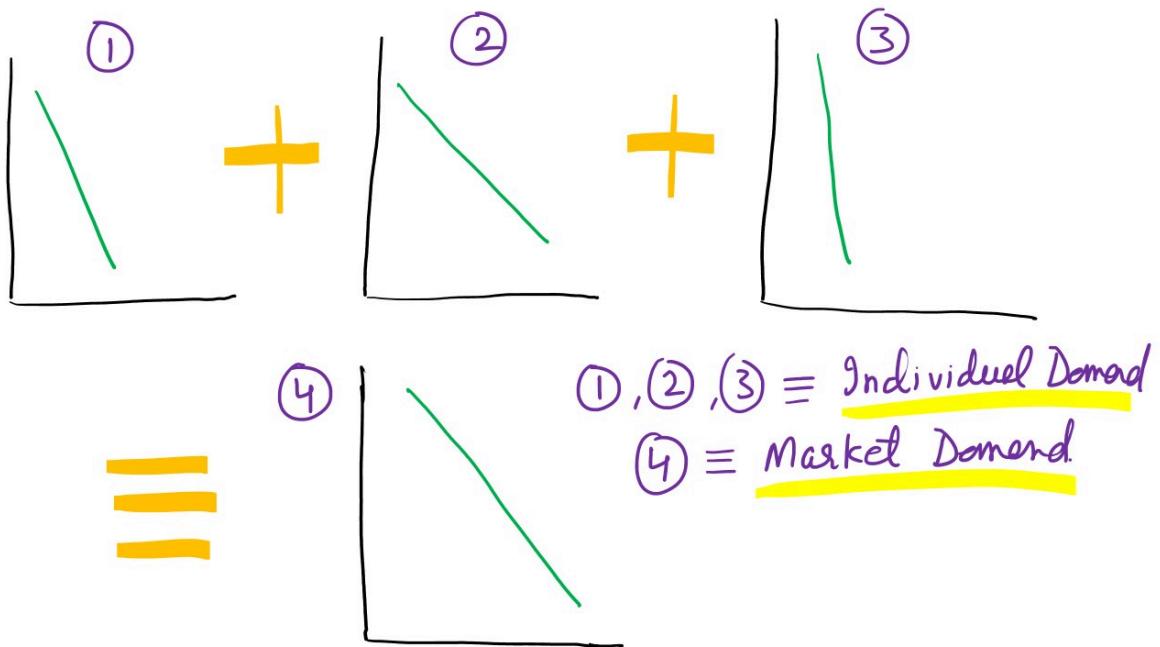


A **Demand Curve** is a graphical presentation of the demand schedule. A demand curve (given in the figure) is obtained by plotting a demand schedule. Each price-quantity combination listed in the demand schedule becomes a point in the demand curve. As we can see in the diagram that the demand increases with decrease in price.

The demand curve slopes downward, reflecting the law of demand, **Price and quantity demanded are inversely related**, other things constant. Assumed constant along the demand curve are the prices of other goods. Thus, along the demand curve for shirts, the price of shirts changes relative to the prices of other goods. The demand curve shows the effect of a change in the relative price of a shirt—that is, relative to other prices, which do not change.

Take care to distinguish between demand and quantity demanded. The **demand** for shirts is not a specific amount, but rather the entire relationship between price and quantity demanded—represented by the demand schedule or the demand curve. An individual point on the demand curve indicates the **quantity demanded** at a particular price

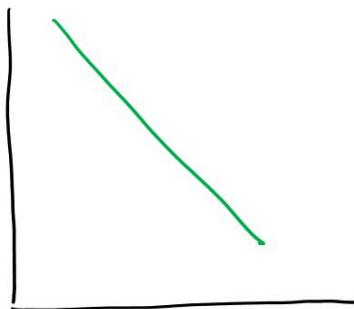
It is useful to distinguish between **individual demand**, which is the demand of an individual consumer, and market demand, which is the sum of the individual demands of all consumers in the market. Unless otherwise noted, when we talk about demand, we are referring to market demand.



The **market demand curve**, like the individual demand curve, slopes downwards to the right because it is nothing but the lateral (horizontal) summation of individual demand curves.

4. Shifts of Demand Curve

Factors affecting Law of Demand



1. Change in Income

2. Change in Price of related Goods

3. Change in Consumer Expectations

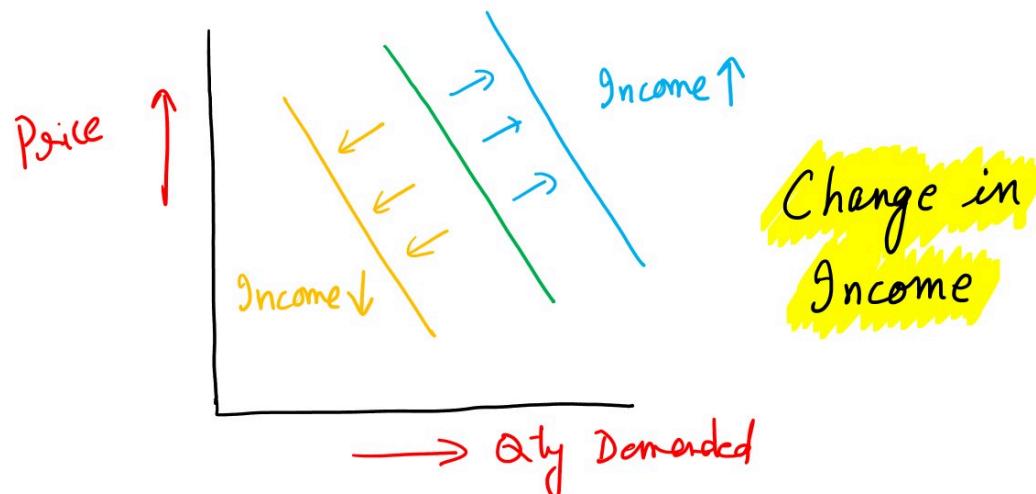
4. Change in Consumer Taste

5. Demographic factors

A demand curve isolates the relation between the prices of a good and quantities demanded when other factors that could affect demand remain unchanged. What are those other factors, and how do changes in them affect demand? Variables that can affect market demand are:

1. the money income of consumers,
2. prices of related goods,
3. consumer expectations,
4. the number or composition of consumers in the market, and
5. consumer tastes.

4. Shifts of Demand Curve



The demand curve shows the relationship between the price of a product and the quantity of the product that consumers are willing and able to buy. When consumer income increases, some consumers will have more money to spend, and they will be willing and able to buy more of the product at each price. The increase in demand leads to a rightward shift in the demand curve, as shown in the figure. The shift in the demand curve (from green to blue) indicates that consumers are willing to buy more at each price level.

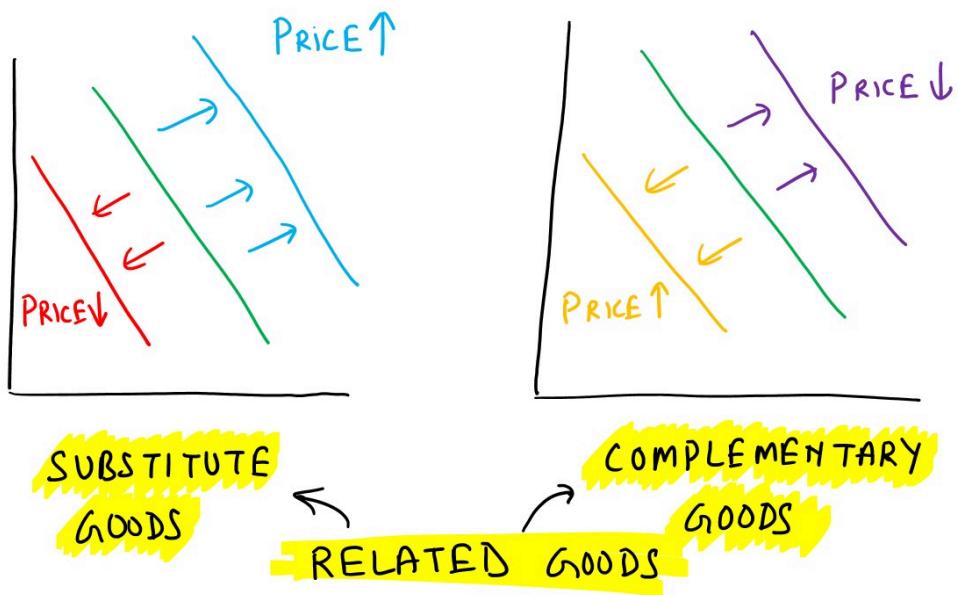
When consumer income decreases, same consumers will have less money to spend, and they will buy less of the product at each price. The decrease in demand leads to a leftward shift in the demand curve, as shown in the figure. The shift in the demand curve (from blue to yellow) indicates that consumers are willing to buy less at each price level.

Normal and Inferior Goods

Goods are classified into two broad categories depending on how demand responds to changes in consumer income. **Normal goods** are those goods for which the demand increases as consumer income increases. Pizza, air travel, cars, movie tickets are examples of a normal good. As consumer income increases, more consumers can afford to buy pizza, leading to an increase in demand.

On the other hand, **inferior goods** are those goods for which the demand decreases as consumer income increases. Examples of inferior goods include public transportation, non-branded clothes, used furniture, and used clothing. As consumer income increases, consumers tend to switch from consuming inferior goods to consuming normal goods like branded clothes, new furniture, and new clothing.

4. Shifts of Demand Curve

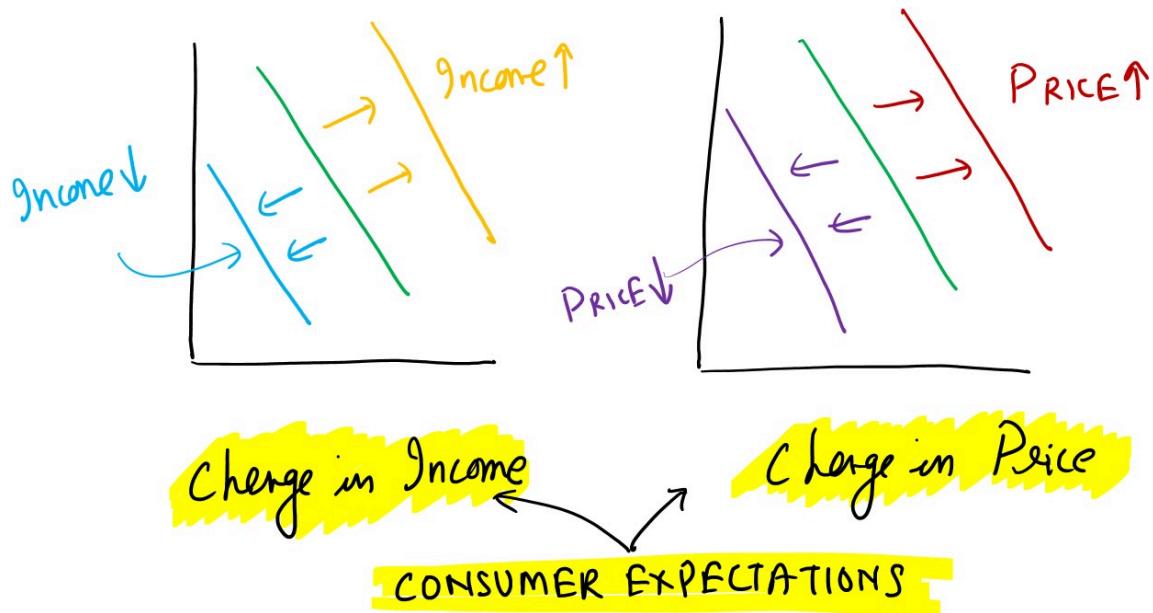


Substitutes are goods that can be used in place of each other. When the price of a substitute good changes, it can cause a shift in the demand curve for the original good. For example, let's consider the market for roti and pizza. If the price of roti increases, consumers may choose to buy less roti and instead opt for pizza. This shift in consumer behaviour will lead to a decrease in the quantity demanded of rotis and an increase in the quantity demanded of pizza. As a result, the demand curve for pizza will shift to the right.

Complements are goods that are typically consumed together. When the price of a complement good changes, it can also cause a shift in the demand curve for the original good. For example, let's consider the market for pizza and Coke. If the price of pizza increases, consumers may be less likely to buy pizza and therefore less likely to buy Coke to go with it. This shift in consumer behaviour will lead to a decrease in the quantity demanded of both pizza and Coke. As a result, the demand curve for Coke will shift to the left.

Not all goods are related to each other, and changes in the price of an **unrelated good** will not have a significant impact on the demand curve for the original good. For example, let's consider the market for pizza and socks. If the price of socks were to increase, it would have no impact on the demand for pizza since there is no relation between the two goods.

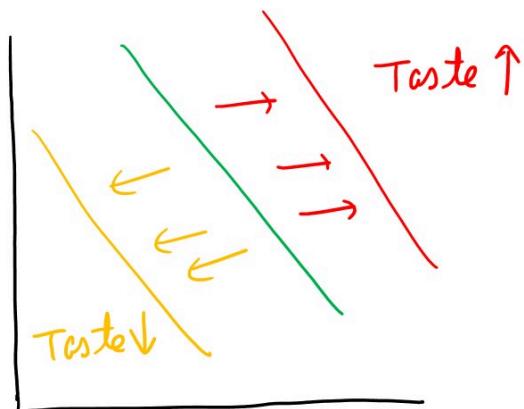
4. Shifts of Demand Curve



Changes in consumer expectations can shift the demand curve. For example, if a consumer learns that they will receive a pay raise in the future, they may increase their demand for goods and services before the raise takes effect. This can shift the demand curve for those goods and services to the right.

Similarly, if consumers expect the price of a product to increase in the future, they may increase their demand for it now, which shifts the demand curve for that product to the right. Conversely, if consumers expect the price of a product to decrease in the future, they may decrease their demand for it now, which shifts the demand curve to the left. For example, if consumers expect housing prices to decrease in the future, they may postpone their purchases of houses, shifting the demand curve for housing to the left.

4. Shifts of Demand Curve

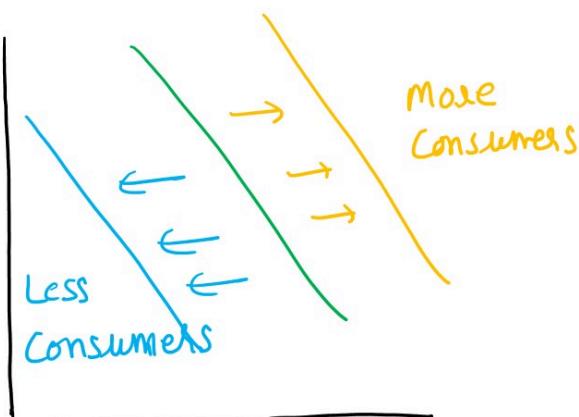


CHANGE IN CONSUMER TASTE

Consider the case of pizza. Suppose a study reveals that the tomato sauce and cheese topping on pizza promote overall health. This discovery could change consumer tastes, leading to an increase in demand for pizza. As a result, the demand curve for pizza would shift to the right.

Changes in tastes can have a significant impact on the demand for goods and services. For instance, suppose there is a growing trend of health-consciousness among consumers. In that case, it can lead to a shift in demand towards healthier food options such as salads, fruits, and vegetables, while demand for fast food or junk food may decrease.

4. Shifts of Demand Curve

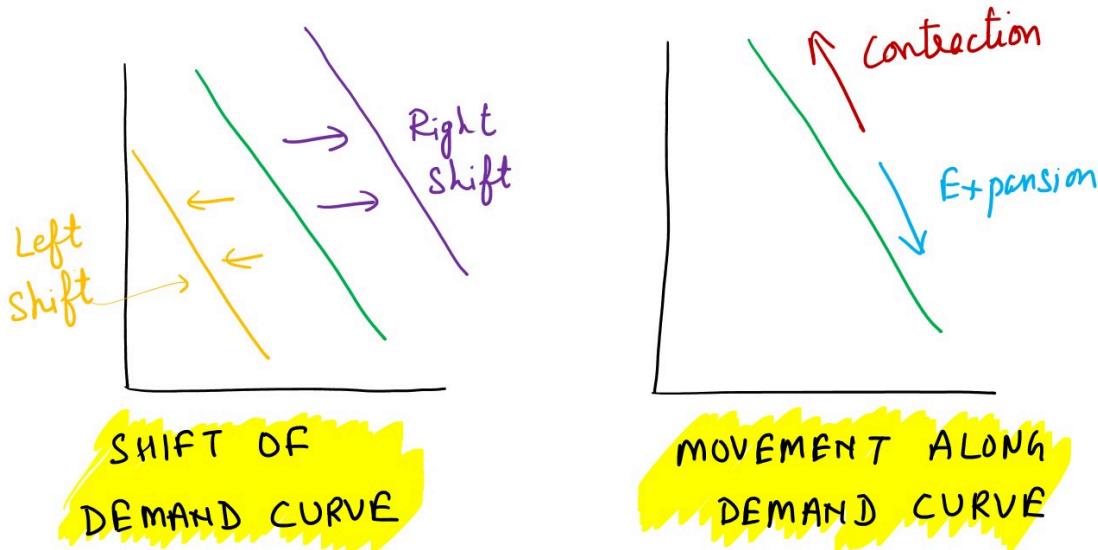


COMPOSITION OF CONSUMERS

The market demand curve is the sum of the individual demand curves of all consumers in the market. Hence, if the number of consumers changes, the demand curve will shift. For example, if the population of a particular area grows, the demand curve for goods and services will shift rightward. Similarly, a decrease in population will shift the demand curve to the left.

Furthermore, changes in the composition of the population can also shift the demand curve. For example, if there is an increase in the number of teenagers in a particular area, the demand for products that appeal to teenagers, such as video games, fast food, and clothing, will increase, shifting the demand curve to the right. Conversely, a decrease in the number of teenagers in a particular area will shift the demand curve to the left. Similarly, a baby boom will shift the demand for baby food and car seats to the right.

5. Difference between Shift and Movement along Demand Curve



You should remember the distinction between a movement along a given demand curve and a shift of a demand curve. A change in price, other things constant, causes a **movement along a demand curve**, changing the quantity demanded. A change in one of the determinants of demand other than price causes a **shift of a demand curve**, changing demand.

Other factors remaining same, the quantity demanded changes, due to change in price. It is known as **Change in Quantity Demanded**. Because the demand curve moves either upward or downward, therefore, it is known as **movement along a demand Curve**.

1. When demand increases, as a result of fall in prices (other factors remaining same), it is known as **Expansion of Demand**. In this case, the demand curve moves downward.

Price ↓ - Demand ↑ = *Expansion* (represented by downward arrow in figure)

2. When demand falls, as a result of increase in prices (other factors remaining same), it is known as **Contraction of Demand**. In this case, the demand curve moves upward.

Price ↑ - Demand ↓ = *Contraction* (represented by upward arrow in figure)

6. Demand Function

The demand function expresses the connection between the factors that influence the demand for a product, which are the independent or explanatory variables, and the quantity of the product demanded, which is the dependent variable.

