# *POE Notes Till Chapter 11*

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# *Chapter-1*

Opportunity cost: The best alternative we forgo or give up to choose other alternative.
eg: you choose to watch a movie, opportunity cost for movie is 3hours of your time and money to buy the ticket. Now if you had infinite time, you wouldn't have to think of the opportunity cost for watching a movie. You could watch a movie and then study. Therefore, opportunity cost is applicable when resources are scarce.

Utility: Satisfaction derived when we consume a product.

Marginalism: Process of analyzing the additional costs or benefits arising from a decision.
Marginal cost: additional cost arising from the decision
Marginal Revenue: additional revenue arising from the decision.
MR > MC --> Profitable decision.
Eg: We are making 100 goods initially, if we decide to make another 1, cost of making another 1 is MC.
Profit generated from that 1 pdt. is MR.

Marginal utility: Additional utility arising from a decision.
eg: in a household, if they consumed 5 units of ice cream and they think of going for another 1 unit.
They'll compare MC with MU. if MU is higher, they'll go for another unit of ince cream.

Sunk costs: cost that can not be recovered if the company decides to leave the industry.
for ex: telecom industry has high sunk costs, therefore there is less competition in the industry.
you advertise your company, but then you exit the industry, so advertisement cost becomes a sunk cost.
Therefore, higher sunk costs also act as a barrier to prevent companies joining an industry, thus less competition.

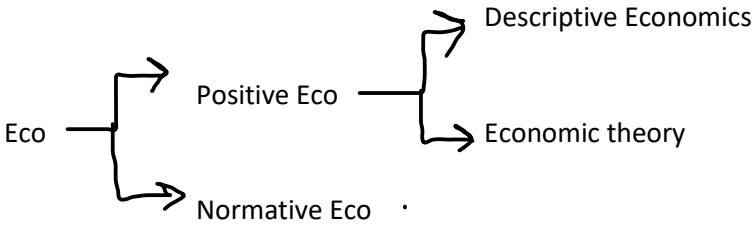
efficient market: a market where profit opportunities are eliminated almost immediately.
eg: you're at a retail store checkout corner, there are 4 lines and one line has less ppl, then ppl would rush to that line,
so the profit opportunity of saving time is eliminated almost immediately.

microeconomics: economics of individual-decision making units like companies, household.
macroeconomics: economics on a national scale including factors like income, employment, output.

Positive economics: economic behaviours are not evaluated as good or bad, they just try to explain how these behaviours work. No judgements made, just facts stated.
Normative economics: economic behaviours are evaluated as good or bad, and how they can be made better and prescribe courses of action. Also called policy economics.
Judgements are made, facts are stated, and course of action to make economic systems better is stated.

printing too much money causes inflation --> positive eco (just facts stated)
unemployment should be lower --> normative eco (judgement is made)

People work harder if the wage is higher --> positive eco (just fact stated)




Descriptive Eco: Simple Compilation of data that describes phenomena and facts.
Economic theory: statement or related statements about cause and effect, action and reaction.
Eg: when price of goods increase(action), less people buy it.(reaction)

Output efficiency: goods produced satisfy consumer's needs.
Production efficiency: resources are used efficiently to produce goods.

# ***Theories and Models***

Model : A formal statement of a theory, usually defines the relationship between two variables.
Eg: when inflation is high, RBI increases its repo rate, thus increasing the interest rate of loans. So repo rate is made proportional to inflation. Repo rate is increased when inflation is increased to reduce inflation as cash flow will be less(chill maar, you don't have to understand all this rn, just know model's definition).
Eg: if inflation is increased, repo rate will be increased thus interest rates will be increased which will lessen the investments made, this will lead to lower employment. Therefore, inflation is inversely proportional to employment.

Variable: a measure that can change from time to time or observation to observation.
Eg: Income

Ockham's razor: The principle that irrelevant details should be removed.
It is a philosophical idea stating that if there are multiple sets of explanation, probably the simplest one is the correct one.

Ceteris paribus/ all else equal : a device used to measure the relationship between two variables by keeping other variables in the equation constant.
Eg: when we try to measure the relationship between price and demand, it can be that price has doubled, but your income might also have doubled. Therefore, demand might not change even if price did. So we keep the income variable constant.

Empirial economics: the collection and use of data to test economic theories.

## *Cautions and Pitfalls*

1) Post hoc, ergo propter hoc fallacy: If event A happens before event B, it doesn't necessarily mean the event A caused event B.
   When event A is not the cause of B, you can't write "event A happened, therefore event B happened".
   Eg: cities that have high crime rate also have more number of cars, but that doesn't mean that cars cause crime.

2) Fallacy of Composition: Something which is true for a part is not necessarily true for the whole.
   Eg: all cattlemen bring their cows to graze the same land.
   If one cattleman decides to bring more cattle to feed, his income will increase.
   But if everyone decides to bring more of their cattle to feed, then the land will be overgrazed and barren.
   As a result, everyone will lose their income from milk production.
   So, income would have increased if only one person(part) did it, but if everyone(whole) does it, income falls.

## ***Judging economic policies***

Criteria to judge economic outcomes is:

1) Efficiency
2) Equity
3) Growth
4) Stability

Efficiency: An economy is efficient if it can produce what consumers want at the least possible cost.
Equity: If the policy implemented will bring equity to the society, that is, it will help in upliftment of the financially weak.
Growth: Overall outcome is increasing.
Stability: A condition in which growth in output is steady, inflation is low and resources are fully employed.

# *Chapter-2*

Factors of production: Resources used for the process of production.
Outputs: Usable product.
Capital: Products which are used to produce other products. Eg: machinery

Three key features of a society:

1) What gets produced?
2) How is it produced?
3) Who gets the products?

In a ***Single Person*** economy, suppose:
Bill is trapped in an island, features of this society:

1) What gets produced? → food, shelter, fire
2) How is it produced? → goes for hunting/ wood / pick berries
3) Who gets the products? → One man economy, so the question is irrelevant as only one person is there.

If he goes to get meat, he will have less time for berries. Trade-off is between berries and meat. He has to do this trade-off as time is scarce. Therefore, opportunity cost comes into play only when resources are scarce.
So, opportunity cost for meat is berries.

In ***Two Person*** economy:
Bill and Colleen are trapped in an island.
What are the possibilities:

1) One of them becomes the leader and decides for both of them.
2) The two may agree to cooperate and work on what they're good at.
3) They may live apart and independently, but trade among themselves if they want to.

Based on the one option they choose from the above, we can answer the three questions:

1) What gets produced?
2) How is it produced?
3) Who gets the products?

The two theories of a producer's advantage:

Absolute Advantage: A producer has an absolute advantage if it uses less resources to produce (thus, lower absolute cost of production).
Comparative Advantage: A producer has a comparative advantage if it can produce the product with a lower opportunity cost.