The formula for a demand function is:

$$D_x = f(P_x, Y, P_y, P_c, T, F)$$

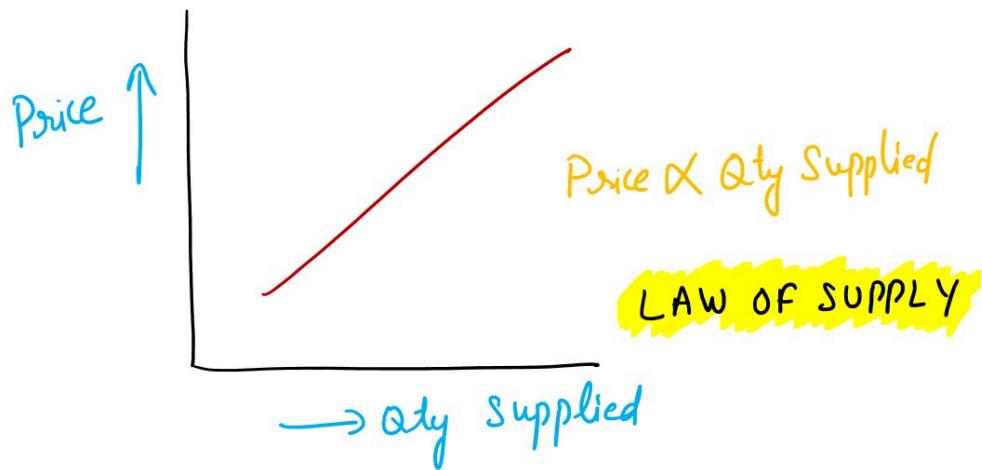
In this formula, D_x represents the amount of product X that is demanded, P_x is the price of the product, Y is the consumer's income, P_y is the price of substitute products, P_c is the price of complementary goods, T represents consumer preferences, and F denotes future expectations.

1. Introduction

Just as demand is a relation between price and quantity demanded, **supply** is a relation between price and quantity supplied.

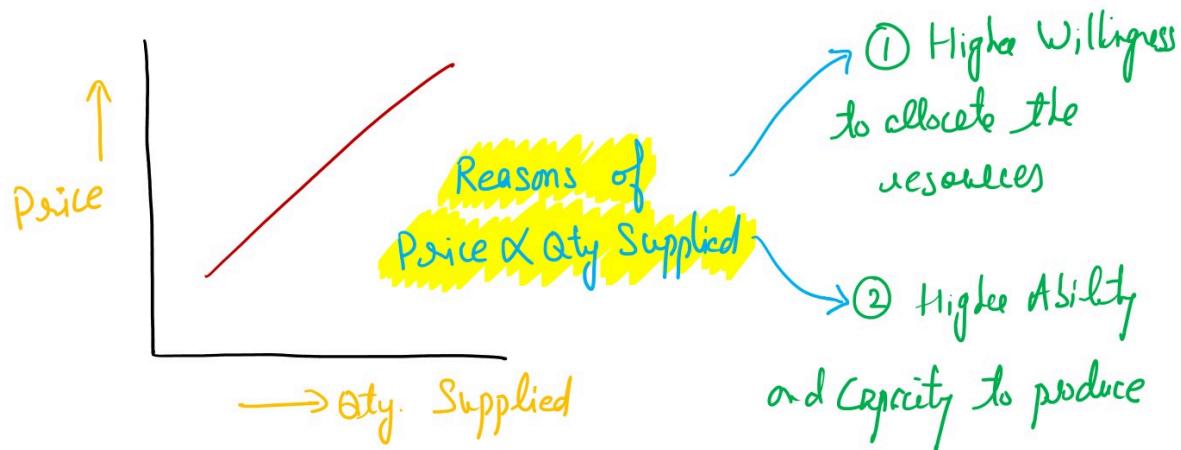
Supply indicates how much producers are willing and able to offer for sale per period at each possible price, other things constant.

2. Law of Supply



The law of supply states that the quantity supplied is usually directly related to its price, other things constant. Thus, the lower the price, the smaller the quantity supplied; the higher the price, the greater the quantity supplied.

3. Reasons of Law of Supply

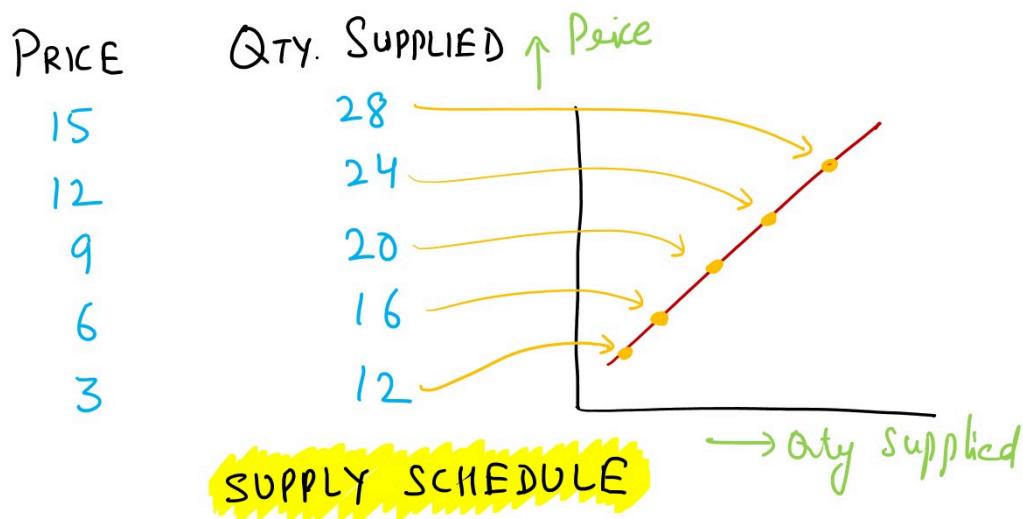


There are two reasons producers offer more for sale when the price rises.

First, as the price increases, other things constant, a producer becomes more willing to supply the good. Prices act as signals to existing and potential suppliers about the rewards for producing various goods. An increase in the price of a particular good, with other prices constant, provides suppliers a profit incentive to shift some resources from producing other goods. *A higher priced good attracts resources from lower priced goods.*

Second, higher prices also increase the producer's ability to supply the good. The law of increasing opportunity cost, states that the opportunity cost of producing more of a particular good rises as output increases—that is, the marginal cost of production increases as output increases. Because producers face a higher marginal cost for additional output, they must receive a higher price for that output to be able to increase the quantity supplied. *A higher price makes producers more able to increase quantity supplied.*

4. Supply Schedule and Supply Curve



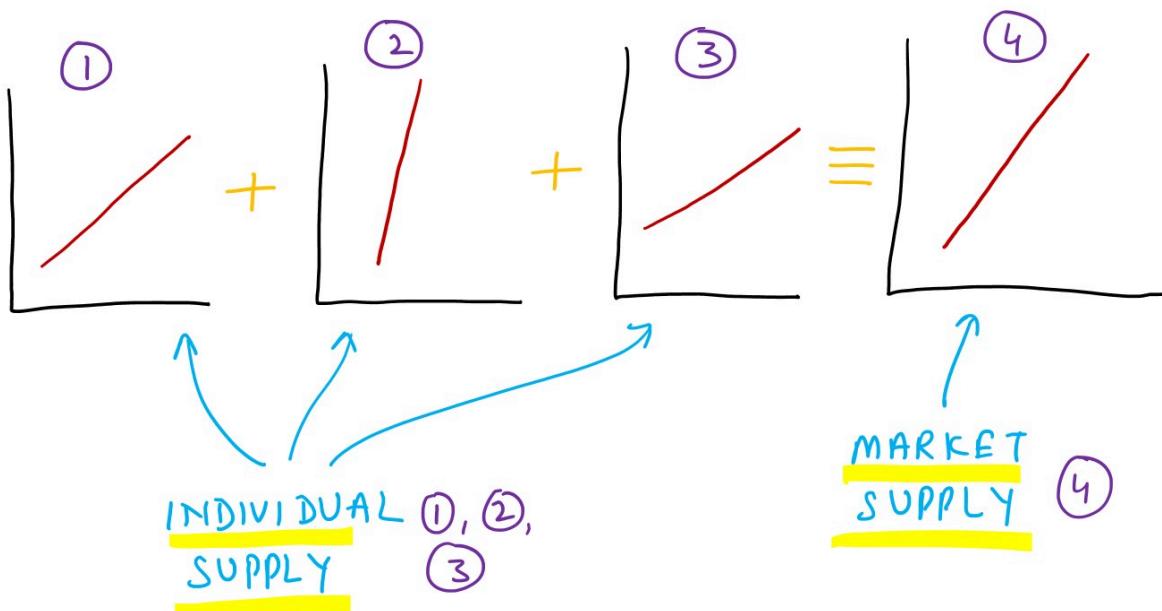
The price and quantity supplied are directly, or positively, related. Producers offer more at a higher price than at a lower price, so the supply curve slopes upward.

There are two reasons producers offer more for sale when the price rises.

First, as the price increases, other things constant, a producer becomes more **willing** to supply the good. An increase in the price of pizza, with other prices constant, provides suppliers a profit incentive to shift some resources from producing other goods, for which the price is now relatively lower, and into pizza, for which the price is now relatively higher.

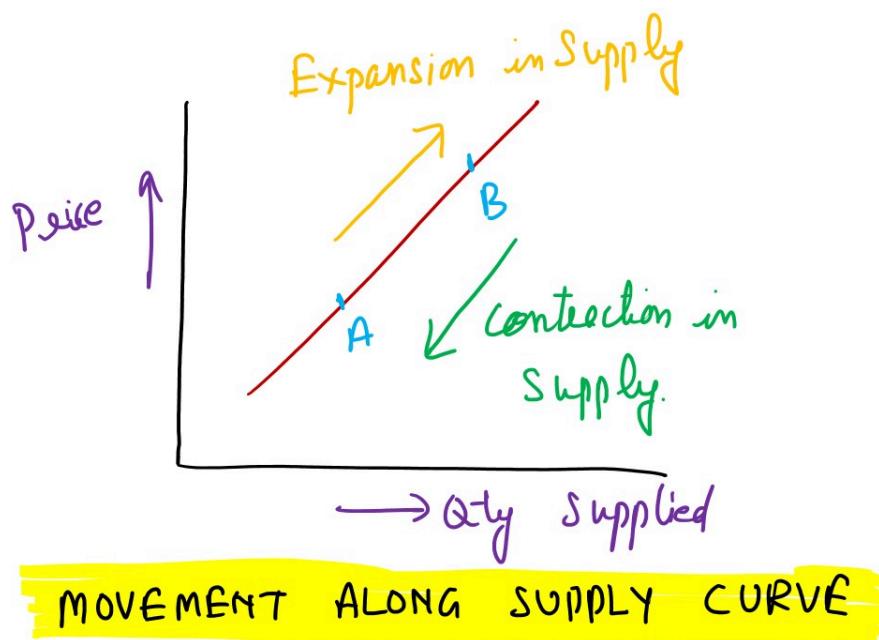
Higher prices also increase the producer's **ability** to supply the good. The law of increasing opportunity cost, states that the opportunity cost of producing more of a particular good rises as output increases—that is, the marginal cost of production increases as output increases. For example, a higher price for petrol increases oil companies' ability to drill deeper and to explore in less accessible areas.

As with demand, we distinguish between **supply** and **quantity supplied**. Supply is the entire relationship between prices and quantities supplied, as reflected by the supply schedule or supply curve. Quantity supplied refers to a particular amount offered for sale at a particular price, as reflected by a point on a given supply curve.



We also distinguish between **individual supply**, the supply of an individual producer, and **market supply**, the sum of individual supplies of all producers in the market. Unless otherwise noted the term supply refers to market supply.

5. Movement along the Supply Curve



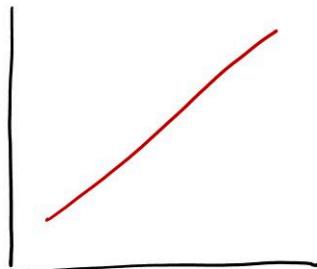
When the price of a commodity changes, other factors kept constant, the quantity supplied of a commodity changes suitably. This is because of the direct relationship between the two. This is known as a **change in quantity supplied**. Graphically it causes movement along the supply curve. A change in price either causes supply curves to expand or contract.

If the prices increase, other factors kept constant, there is an increase in the quantity supplied which is referred to as an **expansion in supply**. Graphically, this is represented as an upward movement along the same supply curve (we move from A to B).

Conversely, if the prices decrease, keeping other factors constant, firms tend to decrease the supply. This is referred to as a **contraction in supply**. Graphically, this is represented as a downward movement along the same supply curve (we move from B to A).

6. Shifts of Supply Curve

Factors affecting Law of Supply



1. Change in Technology

2. Change in Price of relevant resources

3. Change in price of alternate goods

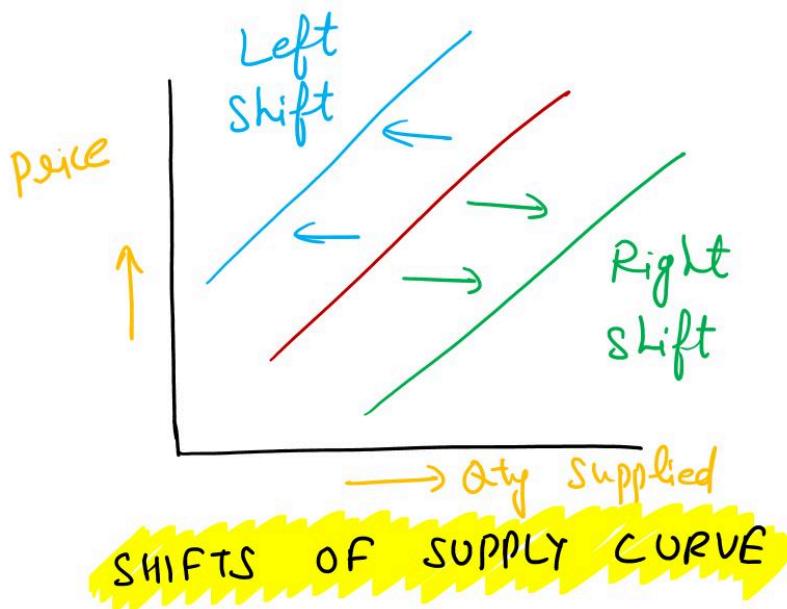
4. Change in producer expectations

5. Change in number of producers

The supply curve isolates the relation between the price of a good and the quantity supplied, other things constant. Assumed constants along a supply curve are the determinants of supply other than the price of the good, including

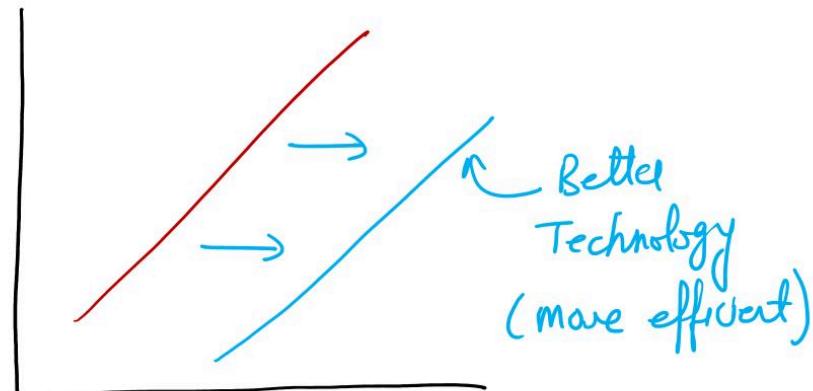
1. the state of technology,
2. the prices of relevant resources,
3. the prices of alternative goods,
4. producer expectations, and
5. the number of producers in the market.

When supply of a commodity rises due to favourable changes in factors other than price of the commodity, it is called increase in supply. These favourable changes may be like fall in input prices, improved technology, lower taxes, lower regulations etc. An increase in supply is shown by **rightward shift** of the supply curve.



When supply of a commodity falls due to unfavourable changes in factors other than price of the commodity, it is called decrease in supply. These unfavourable changes may be like rise in input prices, higher taxes, more regulations etc. A decrease in supply is shown by **leftward shift** of the supply curve.

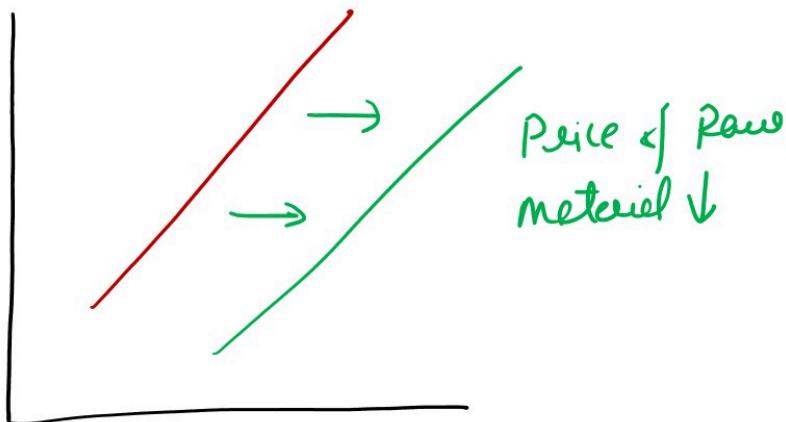
6. Shifts of Supply Curve



CHANGE IN TECHNOLOGY

Technology plays a crucial role in shaping the economy's stock of knowledge about how to combine resources efficiently. When a more efficient technology is discovered, production costs decrease, leading to an increase in supply, which is reflected by a rightward shift in the supply curve. For instance, suppose a new high-tech oven bakes pizza in half the time. Such a breakthrough would shift the market supply curve rightward, leading to an increase in the amount of pizza supplied at each possible price.

6. Shifts of Supply Curve



CHANGE IN PRICES OF RELEVANT RESOURCES

Relevant resources are those that are directly involved in the production of a good or service. A decrease in the price of a relevant resource reduces the cost of production, leading to an increase in supply and a rightward shift in the supply curve. For example, if the price of mozzarella cheese falls, pizza producers are more willing and better able to supply pizza, leading to an increase in the supply of pizza. On the other hand, an increase in the price of a relevant resource increases the cost of production, leading to a decrease in supply and a leftward shift in the supply curve.