Colleen and Bill:

**Case-1:** Colleen cuts more log in 1 day than bill.
Bill picks more fruits in 1 day than colleen.
So, Colleen has absolute advantage in logs and Bill has in fruits.
Specialization will be thus done: Colleen cuts logs and Bill picks more fruits.
Production in a day
B→ 10 berries / 8 logs
C→ 5 berries / 20 logs

Production in a month without specialization
(15 days of berry picking and 15 days of wood)
B→ 150 berries / 120 logs
C→ 75 berries / 300 logs
Total Produce: 225/420

Production in a month with specialization
(B picks berries, C picks logs)
B→ 300 berries/ 0 logs
C→ 0 berries/ 600 logs
Total Produce: 300/600

We see that specialization is better, thus they can trade whatever they need after specialized production.

**Case-2:**
Colleen has an absolute advantage in both logs and fruits. But he has limited time, so they will have to divide work. As acc. To absolute advantage bill should be sitting and chilling, but some work is better than no work, and to decide what B should specialize in, we use comparative advantage which compares opportunity cost to manufacture one product over another.

Production in a day
B→ 8 berries / 4 logs
C→ 10 berries / 10 logs
Here, we will check comparative advantage to allot work to B. So, we have to compare opportunity costs.
There are only two alternatives, berry & logs.
B takes opportunity cost for 1 berry as ½ log. (Time to get 1 berry is equal time to get ½ log for B)
C takes opportunity cost for 1 berry as 1 log. (Time to get 1 berry is equal time to get 1 log for C)

As opportunity cost for producing berries is lower for B, B will produce berries.
(If C was producing berries we would lose 1 log for every berry, but when B will produce berry we will lose only ½ log for every berry)
Production in a month
B→ 240/0
C→ 0/300
Total→ 240/300 -----(A)

Therefore, absolute advantage might fail in a few cases, but comparative never fails. So comparative advantage is preferred to compare producers.

Now, if they both want to produce equal number of berries and logs on their own in a month:
B will produce berries and logs in a 2:1 time ratio.
So, B will produce berries for 10 days = 80 berries and produce logs for 20 days = 80 logs.
C will produce in 1:1 time ratio.
So, C will produce berries for 15 days = 150 berries and produce logs for 15 days = 150 logs.

Total = 230/230 ----(B)
We see that (A) is better than (B), therefore specialization is necessary.

***Combination of Specialization and Trade***
If they want to produce equal number of berries and logs together.
B→ 8*30=240 berries (B→ Full specialization)
C→10*27=270 logs + 10*3=30 berries (C→ Partial Specialization; as C has an absolute advantage as well)
Total→270/270 ---- (C), here berries produced are more than (A), but logs produced are lesser than (C)

After the production, let's see the trade they do:
B gives away 140 berries and gets 100 logs. B finally has 100/100
C gives away 100 logs and gets 140 berries. C finally has 170/170.
Now, this is a good trade for both.
B produces 1 berry in ½ log's time. B gives away 140 berries, so it expects 70 logs atleast but gets 100.
C produces 1 berry in 1 log's time. C gives away 100 logs, so it expects 100 berries but gets 140.

B gives away 1 berry to C, B expects atleast ½ log from C.
C gets 1 berry from B, it can give max. of 1 log to B.
So the Term Of Trade (TOT) for 1 berry is between ½ and 1 log. (ie) ½ log < 1 berry < 1 log.
Here, 140 berries = 100 logs, so 1 berry = 100/140 = 0.714
So TOT is 0.714.

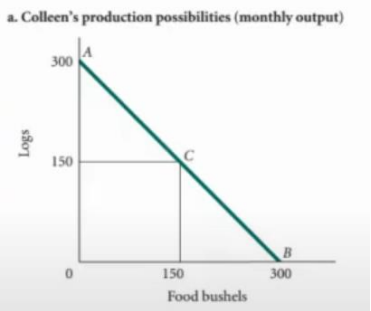


*Figure 2: This graph is production possibility of C*

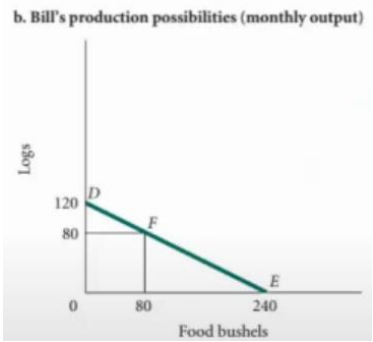
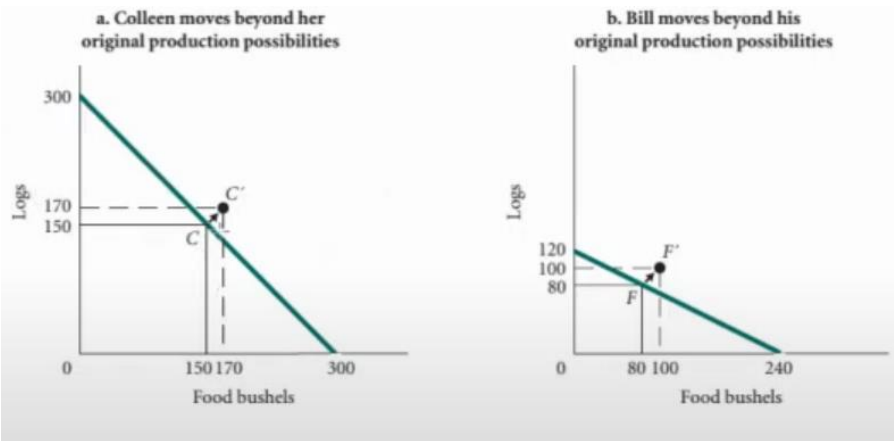


*Figure 1: This graph is production possibility of B*




This is (C), where they specialize and trade, this helps them reach production possibilities higher than what they would have got originally.

Trade-off between present and future costs and benefits
If Bill owns a land which grows wild berries, he has two options: pluck those wild berries now or clear the land and sow seeds for better production and a secure future.

If he decides to sow seeds now: He is trading present value for future value.

Consumer goods: Goods for present consumption. Will give benefit in present.
Investment: Resources used to generate new capital.
Capital goods: products used to produce other valuable goods or services. Will give benefit in future. Eg: Machinery.

Consumer vs Capital goods
Consumer goods will give benefit in the present but Capital goods will give benefit in the future.
Resources are scarce, you can either make consumer or capital goods with given resources, so there is always a trade-off.

Production Possibility Frontier (ppf): A graph that gives all possible combination of goods and services that can be produced if all resources are used efficiently in the society.

Opportunity cost of producing more capital goods is producing lesser consumer goods.

In the graph, opportunity cost of producing total 550 capital goods is producing only 1100 consumer goods.

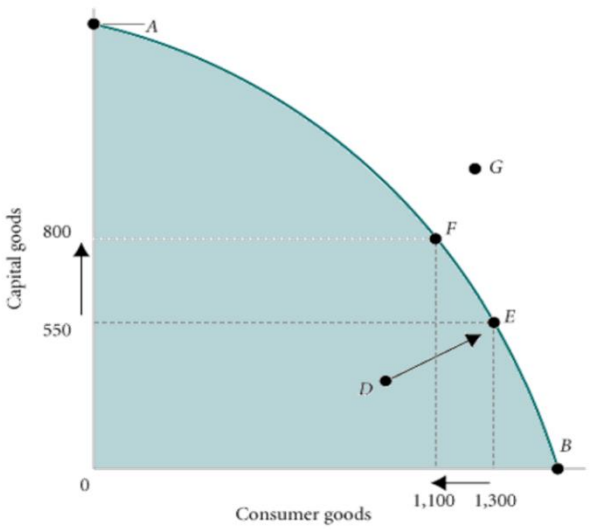



*Figure 3: Production Possibility Frontier (ppf)*

See the point D in the graph, it shows a point which is not on curve. Thus, D shows the point where society is not using its resources efficiently. D can move to E on curve if resources are used efficiently.
G is not possible with the given resources and present technology.

Points on the curve: denote full resource employment and production efficiency.
Points inside the area of curve: denote resource unemployment and production inefficiency.

If opportunity cost for making one good over another is ***constant,*** then ppf is linear.
If opportunity cost for making one good over another is ***increasing,*** then ppf is concave to the origin.
If opportunity cost for making one good over another is ***decreasing,*** then ppf is convex to the origin.

Production Inefficiency: Industrial Plants run at less than their total capacity. Thus, leading to unemployment of labour and capital. This not only happens because of mismanagement of individual pvt. firms but also due to mismanagement of the entire economy.

Marginal Rate of Transformation (MRT): Rate at which one good must be sacrificed to produce a single extra unit of another good.

For ex: corn(y-axis) and wheat(x-axis) production are taken in ppf graph.
There is a point where mrt is 1:1 (ie) we have to lose 1 wheat crop to gain 1 corn crop.
Going higher on y-axis (further increase in corn production) will give mrt of 2:1 at a point (ie) we have to lose 2 wheat crops to gain 1 corn crop. (see ppf graph)
The opportunity cost to manufacture corn increases because:

> Presumably, land best suited for corn is already in use for corn, additional corn production will happen in less-suited land, so less produce.
> In the same way, land best suited for wheat production is already producing wheat.

This increasing opportunity cost makes the curve what it is.

Economic Growth: Increase in total output of an economy. It occurs when society acquires new resources or learns to produce more using existing resources.

Increase in resources: Could mean larger labour force or increased capital stock
Increase in productivity: use of new machinery and equipment, technological change and innovation increases productivity of the workers and helps in application of newer, more efficient production techniques.

Two main reasons for economic growth are: accumulation of capital and technological advances.

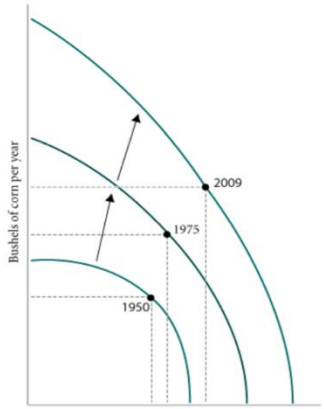


*Figure 4: Effect of eco growth on PPF*

Economic Growth shifts PPF up and to the right.
Investing in *capital goods* shifts PPF up and to the right at a faster rate.

Rich countries find it easier than poor countries to devote resources to the production of capital, and the more resources that flow into capital production, the faster the rate of economic growth.
Thus, the gap between poor and rich countries has grown over time.

Poor countries have to judiciously allocate resources between R&D (future profits) and production of goods (present profits).

Market: An institution where buyers and sellers can interact and exchange.

Kristen and Anna live in the beach town of Santa Monica. They own a small business in which they make wristbands and pot holders and sell them to people on the beach. As shown in the table on the following page, Kristen can make 15 wristbands per hour but only 3 pot holders. Anna is a bit slower and can make only 12 wristbands or 2 pot holders in an hour.

| | OUTPUT PER HOUR | |
|---|---|---|
| | WRISTBANDS | POT HOLDERS |
| Kristen | 15 | 3 |
| Anna | 12 | 2 |

**a.** For Kristen and for Anna, what is the opportunity cost of a pot holder? Who has a comparative advantage in the production of pot holders? Explain your answer.
**b.** Who has a comparative advantage in the production of wristbands? Explain your answer.
**c.** Assume that Kristen works 20 hours per week in the business. Assuming Kristen is in business on her own, graph the possible combinations of pot holders and wristbands that she could produce in a week. Do the same for Anna.
**d.** If Kristen devoted half of her time (10 out of 20 hours) to wristbands and half of her time to pot holders, how many of each would she produce in a week? If Anna did the same, how many of each would she produce? How many wristbands and pot holders would be produced in total?
**e.** Suppose that Anna spent all 20 hours of her time on wristbands and Kristen spent 17 hours on pot holders and 3 hours on wristbands. How many of each item would be produced?
**f.** Suppose that Kristen and Anna can sell all their wristbands for $1 each and all their pot holders for $5.50 each. If each of them worked 20 hours per week, how should they split their time between wristbands and pot holders? What is their maximum joint revenue?

Command Economy: An economy where the government controls the output targets, incomes and prices.

Laissez-Faire Economy: An economy where individual firms can pursue their self-interest without any central regulation. (The free market) Here, the buyers and sellers decide what gets produced, how it is produced and who gets it.

Consumer Sovereignty: The idea that consumers dictate what will be produced and what won't by buying what they want and not buying what they don't.

*Question 1*

# Birla Instituite of Technology & Science, Pilani
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**SUPPLEMENTARY ANSWER BOOK**

ID No. _____ Course No. _____

Name _____ Course Title _____

Date _____

Start Writing from here :-

a) and b) Output per hour

| | Wristbands | Potholder |
|---|---|---|
| Kristen | 15 | 3 |
| Anna | 12 | 2 |

Opportunity cost for Kristen (opportunity cost for wristband)

$15 \longrightarrow 3$

$1 \longrightarrow \frac{3}{15} = .2$

opportunity cost for pot holder.