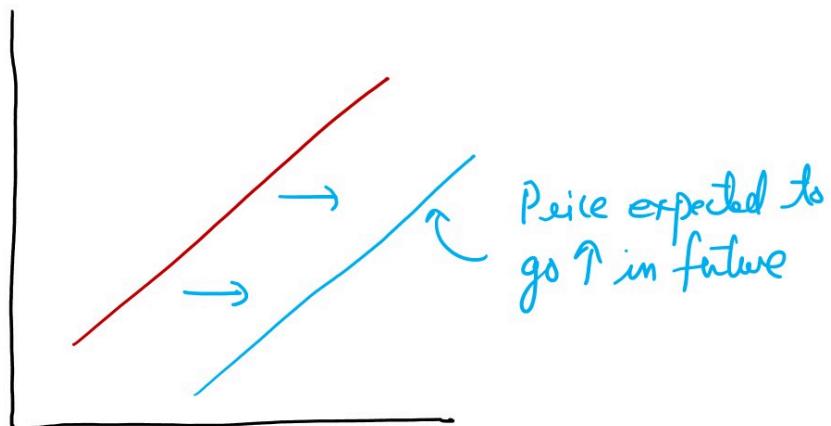
6. Shifts of Supply Curve



CHANGE IN PRICE OF ALTERNATE GOODS

Nearly all resources have alternative uses, and changes in the prices of alternative goods can impact the supply of a particular good or service. If the price of an alternative good decreases, the opportunity cost of producing the primary good decreases, leading to an increase in supply and a rightward shift in the supply curve. For instance, if the price of Italian bread decreases, some bread makers may switch to making pizza, leading to an increase in the supply of pizza. On the other hand, if the price of an alternative good increases, the opportunity cost of producing the primary good increases, leading to a decrease in supply and a leftward shift in the supply curve.

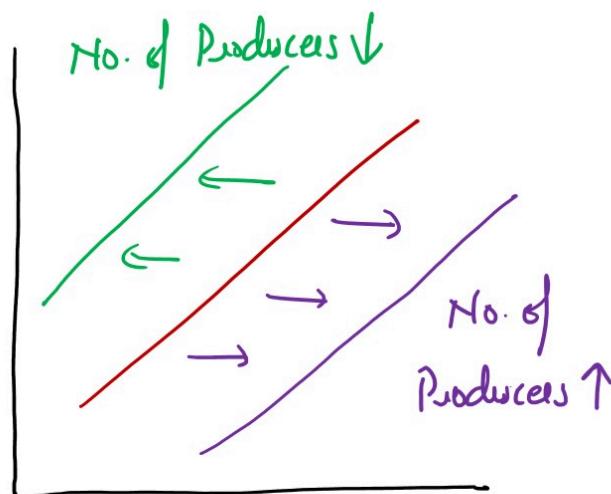
6. Shifts of Supply Curve



CHANGE IN PRODUCER EXPECTATIONS

Changes in producer expectations can also impact the supply curve. If producers expect higher prices in the future, they may increase their current supply, leading to a rightward shift in the supply curve. For instance, a pizza maker expecting higher pizza prices in the future may expand his or her pizzeria now, leading to an increase in the supply of pizza. On the other hand, if producers expect lower prices in the future, they may decrease their current supply, leading to a leftward shift in the supply curve.

6. Shifts of Supply Curve

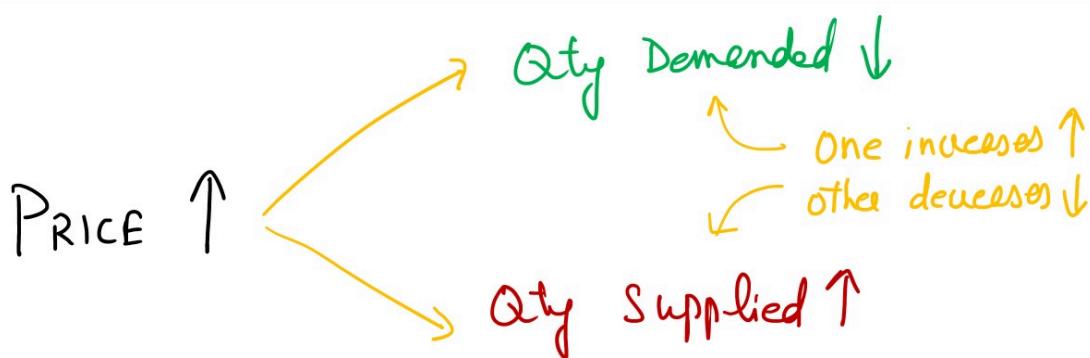


CHANGE IN NUMBER OF PRODUCERS

The number of producers in the market can also impact the supply curve. If the number of producers increases, supply will increase, leading to a rightward shift in the supply curve. For instance, the number of gourmet coffee bars more than quadrupled in the United States during the last decade, leading to an increase in the supply of gourmet coffee. On the other hand, if the number of producers decreases, supply will decrease, leading to a leftward shift in the supply curve.

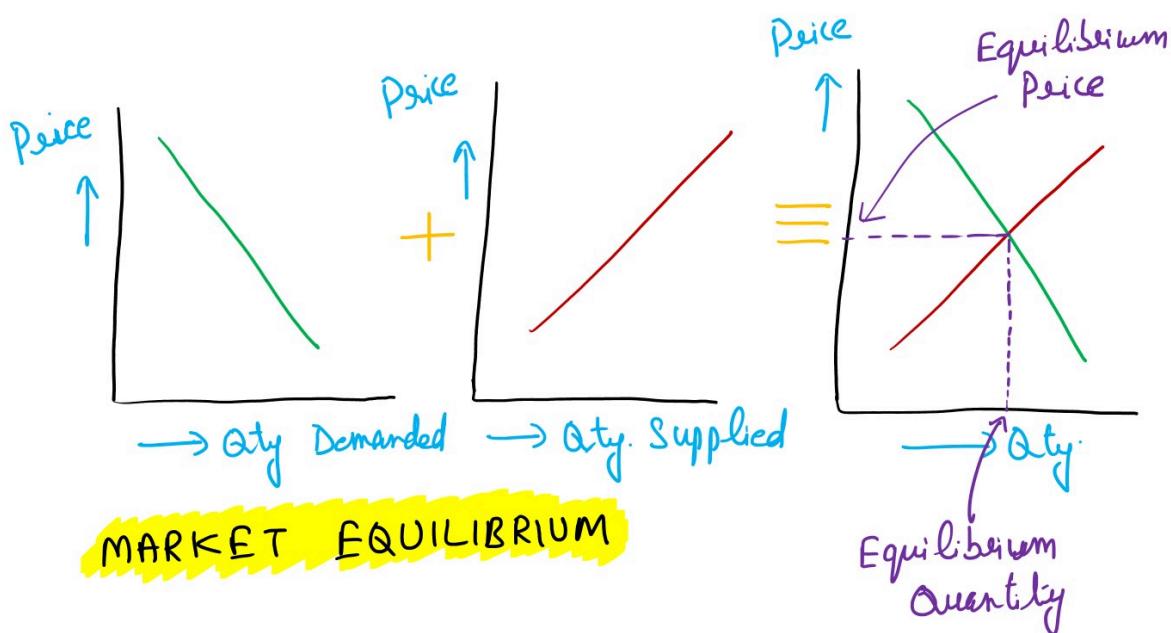
1. Introduction

As the price rises, consumers reduce their quantity demanded along the demand curve and producers increase their quantity supplied along the supply curve.



A market sorts out differences between demanders and suppliers. A market includes all the arrangements used to buy and sell a particular good or service.

2. Market Equilibrium

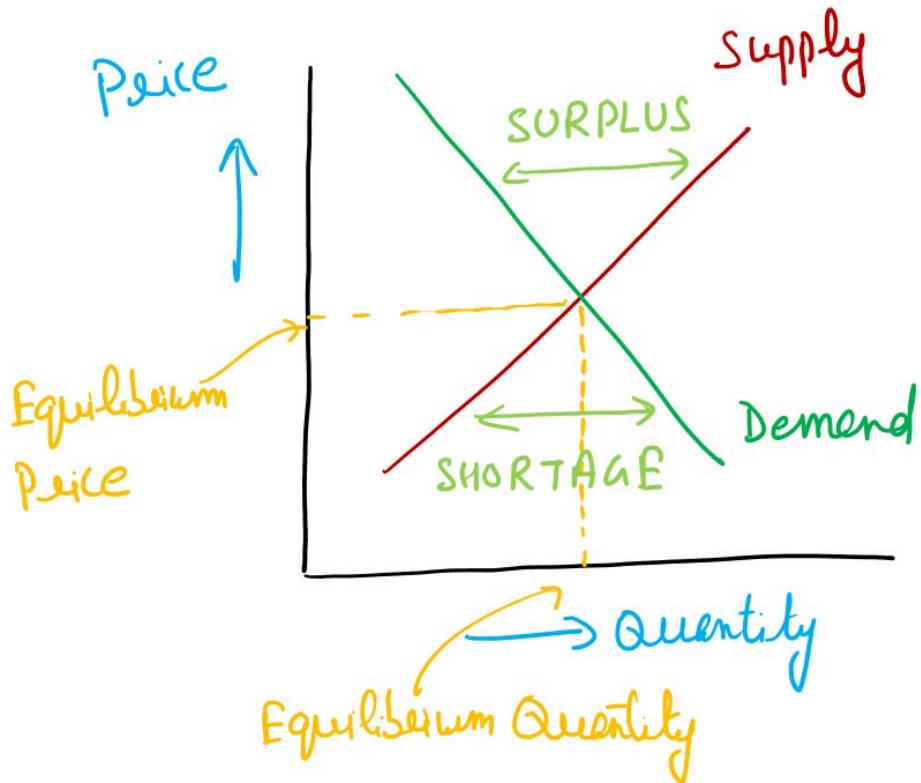


Market equilibrium occurs at the price where quantity demanded equals quantity supplied.

To understand how a market works, it is important to examine the relationship between market demand and supply. In our table on 'Supply and Demand Schedule', let us assume that the initial price is Rs 5. At this price, producers are willing to supply 31 units, while consumers demand only 6 units. This results in an excess quantity supplied, or a **surplus**, of 25 units. The producers desire to eliminate this surplus puts downward pressure on the price, which causes it to fall. As the price falls, producers reduce their quantity supplied, while consumers increase their quantity demanded. This process continues until the price reaches a point where the quantity supplied equals the quantity demanded.

Supply and Demand Schedule			
Price (Rs.)	Quantity Demanded	Quantity Supplied	Impact on price
5	6	31	Downward
4	12	25	Downward
3	19	19	Equilibrium
2	25	12	Upward
1	31	6	Upward

On the other hand, let us assume that the initial price is Rs 2. At this price, consumers demand 25 units, but producers supply only 12 units, resulting in an excess quantity demanded, or a **shortage**, of 13 units. In this scenario, profit-maximizing producers and frustrated consumers create market pressure for a higher price, which causes the price to rise. As the price rises, producers increase their quantity supplied, while consumers reduce their quantity demanded. This process continues until the price reaches a point where the quantity supplied equals the quantity demanded.



It is important to note that a surplus creates downward pressure on the price, while a shortage creates upward pressure. As long as the quantity demanded differs from the quantity supplied, this difference forces a change in price. It is important to understand that a shortage or a surplus is always relative to the price. There is no such thing as a general shortage or surplus.

A market reaches **equilibrium** when the quantity demanded equals the quantity supplied. This means that the independent plans of both buyers and sellers exactly match, so market forces exert no pressure to change price or quantity.

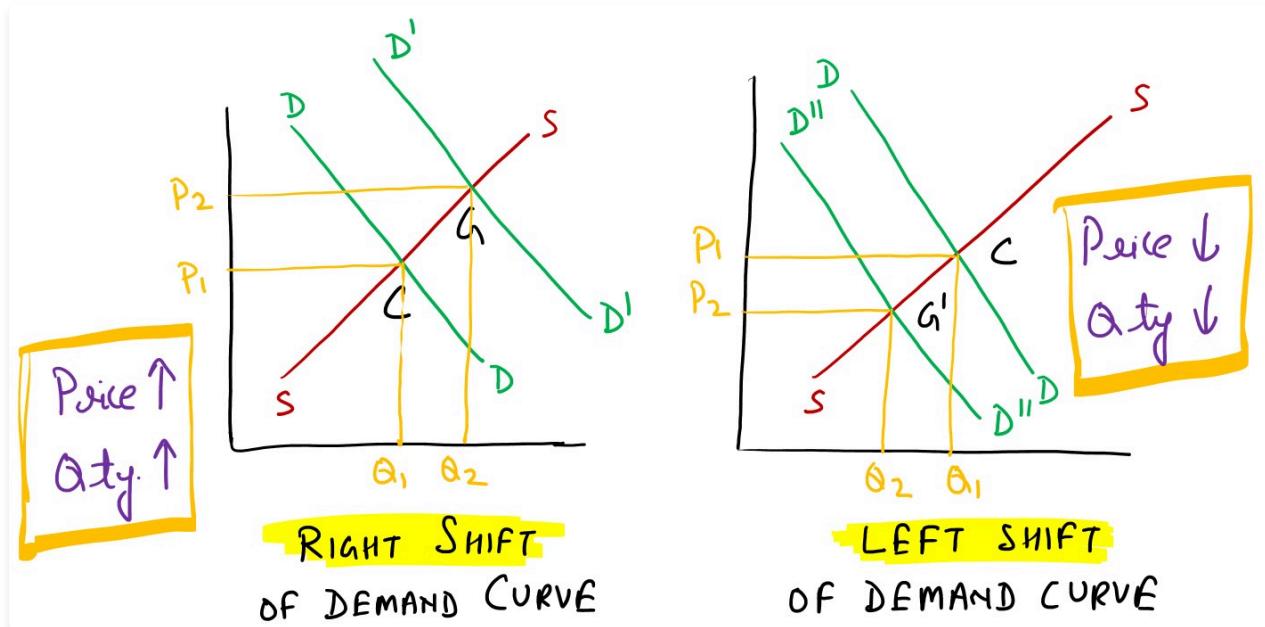
3. Changes in Equilibrium

Equilibrium is the combination of price and quantity at which the intentions of demanders and suppliers exactly match. Once a market reaches equilibrium, that price and quantity will prevail until one of the determinants of demand or supply changes.

Let us understand what happens on:

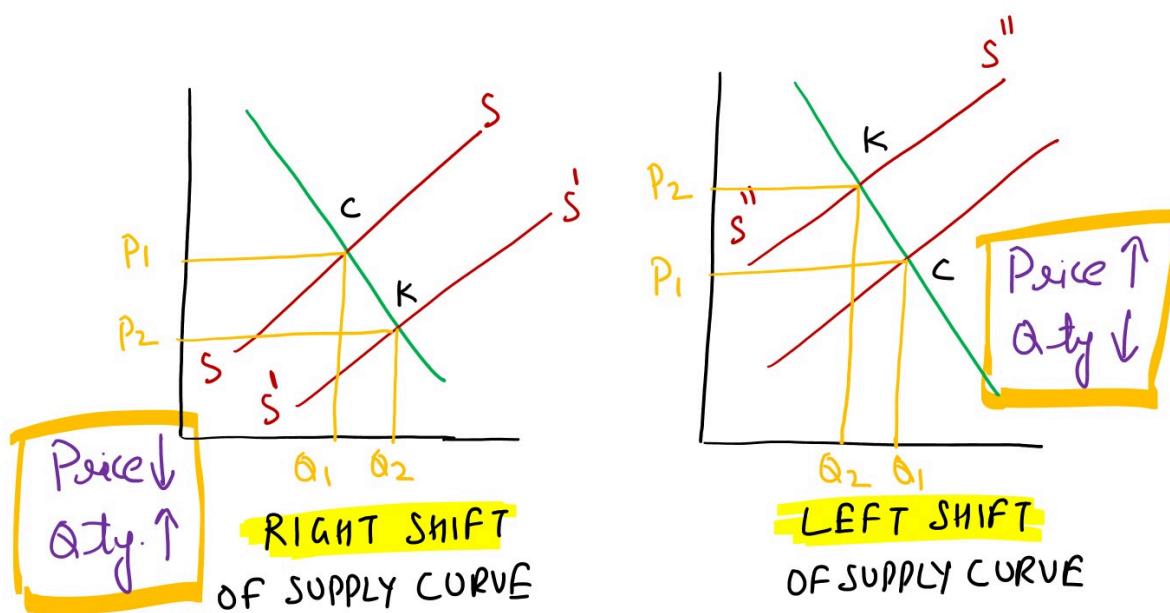
1. Shifts of the Demand Curve
2. Shifts of the Supply Curve
3. Shifts of the Both Curves

3. Changes in Equilibrium



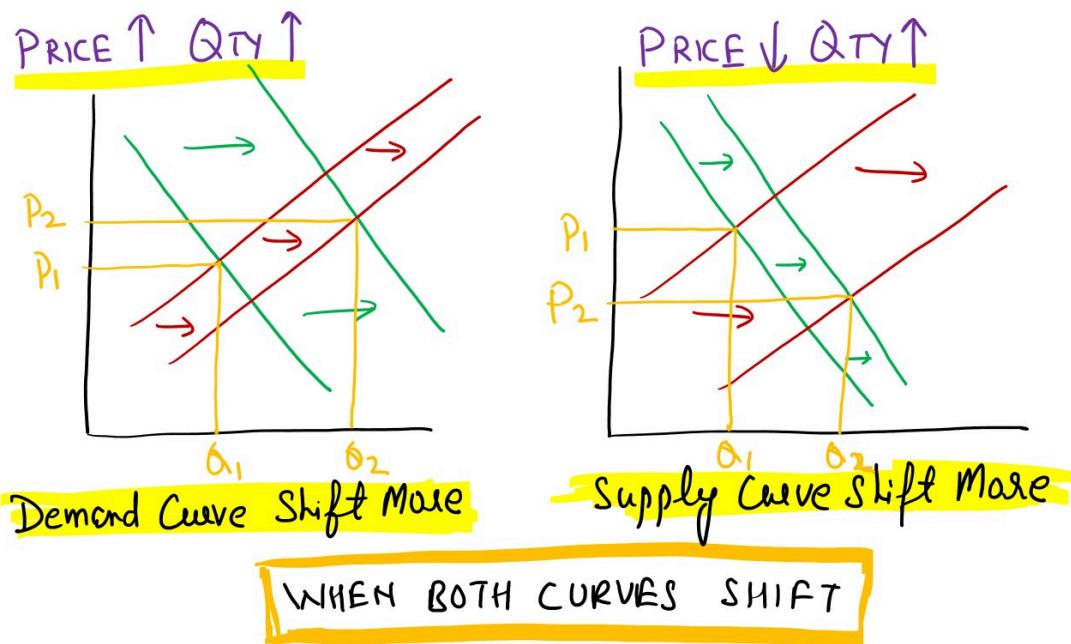
Demand curve D and supply curve S intersect at point C to yield the initial equilibrium price. Now suppose that one of the determinants of demand changes in a way that increases demand, shifting the demand curve to the right from D to D' . This shortage puts upward pressure on the price. As the price increases, the quantity demanded decreases along the new demand curve D' , and the quantity supplied increases along the existing supply curve S until the two quantities are equal once again at equilibrium point G . Thus, given an upward-sloping supply curve, an increase in demand, meaning a rightward shift of the demand curve, increases both equilibrium price and quantity. A decrease in demand, meaning a leftward shift of the demand curve, would lower both equilibrium price and quantity.