$3 \longrightarrow 15$

$1 \longrightarrow \frac{15}{3} = 5$

[Kristen has ~~opportunity cost~~ comparative advt in making pot holders and Anna in wristband]

Opportunity cost for Anna (Opportunity cost for wristban)

$12 \rightarrow 2$

$1 \rightarrow \frac{2}{12} = .166$

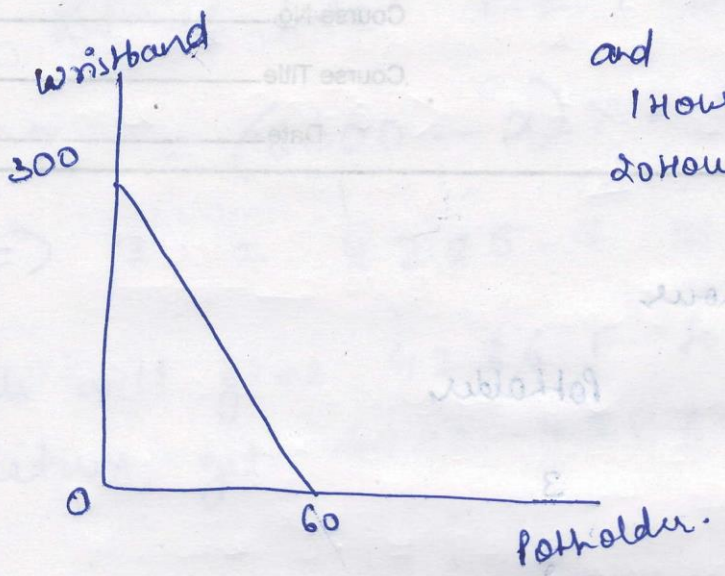
for pot holder

$2 \longrightarrow 12$

$1 \longrightarrow \frac{12}{2} = 6$

c) Kristen works 20 Hours per week

Kristen




1 Hour → 15 wristbands

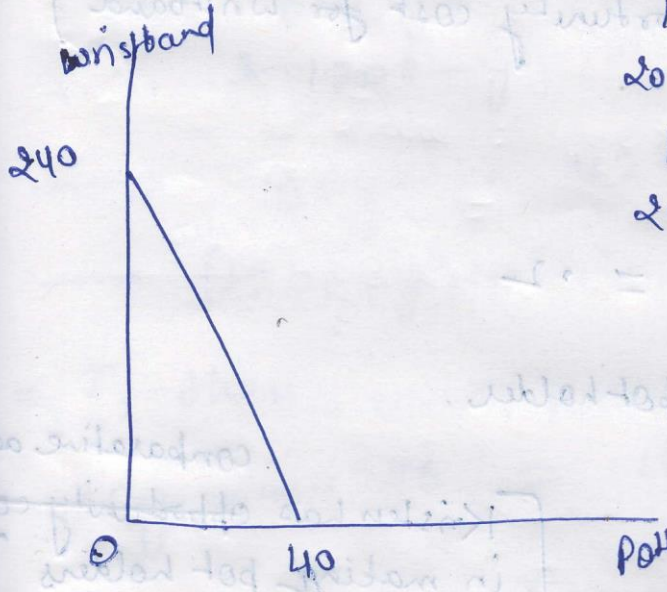
20 Hour → 15×20 = 300

and

1 Hour → 3 potholders.

20 Hour → 20×3 = 60 potholders

for Anna




1 Hour → 12 wristband.

20 Hour → 12×20 = 240

1 Hour → 2 wristband.

20 Hour → 20×2 = 40

duction : F = 4286 + 9214 = 13500 & I = 13500

d).

Kritten.

1 Hour → 15 WB.

10 Hour → 150 WB.

1 Hour → 3 PH

10 Hours → 30 PH.

Anna

1 Hour → 12 WB

10 Hour → 120 WB.

1 Hour → 2 PH.

10 Hour → 20 PH.

Total. 150 + 120

= 270 WB

30 + 20.

= 50 PH

e) Anna

240 Wristband

Kriten

1 Hour 3 PH

17 Hour 17 X 3 = 51 PH.

1 Hour 15 WB.

3 Hour 45 WB

Wristband = 240

+ 45 WB.

= 285 WB and 51 PH.

Potholder 51.

f. Kristern — Pot holders

If she produces one Pot holders, she gets \$5.5

But when she produces one pot holder, she does not produce 5 wristbands. which costs $5 \times 1 = \$5$

Since $\$5.5 > \$5$, all time to pot holders by kristern

Anna — Wrist band

If she produces one wristband, she gets \$1.

But when she produces one WB, she does not produce 0.17 PH, which costs $0.17 \times 5.5 = \$0.935$

Since $\$1 > \$0.935$, all time to wrist bands by Anna

$\therefore$ Total revenue : $(60 \times 5.5) + (240 \times 1)$

$= 330 + 240 = \$570$

**Sum 2:**

*Question 2*

Question 2

The countries of Figistan and Blah are small island countries in the South Pacific. Both produce fruit and timber. Each island has a labor force of 1,200. The following table gives production per month for each worker in each country.

| | BASKETS OF FRUIT | BOARD FEET OF TIMBER |
|---|---|---|
| Figistan workers | 10 | 5 |
| Blah workers | 30 | 10 |

Productivity of one worker for one month

**a.** Which country has an absolute advantage in the production of fruit? Which country has an absolute advantage in the production of timber?

**b.** Which country has a comparative advantage in the production of fruit? of timber?

**c.** Sketch the ppf's for both countries.

**d.** Assuming no trading between the two, if both countries wanted to have equal numbers of feet of timber and baskets of fruit, how would they allocate workers to the two sectors?

**e.** Show that specialization and trade can move both countries beyond their ppf's.

2) One worker for one month

| | Fruit | Timber |
|---|---|---|
| Figi | 10 | 5 |
| Blah | 30 | 10 |

a) Absolute advantage — both with Blah
(as $30 > 10$ & $10 > 5$)

b) Fruit : figi : $10F$ — $5T$
$1F$ — $\frac{5}{10} = 0.5T$
Blah $30F$ — $10T$
$1F$ — $\frac{10}{30} = 0.33T$

∴ Blah has comparative advantage in production of fruit

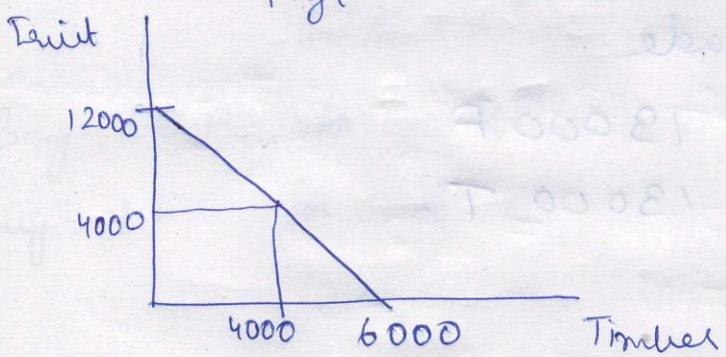
Timber : figi $\begin{cases} 5T \text{ — } 10F \\ 1T \text{ — } \frac{10}{5} = 2F \end{cases}$

Blah : $10T$ — $30F$
$1T$ — $\frac{30}{10} = 3F$

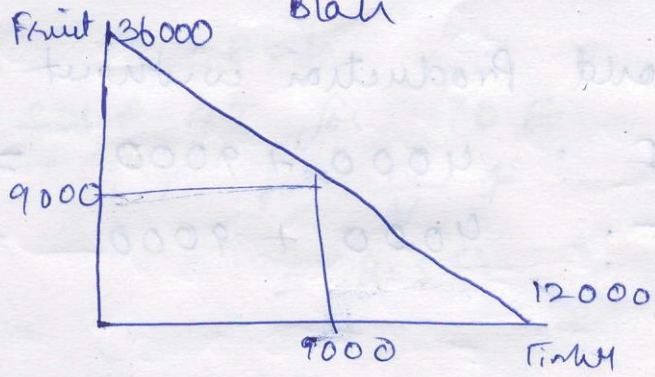
∴ Figi has comparative advantage in production of timber

c) Resource : 1200 workers each

Figi




Blah



d) Both contries want to produce equal number of F & T.

Figi : Fruit : Timber

10 : 5

∴ 2 : 1

∴ labour 1 : 2.

∴ $\frac{1200}{3} = 400$ ∴ 400 labour for fruit
800 labour for timber

∴ 400 × 10 = 4000 F
800 × 5 = 4000 T

Blah : Fruit : Timber

30 : 10

3 : 1

∴ labour 1 : 3

∴ $\frac{1200}{4} = 300$ ∴ 300 labour for fruit
900 labour for timber

∴ ~~400~~ 300 × 30 = 9000 F
9000 × 10 = 9000 T

World Production without trade

F : 4000 + 9000 = 13000 F

T : 4000 + 9000 = 13000 T

e) Comparative advantage : Blah $\longrightarrow$ F
Figi $\longrightarrow$ T.

If totally specialize :

Blah $\longrightarrow$ 36000 F & 0 T

Figi $\longrightarrow$ 0 F & 6000 T

$\therefore$ Total production of F increases as 36000 > 13000

But for T, it decreases as 6000 < 13000

$\therefore$ Blah should produce some timber as well.

So, lets start with Figi who produces only 6000 T & Figi will buy fruits

What Figi is willing to pay for 10 F at max? $\longleftarrow$ 5 T

What is the minimum that Blah is ready to accept for 10 F ? $\frac{10}{3}$ T

So terms of trade should be anything between

$\frac{10}{3}$ T ———— 5 T.

We take ~~5~~ 10 T as 4 T

| Figi | Blah |
|---|---|
| Buy 10 F for 4 T | ~~Sell~~ 4 T for 10 F |
| Buy 1 F for $\frac{4}{10}$ T | 1 T for $\frac{10}{4}$ F |
| | = 2.5 F |

Assume after trade, F owned by figi = T owned by figi. (necessary assumption to solve)
And F owned by blah = T owned by blah.

We assumed TOT as 4T previously, we can assume anything inside the range of TOT.
As we saw, previously, 1T = 2.5F now.

<u>Figi</u>: Assume Figi gives away x amount of timber.
1T = 2.5F as per TOT, then xT = 2.5x F.
So, figi gets 2.5x amount of F.
And we know the number of T and F owned by figi after trade has to be equal. So,
6000-x = Number of T with figi
2.5x = number of F with figi
6000-x = 2.5x
x=1714. So the number of F = T = 4286 are owned by figi.

Blah has partially specialized in F, assume Blah assigns y labourers to F.
Then Blah has assigned 1200 – y labourers to T.

<u>Blah</u>: Blah gets 1714 amount of timber from figi and gives 4286 amount of F.
y*30 – 4286 = F with blah
(1200-y)*10 + 1714 = T with blah

Blah also has same number of T & F. So,
y*30 – 4286 = (1200-y)*10 + 1714
y= 450

Therefore, T with blah = F with blah = 9214
Therefore, production with specialization and trade, total F = total T = 9214 + 4268 = 13500.
Thus, specialization and trade helped both coumtries reach beyond their ppfs.

Two extreme cases Of an economy
- Command Economy
- Laissez-Faire Economy

Command Economy: An economy where the government controls the output targets, incomes and prices.
Here, government answers the three basic questions of economics: what gets produced, how it is produced and who gets it.

Laissez-Faire Economy: An economy where individual firms can pursue their self-interest without any central regulation. (The free market) Here, the buyers and sellers decide what gets produced, how it is produced and who gets it.

These types of economy are extreme cases. Economies are generally a mixture of these two.
The real question is not whether the government should be involved at all or not, but, how much should they be involved, to what extent should the government be involved?

Advantages of government being involved: Better equity, controlled prices of products, prevention of monopoly.
Disadvantages of govt being involved: Bureaucratic process, inefficiency, corruption.

Market: An institution where buyers and sellers interact and engage in exchange.

What gets produced in Laissez-Faire economy?
They decide through the idea of consumer sovereignty.
Consumer Sovereignty: The idea that consumers dictate what will be produced and what won't by choosing to buy what they want.

How are products produced in Laissez-Faire economy?
In the most efficient way possible.
Because of the idea of free enterprise
Free enterprise: the idea that anyone is free to start and operate their private businesses in search of profits.

Free enterprise leads to efficient production, because if a company isn't efficient, it will lose out to its competitors.
Because, these companies are in search of profits, they will produce goods based on the consumer's wants.
Thus, in a free market, competition forces producers to use efficient techniques of production.

Who gets the products in Laissez-Faire economy?
Who gets the products depends on individual's income and wealth.

Income: amount that a household earns every year.
Wealth: amount that household accumulated through saving or inheritance.

Price is the amount that a product sells for per unit, and it reflects what society is willing to pay.

Prices of inputs—labor, land, and capital—determine how much it costs to produce a product. Prices of various kinds of labor, or wage rates, determine the rewards for working in different jobs and professions. Many of the independent decisions made in a market economy involve the weighing of prices and costs, so it is not surprising that much of economic theory focuses on the factors that influence and determine prices. This is why microeconomic theory is often simply called price theory.

Government's intervention is necessary to protect the interests of labourers, they should be paid a minimum wage. They also redistribute income by the means of taxation and social welfare expenditures.

Criticism of free market:

1) They do not always produce the products at the cheapest rate possible, they still have inefficiencies
2) Income may be unfairly distributed and some groups may be left out
3) Periods of unemployment and inflation might recur regularly.

While governments might be brought in to help, they might act on their own self interests.
They may fail to allocate resources efficiently and in an unbiased manner due to corruption.

## Sum Trade

There are 2 countries A & B. Each of them produce 2 commodities logs & berries.

Each country has a labour force of 800.

The following table gives production per month for each worker in each country.