3. Changes in Equilibrium



Demand curve D and supply curve S intersect at point C to yield the initial equilibrium price. Suppose one of the determinants of supply changes, increasing supply from S to S', shifting the supply curve rightward. The surplus forces the price down. As the price falls, the quantity supplied declines along the new supply curve and the quantity demanded increases along the existing demand curve until a new equilibrium point K is established. Thus, an increase in supply reduces the price and increases the quantity. On the other hand, a decrease in supply increases the price but decreases the quantity.

3. Changes in Equilibrium



As long as only one curve shifts, we can say for sure how equilibrium price and quantity will change. If both curves shift, however, the outcome is less obvious. If demand and supply shift in opposite directions, we can say what will happen to equilibrium price.

Equilibrium price will increase if demand increases and supply decreases. Equilibrium price will decrease if demand decreases and supply increases.

		Change in Demand		$\stackrel{?}{=} \text{Indeterminate}$
		Demand \uparrow	Demand \downarrow	
Change in Supply	Supply \uparrow	Price -?	Price \downarrow	SHIFTING OF BOTH CURVES
	Supply \downarrow	Qty \uparrow	Qty -?	
	Supply \uparrow	Price \uparrow	Price -?	SHIFTING OF BOTH CURVES
	Supply \downarrow	Qty -?	Qty \downarrow	

When the demand and supply curves shift in the same direction, equilibrium quantity also shifts in that direction. The effect on equilibrium price depends on which curve shifts more. If the curves shift in opposite directions, equilibrium price will move in the same direction as demand. The effect on equilibrium quantity depends on which curve shifts more.

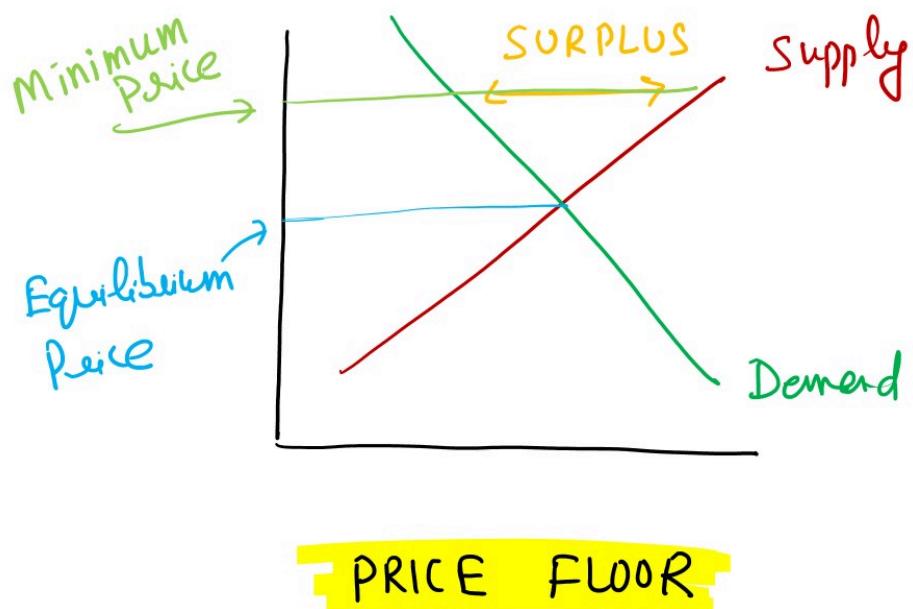
4. Disequilibrium

Markets are constantly changing and trying to reach an equilibrium where the quantity demanded is equal to the quantity supplied. However, markets do not always reach equilibrium quickly, and during this time, the market is said to be in disequilibrium. **Disequilibrium** occurs when there is either a surplus or a shortage of a good or service, which exerts pressure on the price. A surplus exerts downward pressure on the price, while a shortage exerts upward pressure.

Disequilibrium is usually temporary as the market tries to find equilibrium. There are various reasons why a market may be in disequilibrium. For instance, new products may be introduced, or there may be sudden changes in demand or supply. For example, when popular toys, best-selling books, or chart-busting CDs sell out, they create a shortage in the market.

However, sometimes public officials set prices above or below their equilibrium levels to achieve certain objectives. These prices distort markets and result in market disequilibrium. Let's examine how price floors and price ceilings affect markets.

4. Disequilibrium



Price floors occur when the government or private businesses set prices above the equilibrium price. The most common example of a price floor set by the government is the minimum wage law. Private businesses may also set a price floor to ensure fair trade, where manufacturers set a minimum price for their products to ensure that retailers sell them at a certain price.

For example, the Government sets a price floor for some agricultural products to ensure farmers earn a higher and more stable income than they would otherwise earn. A price floor is a minimum selling price set above the equilibrium price. If the price floor is set below the equilibrium price, it will be irrelevant because the market price will still be lower.

4. Disequilibrium



PRICE CEILING

Price ceilings occur when the government or other authorities set prices below the equilibrium price. For example, the government may set price ceilings on rental housing to address concerns about the rising cost of housing in some cities. A price ceiling is a maximum selling price set below the equilibrium price. If the price ceiling is set above the equilibrium price, it will have no effect.

Price ceilings lead to shortages as the quantity demanded exceeds the quantity supplied. To ration housing, other devices emerge, such as long waiting lists, personal connections, and the willingness to make under-the-table payments. These practices distort the market and create inefficiencies. In some cases, black markets may emerge as people seek to buy or sell the good at a price above the ceiling.

1. Introduction

PRICE ELASTICITY OF DEMAND

↳ How demand changes in response to change in price?

Price 10 lekh \rightarrow 12 lekh (20% ↑)
Demand 5000 \rightarrow 3000 (40% ↓)

$$\frac{\% \text{ change in demand}}{\% \text{ change in price}} = \frac{40}{20} = 2$$

Price Elasticity

Elasticity of demand is defined as the responsiveness of the quantity demanded of a good to changes in one of the variables on which demand depends. These variables are price of the commodity, prices of the related commodities, income of the consumers and other factors on which demand depends.

More precisely, elasticity of demand is the percentage change in quantity demanded divided by the percentage change in one of the variables on which demand depends. It is to be noted that when we talk of elasticity of demand, unless and until otherwise mentioned, we talk of price elasticity of demand. In other words, it is price elasticity of demand which is usually referred to as **elasticity of demand**.

2. Price Elasticity of Demand

Price elasticity of demand is defined as the responsiveness or sensitiveness of demand for a commodity to the changes in its price. More precisely, elasticity of demand is the percentage change in demand as a result of one per cent change in the price of the commodity. A formal definition of price elasticity of demand (e_p) is given as:

$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

where:

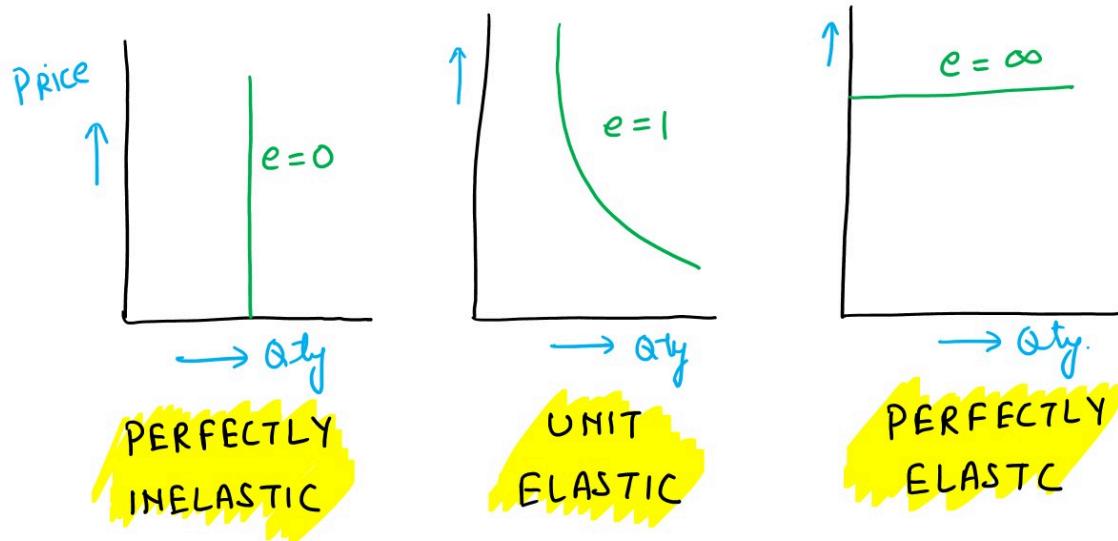
Q = quantity demanded, P = original price, ΔQ = change in quantity demanded, ΔP = change in price.

It is important to note here that a minus sign (-) is generally inserted in the formula before the fraction in order to make the elasticity coefficient a non-negative value.

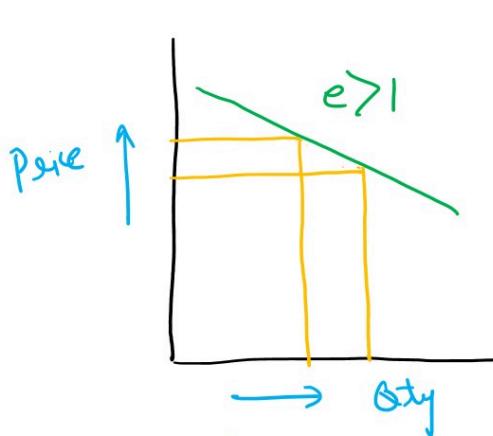
For example, suppose the price of a luxury watch increases by 10%, and the quantity demanded decreases by 20%. In this scenario, the price elasticity of demand would be 2 (-20% / 10%), indicating that the product is highly responsive to price changes, and even a small increase in price leads to a considerable drop in demand. Conversely, if the price of salt increases by 10%, and the quantity demanded drops by only 1%, the price elasticity of demand would be 0.1 (-1% / 10%), indicating that the product is relatively insensitive to price changes, and even a significant price hike does not affect demand much.

3. Categories of Price Elasticity of Demand

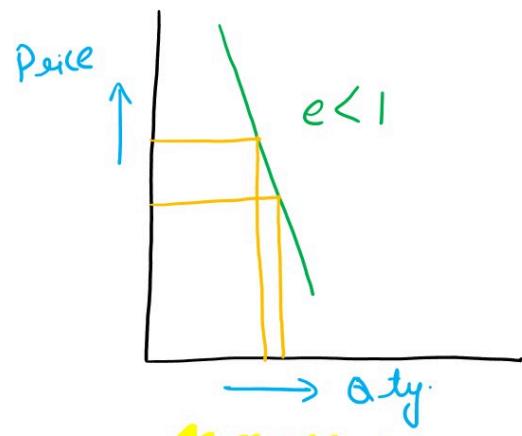
The price elasticity of demand can be divided into 5 categories depending on how responsive the quantity demanded is to a change in price.



- a) **Perfectly Inelastic ($e_p = 0$)** Under the perfectly inelastic demand, irrespective of any rise or fall in price of a commodity, the quantity demanded remains the same. The elasticity of demand in this case will be equal to zero. In such a case the shape of the demand curve will be vertical straight line. Perfectly inelastic demand occurs when consumers have no substitute for the product or service, or when the product is a necessity. For example, the demand for insulin is perfectly inelastic since people with diabetes need it to survive.
- b) **Unit elastic ($e_p = 1$)** When the percentage change in quantity demanded is equal to the percentage change in price, the resulting price elasticity has an absolute value of 1.0. This part of the demand curve is said to have *unit-elastic* demand. The graph of unit elastic is rectangular hyperbola. For example, if the price of movie tickets increases by 10%, and the quantity demanded decreases by 10%, the revenue of the theatre remains the same. When a product has unit elastic demand, a change in price does not significantly impact the total revenue of the seller.
- c) **Perfectly Elastic ($e_p = \infty$)** Perfectly elastic demand is said to happen when a little change in price leads to an infinite change in quantity demanded. A small rise in price on the part of the seller reduces the demand to zero. In such a case the shape of the demand curve will be horizontal straight line. Perfectly elastic demand occurs when there are many substitutes available for a product or service, and consumers can switch to other products easily. For example, if the price of a specific brand of coffee increases, consumers can easily switch to another brand with a lower price.
- d) **Elastic / Relatively Elastic ($e_p > 1$)** When the percentage change in quantity demanded exceeds the percentage change in price, the resulting price elasticity has an absolute value greater than 1.0. This part of the demand curve is considered *elastic*, meaning that the quantity demanded is highly responsive to changes in price. For example, restaurant food is an example of a product with elastic demand. The reason for this is that there are many substitutes for restaurant food, such as cooking at home, eating at a different restaurant, or ordering takeout.



**RELATIVELY
ELASTIC**



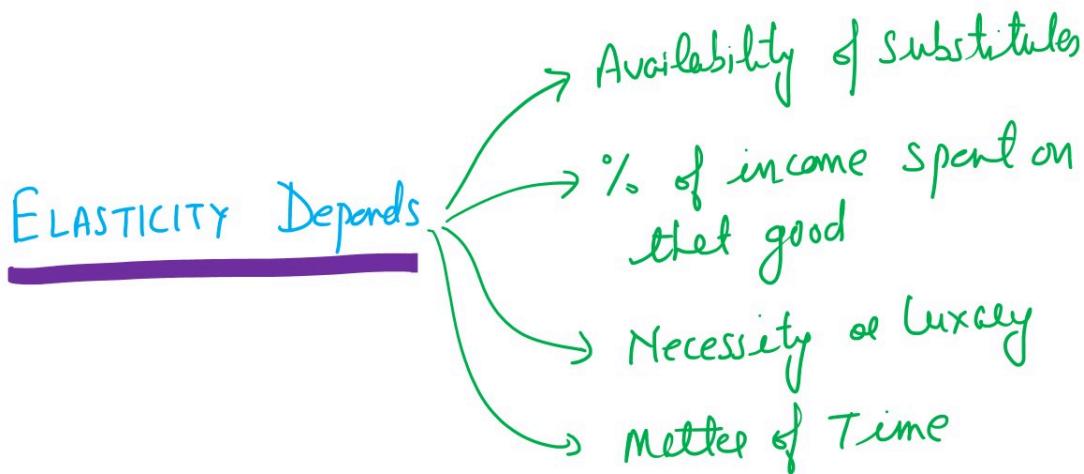
**RELATIVELY
INELASTIC**

e) Inelastic / Relatively Inelastic ($e_p < 1$) When the percentage change in quantity demanded is less than the percentage change in price, the resulting price elasticity has a value between 0 and 1.0. This part of the demand curve is considered to be *inelastic*, meaning that the quantity demanded is not very responsive to changes in price. For example, petrol is a good example of a product with inelastic demand. The reason for this is that there are few good substitutes for petrol, so even if the price increases, consumers will still need to buy it to go to work, school, etc.

Perfectly Elastic Demand Curve, Perfectly Inelastic Demand Curve, and Unit-Elastic Demand Curve are also called a **constant-elasticity demand curve** because the elasticity is the same all along the curve, on all three curves.

4. Determinants of the Price Elasticity of Demand

There are several determinants of price elasticity of demand that affect how much the quantity demanded changes when the price changes. These determinants are discussed below.



a) Availability of Substitutes

The availability of substitutes significantly impacts price elasticity. If close substitutes are readily available, a price increase will prompt consumers to shift to substitutes. However, if there are no substitutes or no close substitutes, the quantity of the good demanded will not decline much. The more substitutes there are, and the more similar they are to the good in question, the greater the price elasticity of demand. For example, the demand for running shoes is more elastic than the demand for shoes because there are more substitutes for running shoes. Similarly, the demand for a particular Nike model is more elastic than the demand for Nike running shoes because Nike has several models. Conversely, certain goods, like some prescription drugs, have no close substitutes and hence have inelastic demand.

b) Proportion of the Consumer's Budget Spent on the Good

The proportion of a consumer's budget spent on a good affects price elasticity. An increase in the price of a good that accounts for a large proportion of the consumer's budget will substantially reduce the consumer's ability to buy the good, and hence the quantity demanded. For example, the demand for housing is more elastic than the demand for paper towels because housing claims a large share of the consumer's budget.

c) A Matter of Time

Consumers may take time to find substitutes for higher-priced goods. The more time consumers have to adjust, the more responsive the change in quantity demanded is to a given change in price. For example, the OPEC cartel raised the price of oil sharply between 1973 and 1974, which led to a 45 percent increase in gasoline prices. However, the quantity demanded decreased by only 8 percent in the short term. Over time, as people purchased smaller cars, made greater use of public transportation, and added insulation to their homes, the demand for oil decreased. The longer the period of adjustment, the more elastic the demand becomes.

d) Necessity or Luxury

The necessity or luxury status of a good also influences price elasticity. Necessities have inelastic demand because they are essential and have no close substitutes. In contrast, luxuries have elastic demand as they have several substitutes. For example, the demand for salt is inelastic, while the demand for diamond jewellery is elastic.

5. Arc Elasticity

The measure of elasticity of demand between any two finite points on a demand curve is known as **arc elasticity**.



$$(e_p = - \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}) \text{ (with minus sign)}$$

For example, the measure of elasticity between points J and K, in the figure, is the measure of arc elasticity. The movement from point J to K on the demand curve shows a fall in the price from Rs. 20 to Rs. 10 so that $\Delta P = 20 - 10 = 10$. The fall in price causes an increase in demand from 43 units to 75 units so that $\Delta Q = 75 - 43 = 32$.

The elasticity between points J and K (moving from J to K) can be calculated by substituting these values into the elasticity formula as follows,

$$(e_p = \frac{-32}{10} \times \frac{20}{43} = 1.49)$$

This means that a 1 % decrease in price of commodity X results in a 1.49 % increase in demand for it.

Arc elasticity coefficient differ between the same two finite points on a demand curve if direction of change in price is reversed. A reverse movement in the price, i.e., the movement from point K to J implies a different elasticity coefficient. It means that the elasticity depends also on the direction of change in price. Therefore, while measuring price elasticity, the direction of price change should be carefully noted.

Some modifications have been suggested in economic literature to resolve the problems associated with arc elasticity.

First, the problem arising due to the change in the direction of price change may be avoided by using the lower values of P and Q in the elasticity formula, so that

$$(e_p = - \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1})$$

where, $P_1 = 10$ (the lower of the two prices) and $Q_1 = 43$ (the lower of the two quantities).

$$(e_p = - \frac{-32}{10} \times \frac{10}{43} = 0.74)$$

Second, another method suggested to resolve this problem is to use the average of upper and lower values of P and Q in fraction P/Q. This is also known as *mid-point formula*. In that case the formula is:

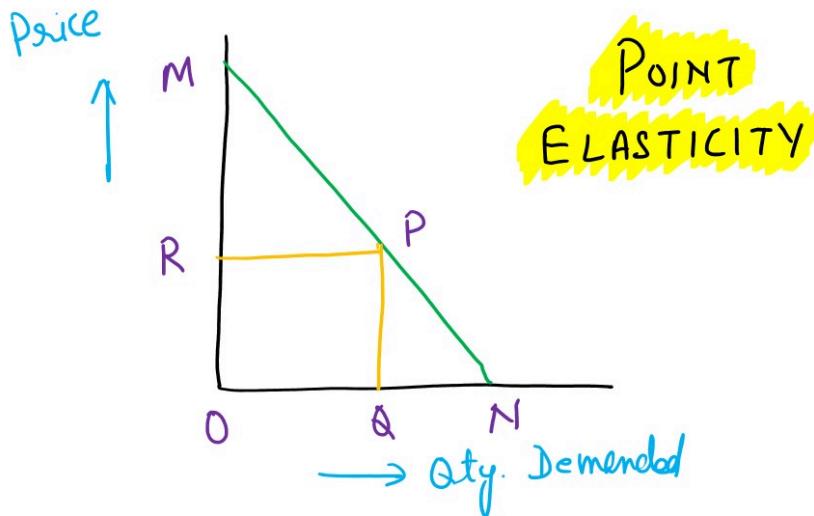
$$(e_p = - \frac{\Delta Q}{\Delta P} \times \frac{(P_1 + P_2)}{(Q_1 + Q_2)})$$

$$(e_p = - \frac{(Q_1 - Q_2)(P_1 - P_2)}{(P_1 + P_2)(Q_1 + Q_2)})$$

where, subscripts 1 and 2 denote lower and upper values of prices and quantities.

6. Point elasticity

Point elasticity is also a way to resolve the problem in measuring elasticity. The concept of point elasticity is used for measuring price elasticity where change in price is infinitesimally small. Point elasticity is the elasticity of demand at a finite point on a demand curve.



$$\epsilon_p = \frac{\delta Q}{\delta P} \times \frac{P}{Q}$$

It means that the price elasticity of demand at point P (in figure) is given by

$$\epsilon_p = \frac{PN}{PM}$$

which, may also be written as

$$\epsilon_p = \frac{QN}{OQ}$$

It may thus be concluded that the price elasticity of demand at any point on a linear demand curve is equal to the ratio of lower segment to the upper segments of the line, i.e.

$$\epsilon_p = \frac{\text{lower segment}}{\text{upper segment}}$$

7. Price Elasticity of Supply

Prices are signals to both sides of the market about the relative scarcity of products. Higher prices discourage consumption but encourage production. The price elasticity of demand measures how responsive consumers are to a price change.

PRICE ELASTICITY
of

DEMAND **SUPPLY**

$$\text{Demand: } = \frac{\% \text{ change in Qty demanded}}{\% \text{ change in price}}$$
$$\text{Supply: } = \frac{\% \text{ change in Qty supplied}}{\% \text{ change in price}}$$

Likewise, the **price elasticity of supply** measures how responsive producers are to a price change. This elasticity is calculated in the same way as price elasticity of demand. In simplest terms, the price elasticity of supply e_S equals the percentage change in quantity supplied divided by the percentage change in price.

$$e_S = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

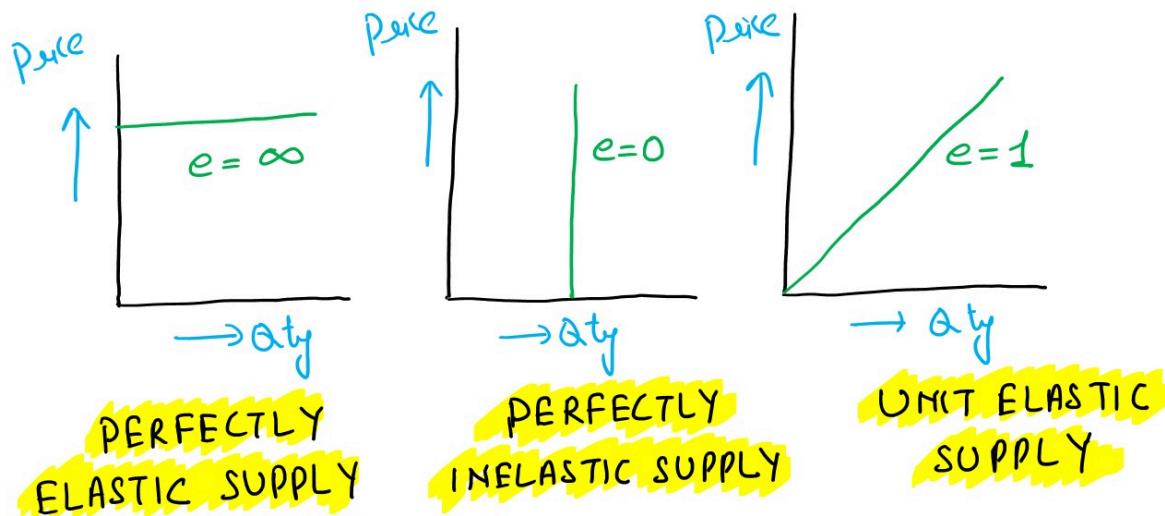
where:

Q = quantity supplied, P = original price, ΔQ = change in quantity supplied, ΔP = change in price.

Because the higher price usually results in an increased quantity supplied, the percentage change in price and the percentage change in quantity supplied move in the same direction, so the price elasticity of supply is usually a positive number.

8. Categories of Price Elasticity of Supply

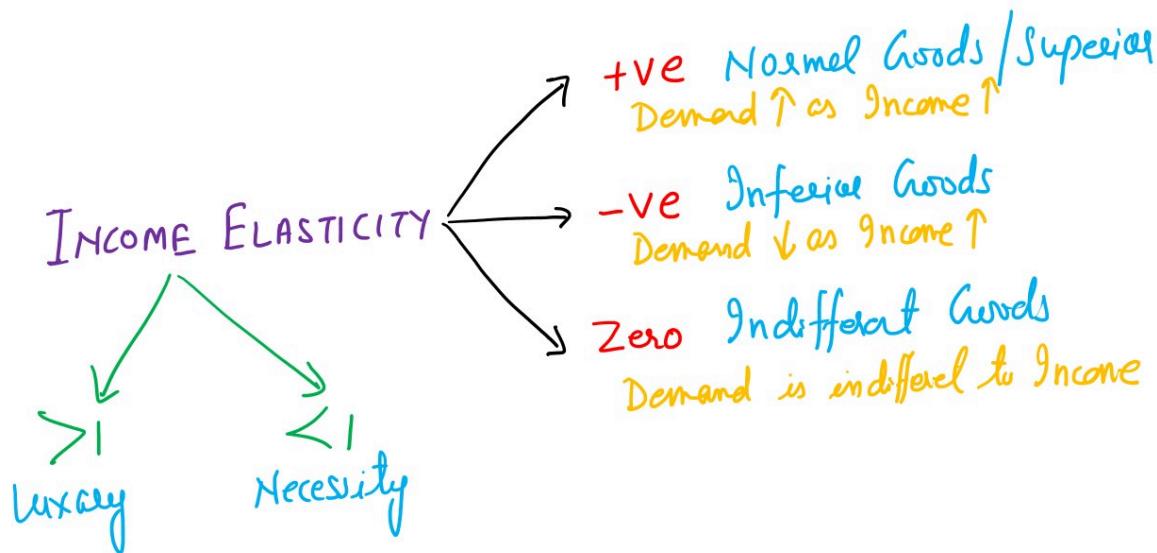
Price elasticity of supply refers to the degree to which the quantity supplied of a good or service changes in response to a change in its price. It can be classified into the following 5 categories:



- Perfectly inelastic supply ($e_S = 0$):** Perfectly inelastic supply occurs when the quantity supplied of a good remains unchanged regardless of a change in its price. For example, land is a fixed resource, and its supply is perfectly inelastic. No matter how high the price of land goes, the quantity supplied remains the same. Similarly, supply of rare paintings, antiques, or collector's items may have perfectly inelastic supply as the quantity supplied is limited, and the price has little to no effect on the supply.
- Relatively less-elastic supply ($0 < e_S < 1$):** Relatively less-elastic supply occurs when the percentage change in the quantity supplied of a good is less than the percentage change in its price. For example, if the price of sugar increases by 10%, and the quantity supplied of sugar increases by only 5%, then the supply of sugar is relatively less elastic.
- Relatively greater-elastic supply ($1 < e_S < \infty$):** Relatively greater-elastic supply occurs when the percentage change in the quantity supplied of a good is greater than the percentage change in its price. For example, if the price of airline tickets decreases by 10%, and the quantity supplied of airline tickets increases by 20%, then the supply of airline tickets is relatively greater elastic.
- Unit-elastic supply ($e_S = 1$):** Unit-elastic supply occurs when the percentage change in the quantity supplied of a good is equal to the percentage change in its price. For example, if the price of petrol increases by 10%, and the quantity supplied of petrol decreases by 10%, then the supply of gasoline is unit-elastic.
- Perfectly elastic supply ($e_S = \infty$):** Perfectly elastic supply occurs when the quantity supplied of a good changes infinitely in response to a small change in its price. For example, if the price of a product decreases by a small amount, and the quantity supplied increases to an infinitely large amount, then the supply of the product is perfectly elastic. This situation is rare in reality, but it is commonly used in economic theory as a hypothetical scenario.

9. Income Elasticity of Demand

Income elasticity of demand measures the responsiveness of the quantity demanded of a good to a change in consumer income.



The formula for measuring income elasticity of demand is the same as that for measuring the elasticity. The only change in the formula is that the variable 'income' (Y) is substituted for the variable 'price' (P).

Income-elasticity of demand for a product, say X, i.e. e_y may be defined as:

$$(e_y = \frac{\Delta X_q}{X_q} / \frac{\Delta Y}{Y}) = \frac{\Delta X_q}{X_q} \cdot \frac{1}{\Delta Y / Y}$$

X_q = quantity of X demanded, Y = income, ΔX_q = change in quantity of X demanded and ΔY = change in income.

Categories of goods based on income elasticity

There are 3 categories of goods based on their income elasticity, whether it is positive, negative, or zero.

a) **Normal Goods:** These are goods for which the quantity demanded increases as consumer income increases. These goods typically include necessities such as food, housing, and clothing. For instance, people may buy more food as their income rises, but the increase in demand may not be proportional to the increase in income. These are also called superior goods. For normal goods, income elasticity is positive ($e_y > 0$).

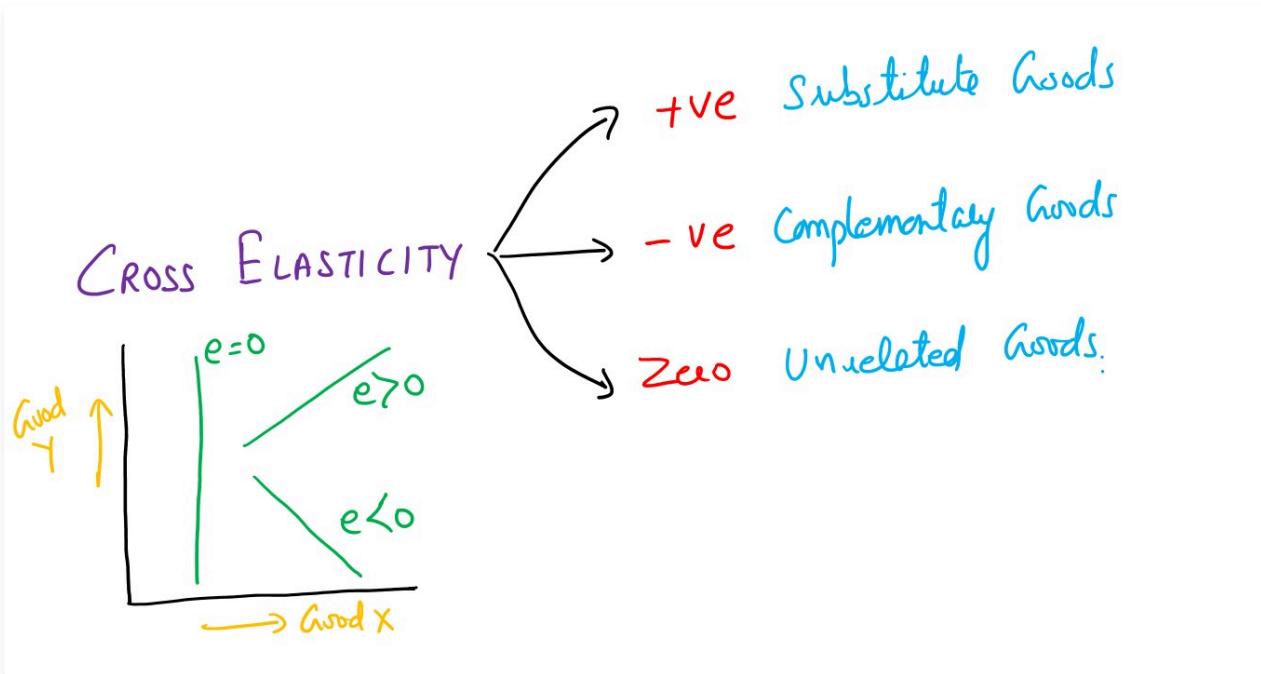
Normal goods may be further classified as either *necessities* or *luxuries*. A commodity is classified as a necessity if $0 < e_y < 1$. The sales of such goods (electricity, rent, food, etc.) are relatively insensitive to economic fluctuations. A commodity is classified as a *luxury* if ($e_y > 1$). Such commodities (jewellery, luxury automobiles, yachts, furs, restaurant meals, etc.) are very sensitive to economic fluctuations. These are goods for which the quantity demanded increases more than proportionately as consumer income increases.

b) **Inferior Goods:** Some goods, such as used furniture and used clothing, have a negative income elasticity of demand, meaning that the demand for these goods declines as consumer income increases. These goods are called inferior goods. For inferior goods, income elasticity is negative ($e_y < 0$).

c) **Indifferent Goods:** Indifferent goods, also known as income-inelastic goods, are a category of goods for which the demand does not change as consumer incomes change. In other words, the income elasticity of demand for these goods is zero ($e_y = 0$). For example, items like salt, basic food staples, and certain medications often fall into this category. No matter how much your income increases or decreases, you still need a relatively consistent amount of these goods.

10. Cross-Price Elasticity of Demand

The Cross-Price Elasticity of Demand refers to how a change in the price of one product affects the demand for another. This is particularly important for firms that produce a line of products. The numerical value of the cross-price elasticity can be positive, negative, or zero, depending on the relationship between the two goods being analyzed.



a) **Substitute goods:** If the price of one good increases, and this leads to an increase in the demand for another good, then these goods are substitutes, and the cross-price elasticity is *positive*. For example, coke and Pepsi are substitutes since a price increase in Coke results in an increase in the demand for Pepsi. The cross-price elasticity between Coke and Pepsi is positive, and this relationship has been estimated at 0.7, meaning that a 10% increase in the price of one good leads to a 7% increase in the demand for the other.

b) **Complements goods:** If an increase in the price of one good leads to a decrease in the demand for another good, then the goods are complements, and the cross-price elasticity is *negative*. For example, gasoline and tires are complements since an increase in the price of gasoline leads to a decrease in the demand for tires since people drive less and replace their tires less frequently. The cross-price elasticity between gasoline and tires is negative.

c) **Unrelated goods:** Most pairs of goods are unrelated, and their cross-price elasticity is zero. This means that a change in the price of one good does not affect the demand for the other. For example, a change in the price of laptops does not affect the demand for fresh fruits. Similarly, if the price of shoes increases, it is unlikely to affect the demand for toothpaste.

In summary, firms producing a line of products need to consider the cross-price elasticity of demand to predict how a change in the price of one good affects the demand for another. The relationship between the goods being analyzed can be positive, negative, or zero, depending on whether they are substitutes, complements, or unrelated, respectively.

1. Introduction

Price elasticity of demand is a valuable tool for producers to determine the effect of a price change on total revenue. Total revenue is calculated by multiplying the price of the product by the quantity of goods or services sold at that price.

The impact of a lower price on total revenue is determined by the elasticity of demand. If demand is elastic, the percentage increase in quantity demanded exceeds the percentage decrease in price, so total revenue increases. This is because the positive effect of greater quantity demanded outweighs the negative effect of a lower price. For example, if a producer lowers the price of a pen drive from Rs 1000 to Rs 800, and the quantity demanded increases from 100 to 150, then the total revenue will increase from Rs 1,00,000 to Rs 1,20,000.

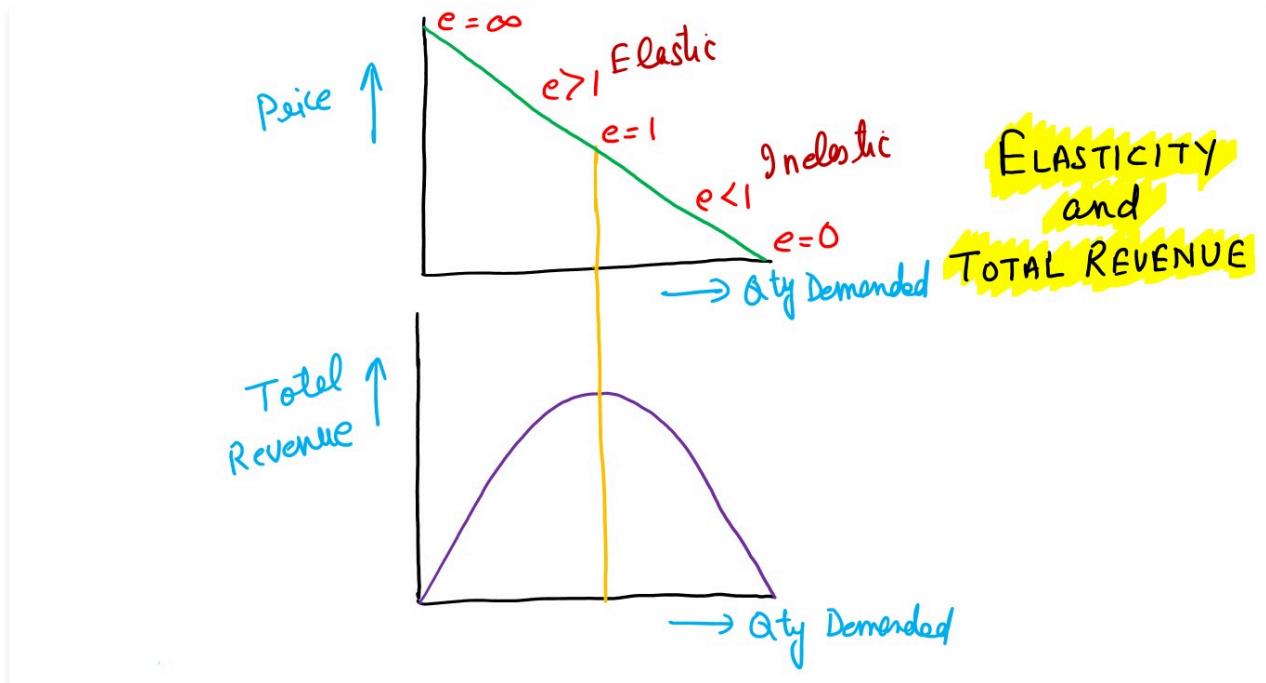
If demand is unit elastic, the percentage increase in quantity demanded equals the percentage decrease in price, so total revenue remains unchanged. For example, if a producer lowers the price of a toffee from Rs 1 to 90 paisa, and the quantity demanded increases from 100 to 111, then the total revenue will remain the same at Rs 100.