Assume productivity is constant & identical for each worker in each country

| | Productivity of 1 worker for 1 month | |
|---|---|---|
| | Logs | Berries |
| A | 6 | 18 |
| B | 3 | 12 |

a) Absolute advantage : Country A has both the products as $6 > 3$ & $18 > 12$

b) Comparative advantage :

Logs

A : 6 Logs — 18 berries
1 Log — 3 berries

B : 3 Logs — 12 berries
1 log — 4 berries

∴ Country A has comparative advantage in production of logs

Berries

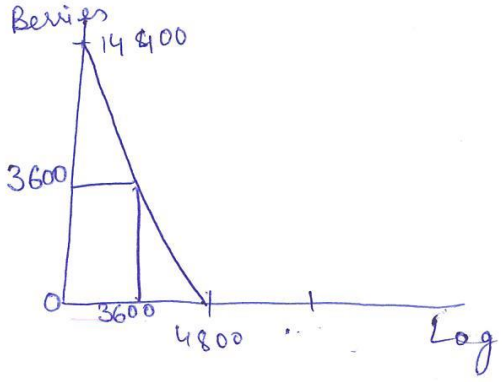
A : 18 berries — 6 Logs
1 Berry — $\frac{6}{18} = \frac{1}{3}$ log

B : 12 Berries — 3 log
1 berry — $\frac{3}{12} = \frac{1}{4}$ log

∴ Country B has a comparative advantage in production of berries

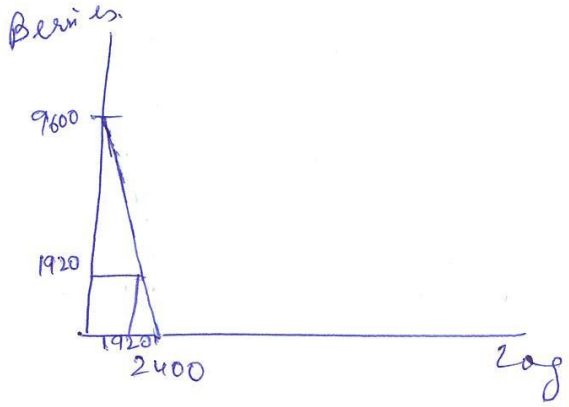
c) PPF

Country A




PPF

Country B




d) No trade – how to allocate labour so that each nation consumes equal amount of both the products

Country A : Production ratio : 6 : 18
1 : 3

∴ Labour ratio 3 : 1

∴ 600 workers for ~~1~~ log
& 200 workers for ~~1~~ berries.

∴ 3600 units of both ~~XXY~~ logs and berries would be produced & consumed.

Country B : Production Ratio : 3 : 12.
1 : 4

∴ labor ratio 4 : 1

∴ 640 workers for logs
& 160 workers for berries

Therefore 1920 units of logs & berries would be produced and consumed.

e) Show specilization and trade can move both countries beyond their PPF.

Without trade the total world production of each commodity is $3600 + 1920 = 5520$.

With trade: If both specializes according to comparative advantage. Total production of logs for country A is $6 \times 800 = 4800$ and total production berries is $12 \times 800 = 9600$.

Since total production of logs falls compared to pre trade situation, country B should specilize partially.

Therefore, country A will be exporting log and importing berries. Maximum that country A is willing to pay for one unit of berry is $\frac{1}{3}$ or log.

Minimum that country B is ready to accept by giving one unit of berry is $\frac{1}{4}$.

So terms of trade acceptable for both countries will be "A" for 1 unit of berry such that it lies between $\frac{1}{4}$ to $\frac{1}{3}$

Since, country B specilizes partially let it denote Z amount to log and $800 - Z$ to berries.

∴ Production:

| | Country A | Country B |
|---|---|---|
| Log | 4800 | 3Z |
| Berry | 0 | 12 (800 − Z) |

We assume country A consumes equal amount of log and berries after trade.

Let country A gives a unit of log and takes $\beta$ units of berry from country B. Therefore,

$$4800 - a = \beta \longrightarrow (1)$$

for country B:

$$3Z + a = 12(800 - Z) - \beta \longrightarrow (2)$$

$$3Z + a = 12(800 - Z) - 4800 + a \quad (\text{from eq. (1)})$$

$$3Z + a = 9600 - 12Z - 4800 + a$$

$$15Z = 4800$$

$$Z = 320$$

$\therefore$ final production:

| | Country A | Country B | Total. |
|---|---|---|---|
| log | 4800 | 960 | 5760 |
| berries | 0 | 5760 | 5760 |

Therefore, world production has increased from 5520 to 5760.

Suppose we take terms of trade as ·3.

Country A

Get 1 berry for ·3 Log

Country B

Get ·3 Log for 1 Berry

or 1 log for $\frac{1}{\cdot 3}$ berry = 3·33 berry

∴ from equation (1)

$$4800 - a = a \times 3.33$$

$$a = 1108.54 \text{ approx} = 1109$$

∴ A will have 3691 of both products ; 3691 > 3600

Country B

from equation (2)

$$\log = 960 + a$$

i.e $960 + 1109 = 2069$

Berry

$5760 - 3691 = 2069$ ; $2069 > 1920$

Other possible outcomes

(i)

| | Log | Berry |
|---|---|---|
| A | 4800<br>−1000 | 0<br>+3800 |
| B | 960<br>+1000 | 5760<br>−3800 |

(ii)

| | Log | Berry |
|---|---|---|
| A | 4800<br>−1100 | 0<br>3700 |
| B | 960<br>+1100 | 5760<br>−3700 |

Economic Investment: Investments used to buy/produce capital goods.

Output efficiency: goods produced satisfy consumer's needs.
Production efficiency: resources are used efficiently to produce goods.
When economy's production is efficient, production of one good is increased only when production of another good is decreased. This happens because,
If economy is production efficient → it is on the ppf line.

# Chapter-3

HouseHolds (HH) → Consuming unit → aims for max utility
Firm → Producing Unit → aims for max profits

Firm: An organization that converts resources into products. They are the primary producing units in the economy.

Entrepreneur: A person who organizes, manages and assumes the risks of a firm. Taking an idea and making it into a successful business.

HouseHolds (HH)→ consuming units of an economy.

- ➔ Limited income
- ➔ Have to pay for goods and services.