Finally, if demand is inelastic, the percentage increase in quantity demanded is less than the percentage decrease in price, so total revenue decreases. This is because the negative effect of a lower price outweighs the positive effect of a greater quantity demanded. For example, if a producer lowers the price of a prescription medication from Rs 100 to Rs 90, and the quantity demanded increases from 10 to 11, then the total revenue will decrease from Rs 1000 to Rs 990.

2. Demand, Price Elasticity and Total Revenue

The price elasticity of demand is larger on the higher-price end of the demand curve than on the lower-price end. In other words, if the demand curve is linear, consumers are more responsive to a given price change when the initial price is high than when it's low.

Demand becomes less elastic as we move down the curve. At a point halfway down the linear demand curve in the figure, the elasticity equals 1.0. This halfway point divides a linear demand curve into an elastic upper half and an inelastic lower half.



From the figure, you can observe a clear relationship between the elasticity of demand and total revenue. Notice that where demand is elastic, a decrease in price increases total revenue because the gain in revenue from selling more units exceeds the loss in revenue from selling all units at the lower price. But where demand is inelastic, a price decrease reduces total revenue because the gain in revenue from selling more units is less than the loss in revenue from selling all units at the lower price.

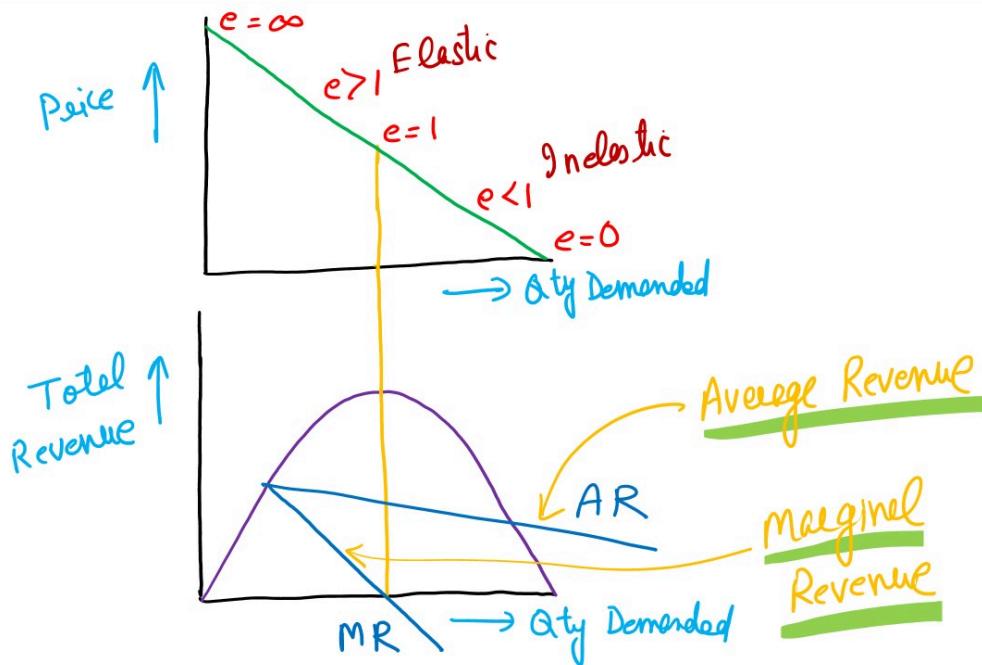
Where demand is unit elastic, the gain and loss of revenue exactly cancel each other out, so total revenue at that point remains constant. Thus, total revenue "peaks" in the lower panel in the figure.

The relationship between Price-elasticity, Price Change and Change in Total Revenue, TR is summed up in Table next.

Elasticity Co-efficient	Change in price	Change in Total Revenue
$e = 0$	Increase Decrease	Increase Decrease
$e < 1$	Increase Decrease	Increase Decrease
$e = 1$	Increase Decrease	No change No change
$e > 1$	Increase Decrease	Decrease Increase
$e = \infty$	Increase Decrease	Decrease to zero Infinite increase

3. Marginal Revenue, Average Revenue and Elasticity

Marginal Revenue (MR) is the additional revenue generated from selling one more unit of output. It is the change in total revenue resulting from a one-unit increase in output. In other words, it is the slope of the total revenue curve at a given point. Mathematically, $(MR = \frac{\Delta TR}{\Delta Q})$.



Average Revenue (AR) is the revenue generated per unit of output sold. It is calculated by dividing total revenue by the quantity sold. In other words, it is the price at which each unit of output is sold. Mathematically, $(AR = \frac{TR}{Q})$.

It is to be noted that marginal revenue (MR), average revenue (AR) and price elasticity of demand (e) are uniquely related to one another through the formula:

$$(MR = AR(1 - \frac{1}{e}))$$

which can also be rewritten as:

$$(e = \frac{AR}{AR - MR})$$

This formula shows how marginal revenue is affected by changes in price elasticity. If the price elasticity is greater than one, the demand for the product is elastic and an increase in price will result in a decrease in quantity demanded.

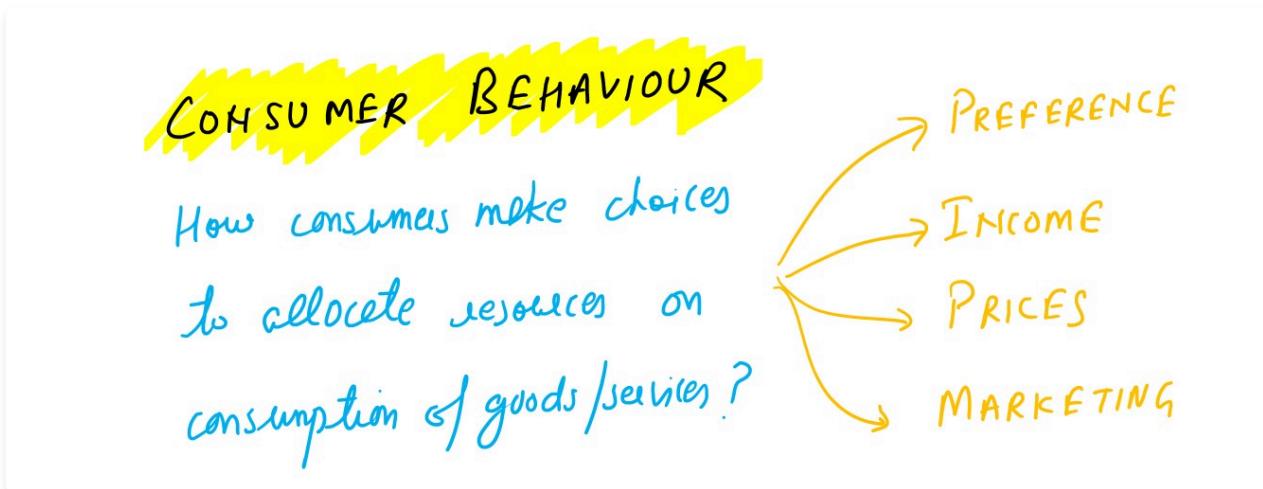
As a result, MR will be positive, and total revenue will increase up to a certain point. However, if the price elasticity is less than one, the demand for the product is inelastic, and an increase in price will result in a smaller decrease in quantity demanded. In this case, MR will be negative, and total revenue will decrease as more units are sold.

The MR curve is below the AR curve because each additional unit sold generates less revenue due to the downward-sloping demand curve.

At the point where the demand curve is unit elastic, which is represented by the midpoint of the demand curve, MR is zero. This is because any increase in quantity sold will not increase total revenue. When the demand curve is relatively elastic, MR is positive, and total revenue increases as more units are sold up to the point of unit elasticity. When the demand curve is relatively inelastic, MR is negative, and total revenue decreases as more units are sold.

1. Consumer Behaviour

Consumer Behaviour refers to the study of how individuals make decisions to spend their available resources (time, money, effort) on various consumption-related items. It involves understanding the factors that influence consumers' choices, preferences, and decision-making processes when they purchase goods or services.

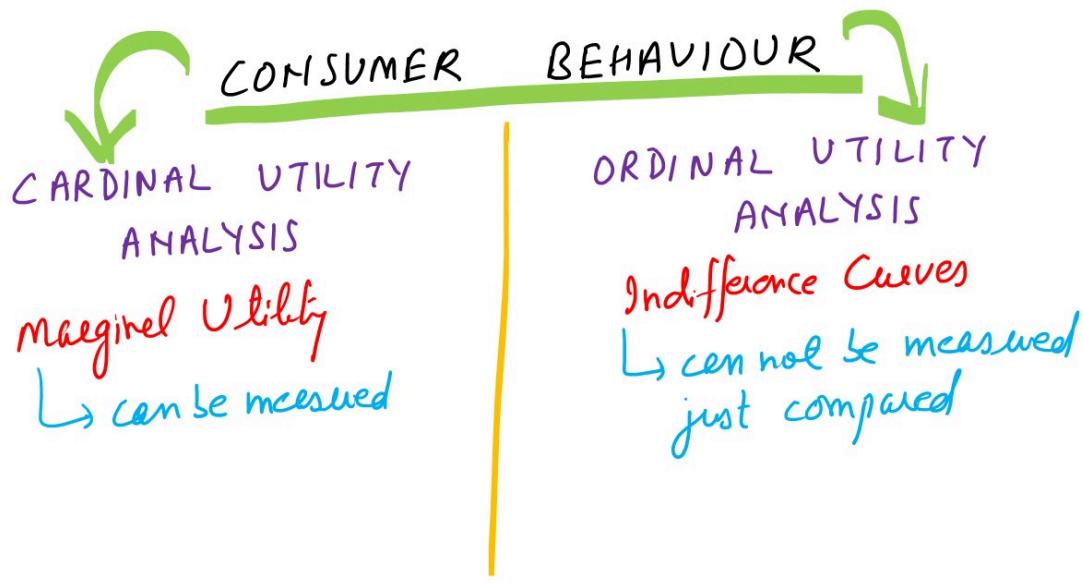


Managers use insights from consumer behavior to make informed decisions regarding product development, pricing, marketing strategies, and distribution. Understanding consumer behavior helps managers tailor their products or services to better meet the needs and desires of their target market, ultimately aiming to increase sales and profitability.

Two fundamental approaches used to analyze consumer behavior in economics are cardinal utility analysis and ordinal utility analysis.

2. Cardinal Utility and Ordinal Utility analysis

Marginal Utility Analysis and Indifference Curve Analysis are two important theories of consumer behaviour that are used to explain how consumers make choices among different goods and services.



Marginal Utility Analysis, also known as *Cardinal Utility theory*, was developed by **Alfred Marshall**. It focuses on the concept of marginal utility, which refers to the additional satisfaction or utility a consumer derives from consuming an additional unit of a good or service. The theory assumes that utility can be measured in cardinal numbers, and that consumers are rational and always seeking to maximize their utility. In other words, the theory assumes that consumers can rank their preferences and that they always choose the option that provides the most utility per unit of money spent.

For example, if a consumer is deciding between purchasing a chocolate bar or a bag of chips, the theory of Marginal Utility Analysis assumes that the consumer can quantify the amount of satisfaction or utility they would derive from each item and make their choice accordingly.

On the other hand, **Indifference Curve Analysis**, also known as *Ordinal Utility theory*, was developed by **John Hicks** and **Roy Allen**. It focuses on the concept of indifference curves, which represent all combinations of two goods that provide a consumer with the same level of satisfaction or utility. The theory assumes that utility cannot be measured in cardinal numbers, but only in ordinal numbers, which allow for comparisons between different options but not for precise quantification of the amount of satisfaction derived from each option.

For example, if a consumer is deciding between purchasing a chocolate bar or a bag of chips, the theory of Indifference Curve Analysis assumes that the consumer can only rank their preferences and determine which option they would prefer based on the combination of both items that provide the same level of satisfaction or utility.

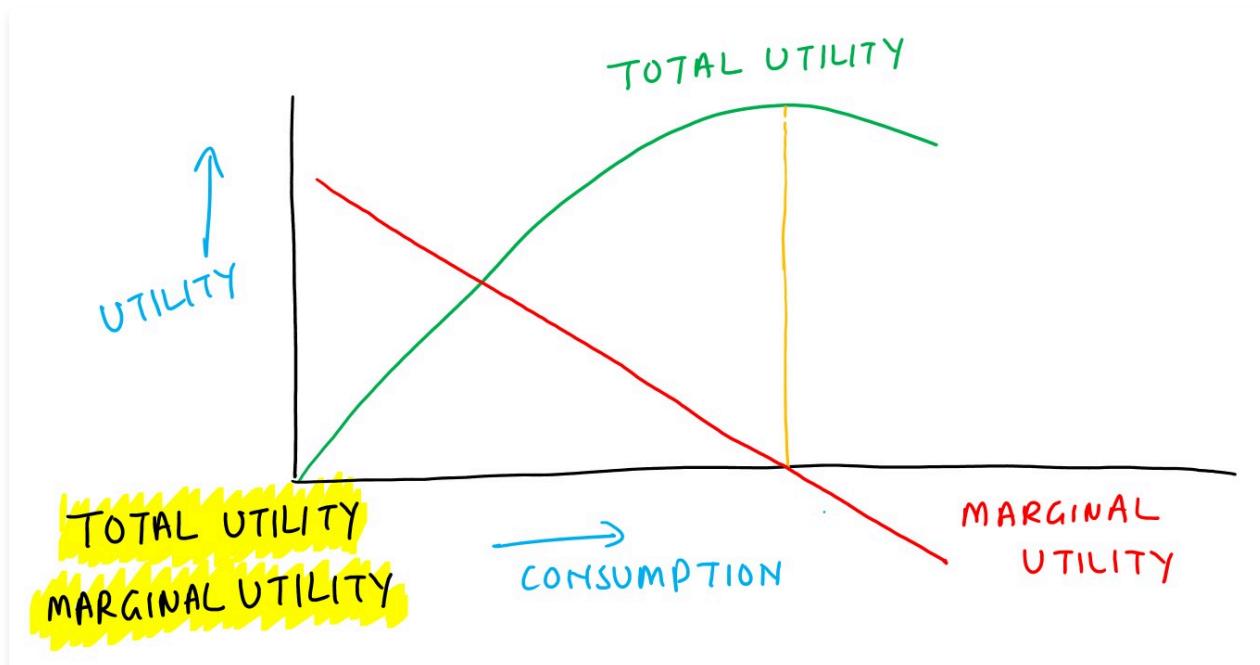
3. Cardinal Utility Analysis

Utility refers to the sense of pleasure or satisfaction that one experiences when consuming a good or service. It is a subjective concept that varies from person to person and is dependent on their tastes and preferences. For example, someone may derive a high utility from consuming spicy food, while another person may find it unpleasant.

A **commodity** can have different levels of utility for the same person at different places or times. For instance, a person may value a bottle of water highly in a desert environment where it is scarce, but not as highly in an area where it is abundant.

Ultimately, utility is a crucial component of the theory of consumer behaviour. It helps explain why people make certain choices when it comes to purchasing goods and services. By understanding what drives individuals' utility, economists can gain insights into consumer behaviour and predict demand for certain products.

3. Cardinal Utility Analysis



Total utility is the total satisfaction or pleasure an individual derives from the consumption of a good or service. Total utility is an aggregate measure and is not affected by the quantity of the good consumed at a particular time. For example, if a person drinks four glasses of water on a hot summer day, the total utility is the satisfaction or pleasure derived from the consumption of all four glasses of water combined.

Marginal utility, on the other hand, is the additional utility or satisfaction derived from consuming an additional unit of a good or service. It is the change in total utility as a result of consuming one more unit of the good or service. For example, if the first glass of water provides a total utility of 10 and the second glass provides a total utility of 7, then the marginal utility of the second glass is -3, which means that the second glass provides less satisfaction than the first glass.

3. Cardinal Utility Analysis

The Law of Diminishing Marginal Utility states that the more a person consumes a good or service, the less additional satisfaction or utility he or she derives from consuming an additional unit of that good or service. The law assumes that other factors such as income, prices, and tastes are held constant.

For example, the first slice of pizza may provide a great deal of satisfaction, but the second slice may not provide as much satisfaction as the first. The third slice may provide even less satisfaction than the second, and so on. Eventually, the marginal utility of consuming additional slices of pizza becomes negative, as the individual may start to feel sick or lose interest in eating more pizza.

Similarly, the first beer may provide a great deal of satisfaction, but additional beers may provide less and less satisfaction. This is because the individual is already feeling satisfied or drunk, and consuming more beer will not increase their satisfaction or utility.

3. Cardinal Utility Analysis

Although utility is subjective and difficult to measure objectively, assigning numerical values to the utility derived from each quantity consumed can help us quantify it. For example, if you were to drink glasses of water, you could assign values to each glass based on the level of satisfaction it provided.

Let's say the first glass provided you with 40 units of utility, the second with 20, the third with 10, and the fourth with 5. A fifth glass, if forced to drink it, would yield negative utility of -2 units. These values allow us to compare the total utility a consumer gets from different goods and the marginal utility they get from additional consumption.

4. Utility Maximization

AT CONSUMER EQUILIBRIUM

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z}$$

→ Marginal Utility (MU) per dollar is equal for all goods. Condition of Utility maximization

Utility maximization is the concept that individuals make decisions based on their preferences in order to achieve the highest level of satisfaction possible, given their budget constraints. In other words, they aim to get the most "bang for their buck" by allocating their resources in a way that maximizes their overall happiness or well-being.

Consumption Units	Pizza			Videos		
	Total Utility	Marginal Utility	Marginal Utility per dollar	Total Utility	Marginal Utility	Marginal Utility per dollar
1	56	56	7	40	40	10
2	88	32	4	68	28	7
3	112	24	3	88	20	5
4	130	18	2.25	100	12	3
5	142	12	1.50	108	8	2
6	150	8	1	114	6	1.50

For example, suppose the price of a pizza is Rs 8, the rental price of a video is Rs 4, and your income is Rs 40 per week. You will allocate your income between the two goods to maximize utility. Look at the data in the table on amount of utility for each unit of consumption for both Pizza and Videos.

Suppose you start off spending your entire budget of Rs 40 on pizza, purchasing 5 pizzas a week, which yields a total of 142 units of utility. You soon realize that if you buy 1 less pizza, you free up enough money to rent 2 movies. By doing so, you give up 12 units of utility, the marginal utility of the fifth pizza, to get 68 units of utility from the first two videos. Total utility thereby increases from 142 to 198. Similarly, you can keep decreasing consumption of pizza and keep increasing consumption of videos, till a point, where Total utility is maximized. This point is called **consumer equilibrium**.

Once equilibrium has been achieved, any change in your consumption pattern will decrease utility. Once a consumer is in equilibrium, there is no way to increase utility by reallocating the budget.

4. Utility Maximization

Consumer equilibrium is achieved when the marginal utility per dollar (Rupee here) spent on each good is equal. In other words, the last dollar spent on each good provides the same additional satisfaction. This means that one should continue to reallocate her budget until she reaches a point where the marginal utility per dollar spent on both goods is equal.

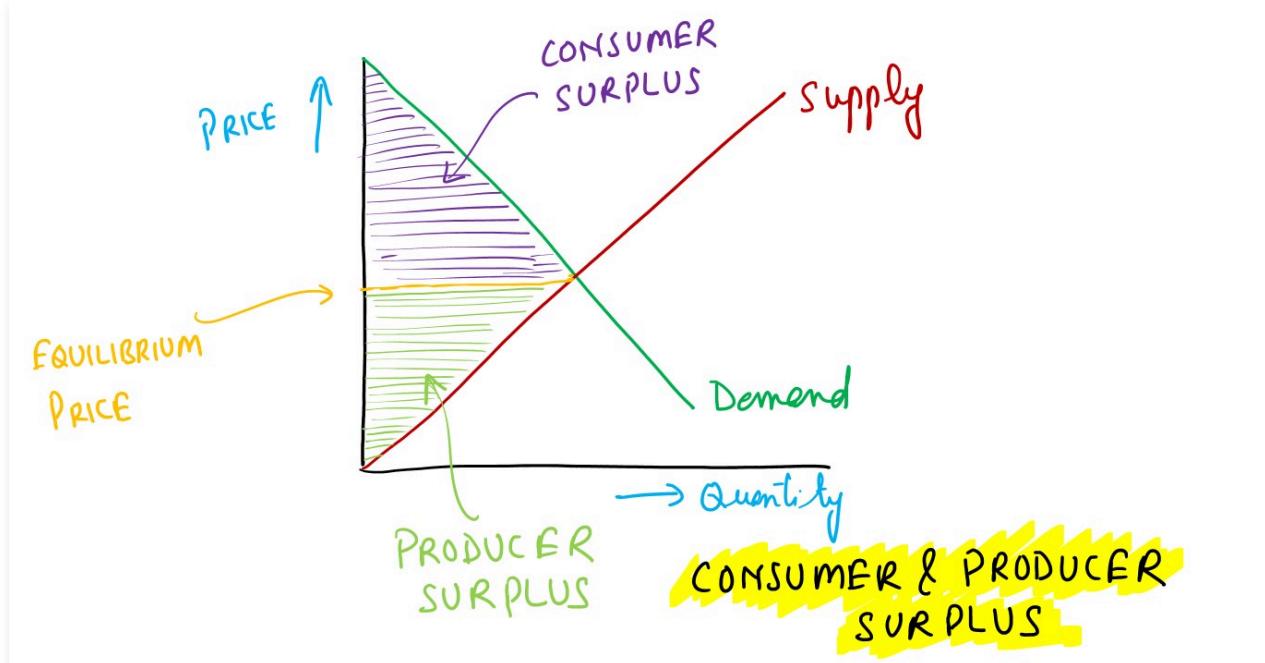
$$\left(\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} \right)$$

MU_X and MU_Y are Marginal Utilities for commodities X and Y and P_X and P_Y are the Prices of Commodities X and Y.

4. Utility Maximization

Consumer Surplus

Consumer surplus refers to the satisfaction or additional value that a consumer gets from a purchase over and above the price paid. It measures the difference between the price that a consumer is willing to pay for a product or service and the actual price that they pay. In other words, it is the benefit that the consumer receives from the transaction.



For example, let's say that Sunita is willing and able to pay Rs. 50 for a book that she wants to buy. However, the actual market price of the book is Rs. 40. In this case, Sunita would receive a consumer surplus of Rs. 10, which is the difference between the amount she was willing to pay and the actual price that she paid.

Consumer surplus can be represented graphically by plotting the demand curve, which shows the price that consumers are willing to pay for different quantities of a good or service. The area under the demand curve and above the market price represents the consumer surplus.

Producer Surplus

Producer surplus is the revenue that a producer obtains from a good or service over and above the price that they were willing to accept. It measures the difference between the market price and the minimum price that a seller is willing to accept to produce and sell a good or service.

For example, suppose that a coffee shop is willing and able to sell a cup of coffee for Rs. 20. However, the actual market price for a cup of coffee is Rs. 25. In this case, the coffee shop would receive a producer surplus of Rs. 5, which is the difference between the market price and the minimum price that they were willing to accept.

Like consumer surplus, producer surplus can also be represented graphically by plotting the supply curve, which shows the price that sellers are willing to accept for different quantities of a good or service. The area above the supply curve and below the market price represents the producer surplus.

Relationship between Consumer Surplus, Producer Surplus and Utility

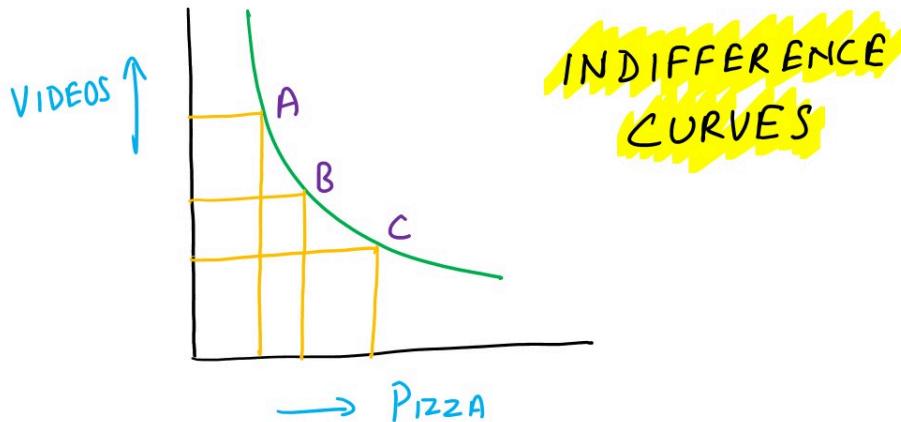
Consumer surplus is a measure of the satisfaction that a consumer gets from a purchase, while producer surplus is a measure of the revenue that a producer receives. Utility is a concept that refers to the level of satisfaction or happiness that a consumer derives from a good or service.

Consumer and producer surplus can be maximized when the market is in equilibrium, meaning that the quantity of a good or service supplied is equal to the quantity demanded. At this point, the consumer surplus and producer surplus are at their maximum, and the price of the good or service reflects its true value to both consumers and producers.

5. Ordinal Utility Analysis

Economists have developed another, more general, approach to consumer behaviour, one that does not rely on a numerical measure of utility. All this new approach requires is that consumers be able to indicate their preferences for various combinations of goods. For example, the consumer should be able to say whether combination A is preferred to combination B, combination B is preferred to combination A, or both combinations are equally preferred.

6. Indifference Curve Analysis



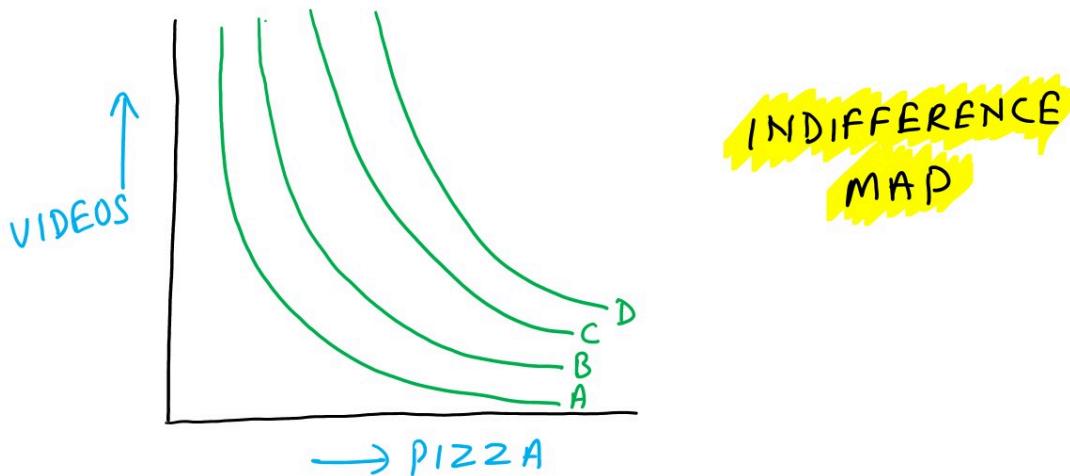
An indifference curve shows all combinations of goods that provide the consumer with the same satisfaction, or the same utility. Thus, the consumer finds all combinations on a curve equally preferred. Because each bundle of goods yields the same level of utility, the consumer is indifferent about which combination is actually consumed. Hence the name is indifference curve. An indifference curve is also called **Iso-utility curve** or **Equal utility curve**.

For you to remain indifferent among consumption combinations, the increase in your utility from eating more pizza must just offset the decrease in your utility from watching fewer videos. Thus, along an indifference curve, there is an inverse relationship between the quantity of one good consumed and the quantity of another consumed. Because of this inverse relationship, indifference curves slope downward.

The **marginal rate of substitution (MRS)** measures the rate at which a person is willing to trade off one good for another while maintaining the same level of satisfaction, or utility. The MRS between two goods, such as pizza and videos, is the absolute value of the slope of the indifference curve at the point where the person is consuming a certain combination of the two goods. The marginal rate of substitution of pizza for video rentals can be found from the marginal utilities of pizza and videos.

$$\text{Marginal Rate of Substitution (MRS)} = \left| \frac{\text{MU}_{\text{pizza}}}{\text{MU}_{\text{videos}}} \right|$$

The **law of diminishing marginal rate of substitution** describes how the amount of one good that a person is willing to give up for another good decreases as they consume more of the first good. This law helps to explain the shape of indifference curves. As you move down an indifference curve, the slope becomes less steep, indicating that the consumer requires more of one good to compensate for the loss of the other good. This is because the marginal utility of each good declines as the consumer consumes more of it, meaning that they are willing to give up less of it in exchange for the other good.



In our case, as the consumption of pizza increases, the number of videos that you are willing to give up to get another pizza declines. Because your marginal rate of substitution of videos for pizza declines as your pizza consumption increases, the indifference curve has a diminishing slope, meaning that it is **convex to origin**.

As you move down the indifference curve, your pizza consumption increases, so the marginal utility of additional pizza decreases. Conversely, the number of movies you rent decreases, so the marginal utility of movies increases. Thus, in moving down the indifference curve, you require more pizza to offset the loss of each video.

We have focused on a single indifference curve, which indicates some constant but unspecified level of utility. We can use the same approach to generate a series of indifference curves, called an **indifference map**. An indifference map is a graphical representation of a consumer's tastes. Each curve reflects a different level of utility. Part of such a map is shown in the figure.

Curves farther from the origin represent greater consumption levels and, therefore, higher levels of utility. Curve D in the figure will have higher utility in comparison to curve C or B or A.

Indifference curves **cannot intersect** because they represent different levels of utility, and a single point cannot have two different levels of utility. If two indifference curves were to intersect, then there would be a point on both curves that represents the same level of utility, which would create a contradiction

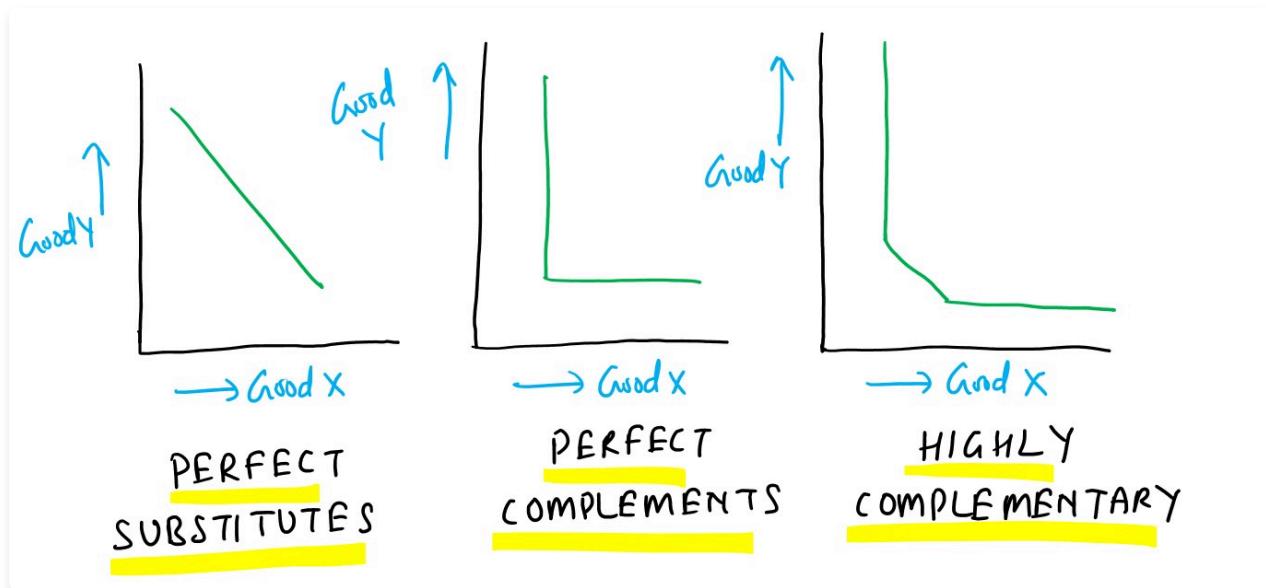
6. Indifference Curve Analysis

The Indifference Curve Approach, also known as the Ordinal Utility Approach, is based on several assumptions:

1. **Rationality:** The consumer is assumed to be rational and aims to maximize total satisfaction given his income and prices of the goods and services he consumes. Consumer decisions are consistent with this objective.
 2. **Ordinal utility:** The analysis assumes that utility is only ordinally expressible, meaning that the consumer is only able to express the order of his preference for different baskets of goods.
 3. **Transitivity and consistency of choice:** The consumer's choices are assumed to be transitive, meaning that if the consumer prefers A to B and B to C, he must prefer A to C.
 4. **Non-satiety:** The consumer is never over-supplied with goods and has not reached the point of saturation in any commodity. Therefore, the consumer always prefers a larger quantity of all goods.
 5. **Diminishing marginal rate of substitution:** The marginal rate of substitution is the rate at which the consumer is willing to substitute one commodity (X) for another (Y) so that total satisfaction remains the same. The analysis assumes that the marginal rate of substitution decreases as the consumer continues to substitute X for Y.
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6. Indifference Curve Analysis

There are cases when the indifference curve does not have a convex shape, which are as follows:



Case 1: Perfect Substitutes

If two goods X and Y are perfect substitutes, the indifference curve is a straight line with negative slope. This is because the marginal rate of substitution (MRS) is constant and equal to the negative of the slope of the indifference curve. The value of this slope is always -1, and $MRS = 1$. In this case, the consumer does not distinguish between these two goods and regards them as the same commodity. Examples of perfect substitutes include two brands of tea, two types of sugar, etc.

Case 2: Perfect Complements

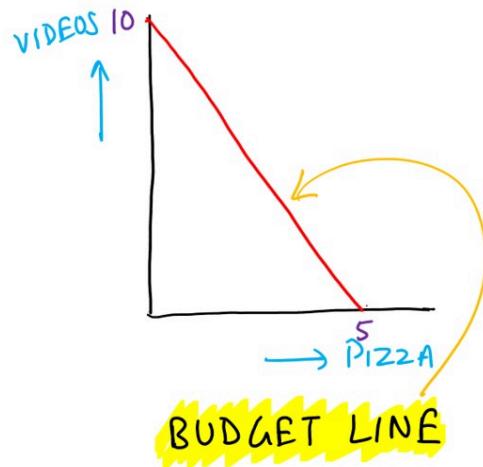
If two goods X and Y are perfect complements, the indifference curve is right-angled or L-shaped. The vertical portion of the indifference curve indicates that no amount of reduction in good Y will lead to an increase in good X. The MRS is zero. Examples of perfect complements include left and right shoes, a car and its tires, etc.

Case 3: Highly Complementary Goods

In the case of highly complementary goods, the indifference curve has a sharp curvature near the bend. The consumer substitutes X for Y at and near the bend of the curve. In the diagram, X and Y will be substituted for each other within the narrow range A and B of the indifference curve. Examples of highly complementary goods include tires and tubes, electricity and electric appliances, etc.

7. Budget Line

The **budget line** represents various combinations of videos and pizzas that can be purchased within a given budget, based on their respective prices.



For instance, if videos rent for Rs 4, pizzas sell for Rs 8, and your weekly budget is Rs 40, you can either afford 10 videos or 5 pizzas. The budget line intersects the vertical axis at 10 videos and the horizontal axis at 5 pizzas, connecting the two intercepts. This line represents your budget constraint and the **consumption possibilities** available to you.

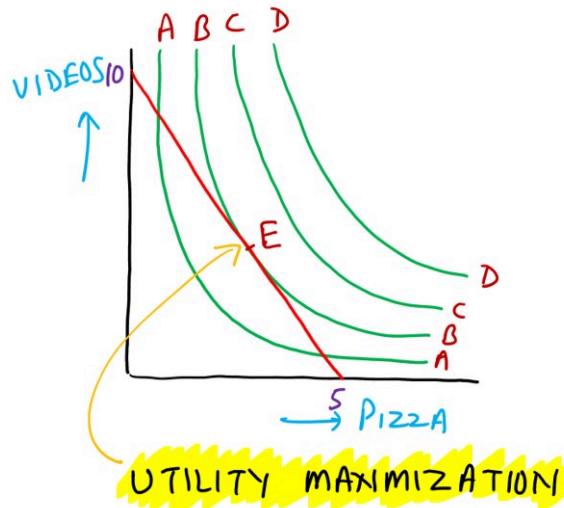
To calculate the slope of the budget line, we divide the vertical change by the horizontal change. The slope of the budget line **only depends on relative prices**, not on the level of income. In the example given, the slope is -2 (Price of Pizza / Price of video), indicating that for each additional pizza purchased, two videos must be foregone.

Slope of budget line = $(- \frac{Y \text{ intercept}}{X \text{ intercept}}) = - \frac{\text{Total income/Prices of Videos}}{\text{Total income/Price of Pizzas}} = - \frac{\text{Price of Pizzas}}{\text{Price of Videos}}$

While the budget line represents what you are **able to buy**, the indifference curve shows what you are **willing to buy**. By combining these two elements, we can determine the specific quantities of videos and pizzas that you are both willing and able to purchase.

8. Consumer Equilibrium at Tangency

As always, the objective of consumption is to maximize utility. We know that indifference curves farther from the origin represent higher levels of utility. You, as a utility-maximizing consumer, will select a combination along the budget line in figure that lies on the highest attainable indifference curve. It is shown by point E, at which budget line is tangent to indifference curve B.



Because you maximize your utility at point E, that combination is an equilibrium outcome. Note that the indifference curve is tangent to the budget line at the equilibrium point, and at the point of tangency, the slope of a curve equals the slope of a line drawn tangent to that curve.