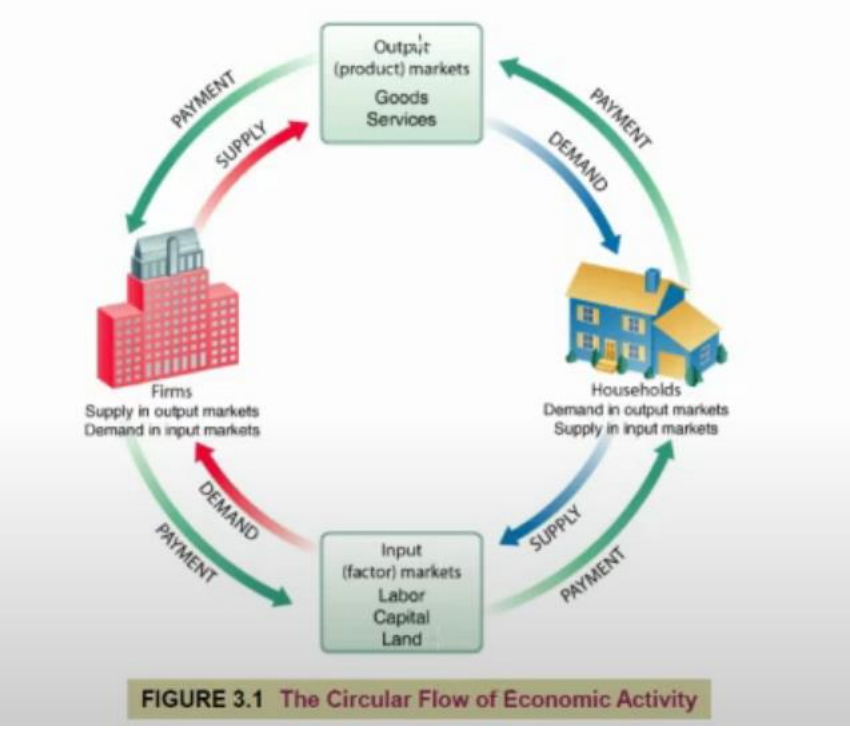


FIGURE 3.1 The Circular Flow of Economic Activity

HH supplies resources to input markets like land, capital and labor. HH are paid for providing these resources to input markets.

Input/factor markets then provide these resources to Firms. Firms pay input markets for these.

Firms use these income factors to make Goods and services which are sold to output markets.

Output markets then sell these to HH. HH pay for them from the money they received providing resources to input markets.

Input markets: markets in which resources used to produce goods are traded. HH supply and Firms demand here.

Output markets: markets in which produced goods and services are traded. Firms supply and HH demand here.

Labor Market: input market where HH supply work for wage to firms that demand labor.
Capital Market: Input markets where HH give their savings to firms for interest or future profits.
Land Market: input markets where HH supply land or real property on rent.

Factors of production: Inputs used by firms to produce goods and services. Eg: Land, labor and capital.

We wish to determine market price by analysing the behaviour between HH and Firms. (Demand and Supply)

Firms determine the quantities and types of outputs produced and the quantities and types of inputs demanded.

Households determine the types and quantities of products demanded and the quantities and types of inputs supplied.

A household's decision about what quantity of a particular output to demand depends on:

- Price of the product
- HH's income
- HH's accumulated wealth
- Price of similar products made by competitors
- The household's tastes and preferences
- Expectations about future income, wealth, and prices

Income: Sum of all forms of earnings for a given period of time. Eg: wages, salaries, profits, interest, rent. It's a flow measure.
Net worth: Total value of what HH owns minus what it owes. It's a stock measure.

Normal Goods: Goods whose demand increases with increase in income and decreases with decrease in income.
Inferior goods: Goods whose demand decreases with increase in income and increases with decrease in income.
Eg: Income is less, prefer bus over cab.

Substitutes: Goods that act as a replacement for one another; increase in prices of one increases demand of the other.

Perfect substitutes: Identical Products.

Complimentary Products: Goods that go hand in hand together, decrease in price one increases demand of both goods. Eg: toothpaste and toothbrush.

Demand schedule: Shows how much of a given product HH would be willing to buy at different prices for a given time period.
Demand curve: A graph illustrating how much of a given product a household would be willing to buy at different prices.

**TABLE 3.1 Alex's Demand Schedule for Gasoline**

| Price (per gallon) | Quantity Demanded (gallons per week) |
|---|---|
| $8.00 | 0 |
| 7.00 | 2 |
| 6.00 | 3 |
| 5.00 | 5 |
| 4.00 | 7 |
| 3.00 | 10 |
| 2.00 | 14 |
| 1.00 | 20 |
| 0.00 | 26 |

**FIGURE 3.2 Alex's Demand Curve**

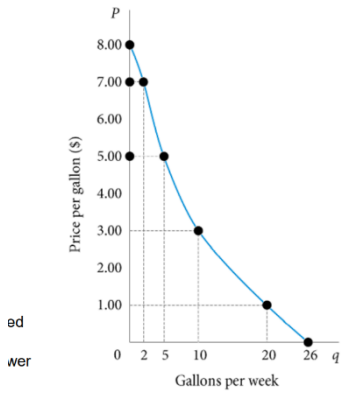



Table 3.1 shows how much gasoline Alex demands with change in its prices → demand schedule
Fig 3.2 Plots the demand schedule (table) showing the demand curve of gasoline by alex.

Law of demand: The negative relationship between prices and demand.

Demand increases when price decreases, ceteris paribus. Demand decreases when prices increase, ceteris paribus.

Ceteris paribus: all else equal; ie, comparison is made provided all other things are equal.

Why is the slope of demand curve negative? (ie) why demand decreases when price increases.
A: Because of two things:

1) Law of diminishing marginal utility: Marginal Utility decreases as more and more units are consumed.
   Marginal Utility: Extra Utility you receive when you consume another additional output unit.
   Because your marginal utility is decreasing you will want to pay lesser for the additional units.
   Eg: Satisfaction the first icecream will give is more than what the second icecream will give in summer.
   You will be ready to buy a costlier icecream the first time, second time you'd want to buy a little cheaper.

   Therefore, when you buy another good (demand increases) you will be willing to pay only less as marginal utility is less, so price drops when demand is more.

2) Income & Substitution Effect: First, if a child could meet his elderly parents by paying Rs.10k for every trip. And he goes 2 times a year.
   Now, if the price has dropped to 5k for every trip, the child would most likely meet them more often.
   When price of a good you demanded decreases, you're better off. Because you're better off, you might want to buy more goods.
   Better off→ you're opportunity cost decreases. Here, opportunity cost decreases from 10k to 5k.
   Therefore, this leads to increased demand in goods with decreased prices.

Properties of demand curve:

1) It'll intersect y-axis because, there will be a price point where no household would be able to afford that good and thus demand will be zero when a certain price point is reached.
2) It'll intersect x-axis because, when price of a good will become negligible, demand will surely increase, but demand curve measures for a set time period, due to time constraint, demand will not be fulfilled and thus infinite demand will never happen.
   Even if supply is huge to fulfil demand, diminishing marginal utility will decrease people's want to consume the good even if at negligible price.
   Eg: keep having icecreams you will get tired eventually because no more marginal utility.
3) Negative slope b/w price and demand → law of demand

Income, wealth and prices of goods are the three factors that determine if an HH ***can*** buy a good or not.
Whether the HH ***will*** buy the good or not depends on their liking and preference. Eg: coke or pepsi

If a good is expected to get costlier in future, the demand in present will grow.
If a family believes its income will grow in the future, they'd be willing to buy a costlier car at the moment.
Expectations thus play a big role in determining demand.