At point E, the slope of the indifference curve equals the slope of the budget line. Recall that the absolute value of the slope of the indifference curve is your marginal rate of substitution, and the absolute value of the slope of the budget line equals the price ratio of two goods. In equilibrium, therefore, marginal rate of substitution between videos and pizza, MRS, must equal the ratio of the price of pizza to the price of video rentals.

Marginal Rate of Substitution = $(\frac{MU_{\text{pizza}}}{MU_{\text{videos}}})$ = Slope of budget line = $(\frac{\text{Price of pizzas}}{\text{Price of videos}})$

which can be rewritten as:

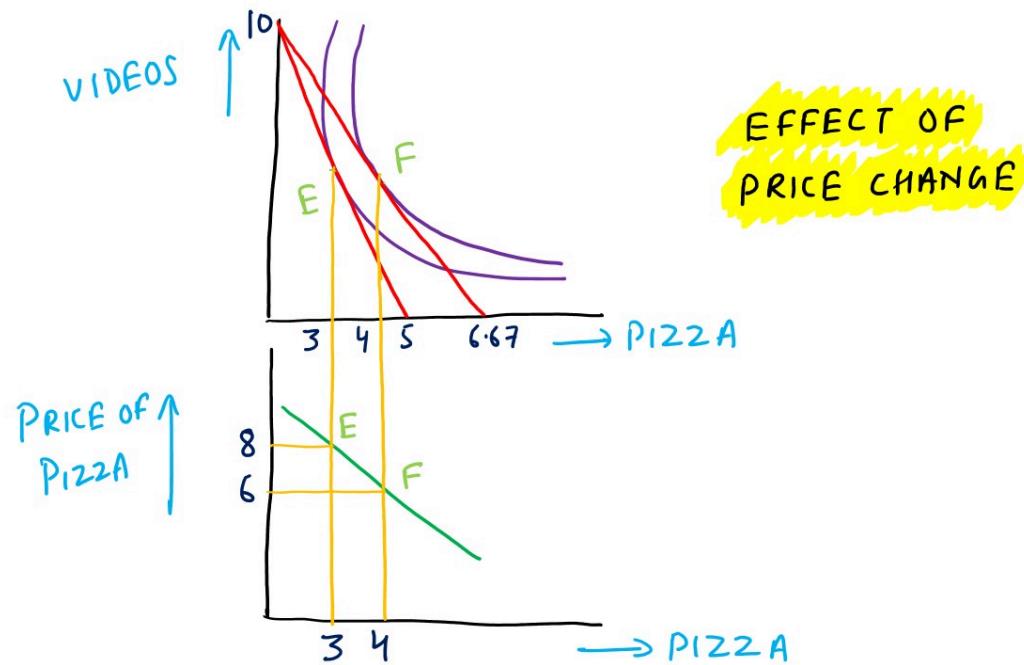
$$= (\frac{MU_{\text{pizza}}}{Price \ of \ Pizzas}) = \frac{MU_{\text{videos}}}{Price \ of \ videos}$$

Recall that, this is same equilibrium point, when the consumer maximizes utility, i.e. the last dollar spent on each good yields the same marginal utility.

$$(\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y})$$

8. Consumer Equilibrium at Tangency

Let us discuss, what happens to your equilibrium consumption when there is a change in price. The answer can be found by deriving the demand curve. We begin at point E, our initial equilibrium, where we consume 3 pizzas and watch 4 videos per week.

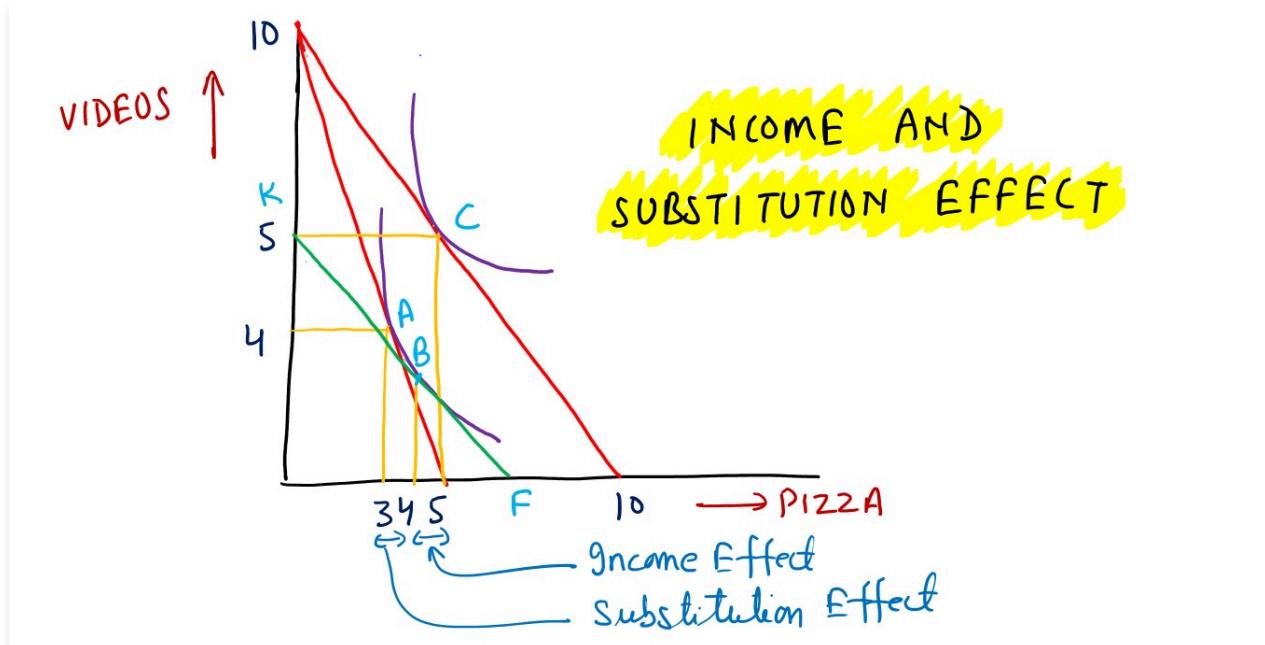


Suppose that the price of pizzas falls from Rs 8 to Rs 6 per unit, other things constant. After the price of pizza changes, the new equilibrium occurs at F, where pizza purchases increase from 3 to 4 and, as it happens, video rentals remains at 4. Thus, price and the quantity of pizza demanded are inversely related.

Because you are on a higher indifference curve at F, you are clearly better off after the price reduction (your consumer surplus has increased).

9. Income and Substitution Effects

The law of demand was initially explained in terms of an income effect and a substitution effect of a price change. Suppose the price of a pizza falls from Rs 8 to Rs 4, other things constant. You can now purchase a maximum of 10 pizzas with a budget of Rs 40 per week. As shown in the figure, the budget-line intercept rotates out from 5 to 10 pizzas. After the price change, the quantity of pizzas demanded increases from 3 to 5. The increase in utility shows how you benefit from the price decrease.



The increase in the quantity of pizzas demanded can be broken down into the substitution effect and the income effect of a price change.

The substitution effect is shown by the move from point A to point B in response to a change in the relative price of pizza, with your utility held constant along first curve. The income effect is shown by the move from B to C in response to an increase in your real income, with relative prices held constant.

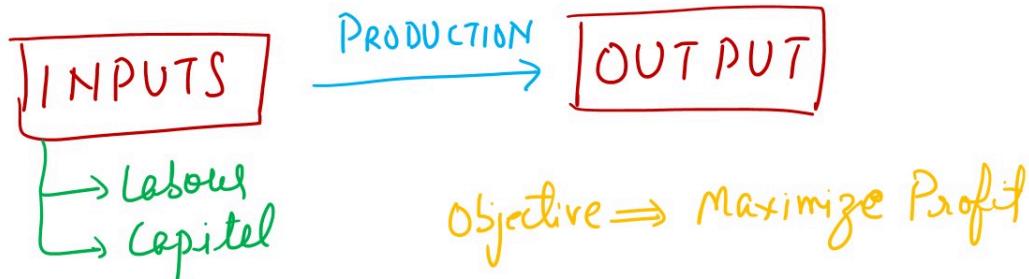
The substitution effect is often larger than the income effect due to 2 reasons:

Availability of substitutes: If there are readily available substitutes for a good whose price has changed, consumers are more likely to switch to those substitutes. This is especially true in markets with high competition and a wide variety of alternatives. For example, if the price of one brand of cereal decreases, consumers can easily switch to another brand without much inconvenience.

Price sensitivity: Consumers tend to be more sensitive to changes in price than changes in income. Price changes directly impact the cost of purchasing a good, whereas changes in income may not immediately influence spending behavior. People are generally more responsive to changes that affect their immediate purchasing decisions.

1. Introduction

Till now, you were asked to think like a consumer, or demander. Now, you must think like a producer, or supplier.



With demand, we assume that consumers try to maximize utility, a goal that motivates their behaviour. With supply, we assume that producers try to maximize profit, and this goal motivates their behaviour. Firms transform resources into products to earn a profit. Over time, firms that survive and grow are those that are more profitable.

Managers need to understand production analysis to optimize resource allocation, control costs, and make informed decisions, ensuring efficient operations and competitive positioning in the business landscape.

2. Production Function

Production function explains the relationship between inputs and output in the production process of goods and services. It represents the maximum amount of output that can be produced with a given set of inputs, assuming that all inputs are used efficiently. In other words, it is a mathematical function that shows the relationship between the inputs used in production, such as labour, capital, and raw materials, and the resulting output produced.

The production function can be written as:

$$Q = f(K, L, M)$$

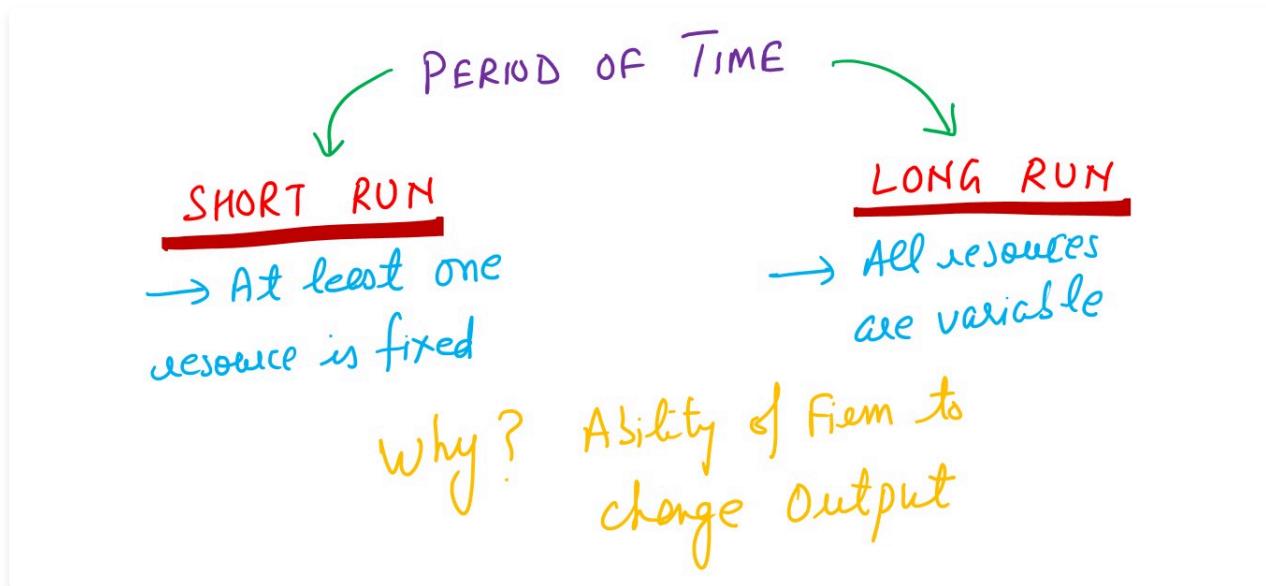
where Q is the quantity of output produced, C represents capital, L represents labour, and M represents raw materials or other inputs.

The production function is related to technological efficiency because it assumes that all inputs are used efficiently to produce the maximum amount of output. **Technological efficiency** refers to the ability to produce the maximum amount of output with the minimum amount of inputs, given the state of technology.

Studying the production function is important because it helps us understand the relationship between inputs and output, and how changes in inputs can affect output.

3. Short run and Long run

In economics, the short run and the long run refer to different time periods when a firm is making production decisions. These periods are important because they affect the firm's ability to change the quantities of its resources, and therefore, its output level.



The **short run** is the period of time in which at least one resource is fixed. This means that the firm cannot easily change the quantity of that resource. For example, if a restaurant wants to increase its output level in the short run, it can hire more waiters, cooks, or buy more ingredients. However, it cannot easily increase the size of its building or kitchen space, which are fixed resources. Thus, the restaurant is limited in its ability to expand in the short run.

On the other hand, the **long run** is the period of time in which all resources can be varied. This means that the firm has more flexibility to change the quantity of all its resources, including fixed resources such as buildings or equipment. For example, a restaurant that wants to increase its output level in the long run can not only hire more waiters and cooks, but also expand its kitchen and dining space. This allows the restaurant to increase its capacity and serve more customers.

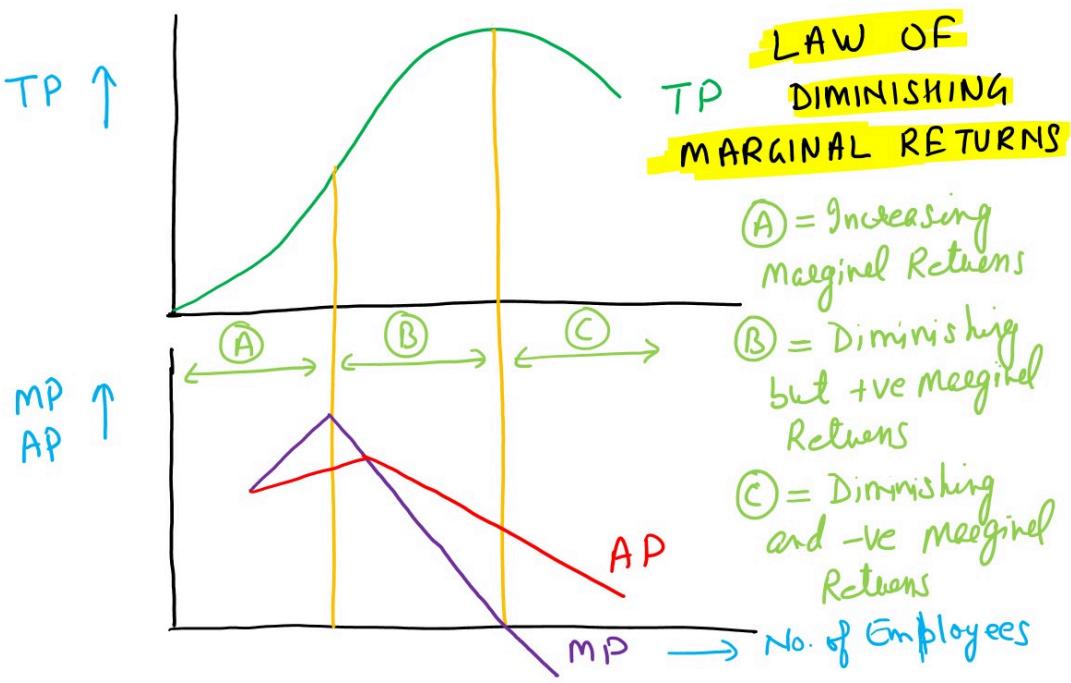
To illustrate, let's consider a car manufacturer. In the short run, the manufacturer has a fixed plant size, which limits its output. If the demand for cars increases, the firm can increase its output in the short run by hiring more workers and increasing their hours. However, if the demand for cars remains high, the firm will eventually need to expand its production capacity in the long run by building a new plant or expanding its existing one. In the long run, the firm can also invest in new technologies and equipment to improve its efficiency and increase its output further.

The length of the long run varies from industry to industry depending on the nature of production. For instance, the long run for a fast-food restaurant chain like McDonald's may be shorter than that of an automobile manufacturing plant. This is because a McDonald's outlet can be expanded more easily and quickly than an auto plant, which requires more complex machinery and a larger infrastructure.

4. Production in Short Run

Consider a restaurant owner, who may analyze the cost of producing an additional dish to determine whether it is profitable to add it to their menu. He would need to consider the cost of the ingredients, the cost of the labour required to prepare the dish, and the price at which they can sell it. By analyzing the product in the short run, he can make a decision about whether or not to add the dish to their menu based on whether it will generate a profit.

4. Production in Short Run



The law of diminishing marginal returns states that as you add more units of a variable resource (such as labour) to a fixed amount of other resources (such as capital), the marginal product of that variable resource will eventually decrease. In other words, there comes a point, where adding more of a variable resource actually reduces the overall output.

Law of Diminishing Returns is also called **Law of Returns to a Variable Input** or **Law of Variable Proportion**.

Let's consider an example of a pizza restaurant that has a fixed amount of kitchen space and equipment (capital) but can hire more employees (labour) to make pizzas. The following table shows the relationship between the number of employees (Variable resource) and the total product (TP) and marginal product (MP):

Units of Labour	Total Product	Marginal Product	Average Product
0	0	N/A	0
1	10	10	10
2	25	15	12.5
3	40	15	13.33
4	52	12	13
5	60	8	12
6	64	4	10.6
7	66	2	9.4
8	66	0	8.2

At first, as the pizza restaurant hires more employees, the TP (total number of pizzas produced) increases rapidly. This is because each new employee (variable resource) can take on different tasks, such as making the dough, adding toppings, and putting pizzas in the oven, and therefore increases the overall output (TP). Because the marginal product (MP) increases, the firm experiences **increasing marginal returns** from labour as each of the first 3 employees are hired.

However, after the third employee, the MP (additional pizzas produced by each new employee) starts to decline. This means that while the TP is still increasing, the rate of increase is slowing down. Finally, when the restaurant hires its 8th employee, the

MP becomes zero, indicating that the additional employee does not contribute to the production of any additional pizzas. After that MP becomes negative.

This example illustrates the law of diminishing marginal returns as the restaurant hires more employees (variable resource), the additional output (MP) they produce eventually decreases because the fixed amount of kitchen space and equipment limits how many pizzas can be made at a time.

The figure illustrates the relationship between TP and MP, using data from our table. Note that because of increasing marginal returns, MP increases with each of the first 3 workers. With MP increasing, the TP at an increasing rate. But once decreasing marginal returns set in, which begins with the 4th worker, MP. The TP still continues to increase but at a decreasing rate. As long as MP is positive, the TP increases. Where MP turns negative, the TP starts to fall.

The Average Product (AP) curve reaches a maximum at a point where the AP and the MP are equated.

The figure summarizes all this by sorting production into three ranges:

1. Increasing marginal returns:

- TP is increasing at increasing rate
- MP is rising
- AP is rising

2. Diminishing but positive marginal returns

- TP is increasing but at decreasing rate
- MP is falling and is positive
- AP is rising till then point AP=MP, then AP starts falling

3. Negative marginal returns

- TP is decreasing
- MP is falling and is negative
- AP is falling but it is always positive