TABLE 3.2 Shift of Anna's Demand Schedule Due to Increase in Income

| | SCHEDULE $D_0$ | SCHEDULE $D_1$ |
|---|---|---|
| Price (Per Call) | Quantity Demanded (Calls Per Month at an Income of $300 Per Month) | Quantity Demanded (Calls Per Month at an Income of $600 Per Month) |
| $ 0 | 30 | 35 |
| .50 | 25 | 33 |
| 3.50 | 7 | 18 |
| 7.00 | 3 | 12 |
| 10.00 | 1 | 7 |
| 15.00 | 0 | 2 |
| 20.00 | 0 | 0 |

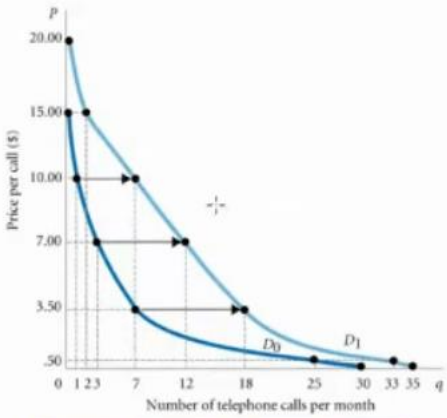



FIGURE 3.3 Shift of a Demand Curve Following a Rise in Income

The table shows that when income was 300$, anna was willing to make less calls at a higher rate.

When her income became 600$, she was ready to make more calls at the same higher rate.

At a lesser price, she was anyways making a lot of calls, now she'll be making more.

**Increase in income → increases demand**
Income is proportional to demand.

Therefore, when income increases, demand curve shifts to the right (demand increase)

When price changes, we move ***along*** the demand curve already plotted.
When anything else other than price changes (income, preference), the demand curve is ***shifted***. (be it left or right)

Move along the curve→ the demand changes to the value plotted next to the new price.

Market Demand: Total quantity demanded by all HHs for a good in a given timeframe.
If more people demand for a good, then demand increases for every price plotted. So demand curve shifts right.

Change in the number of demanders, income changes, preference changes lead to shift in market demand cuve.

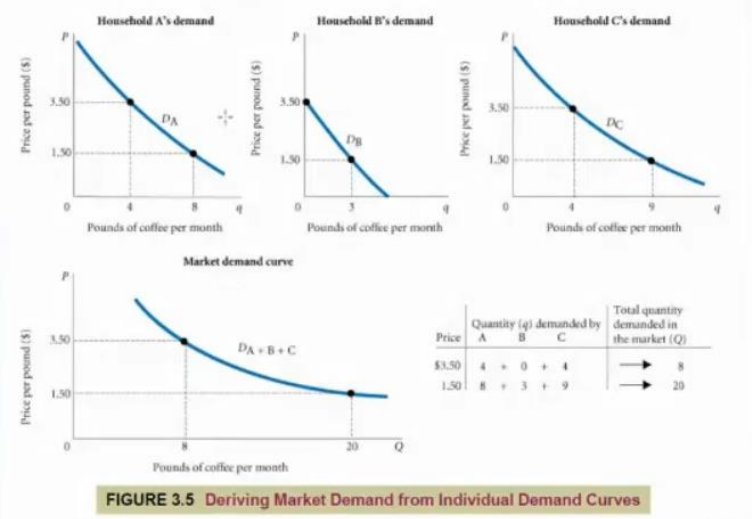
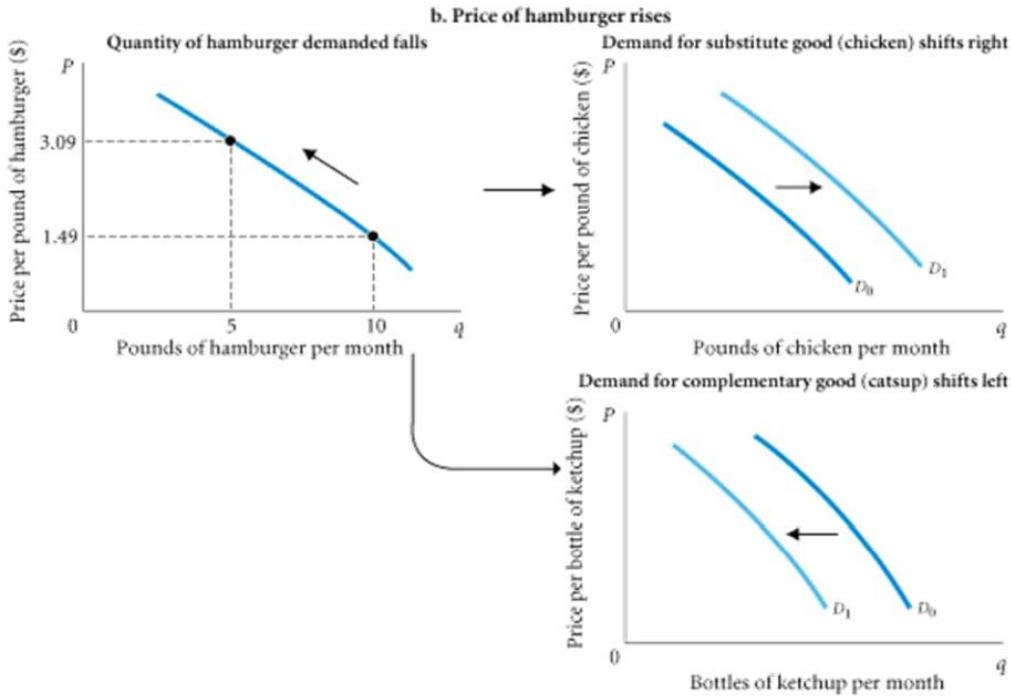


FIGURE 3.5 Deriving Market Demand from Individual Demand Curves

We take individual demand curves, add them up to make the market demand curve.

If income in general increases, then more people will be willing to buy goods at a given price. So at the same price, more people demand. Thus demand increases for the same price offered. Thus, market demand curve shift right as well.




When price of hamburger increases from 1.49 to 3.09, demand falls from 10 to 5 a month. Here, we move along the curve from 1.49 to 3.09.
Chicken, a substitute to hamburger, its demand will thus increase. More demand at the same price point. SO right shift. As chicken's change in demand is not because of its prices→ right shift of curve.
Ketchup, a complementary product to hamburger, its demand will also fall. Less people will be willing to buy at the same price point. As ketchup's change in demand is not because of its prices→ left shift of curve

Demand changes because of price → move along the demand curve. (demand of hamburger changes due to price)
Demand changes because of anything else→ shift the demand curve. (demand of chicken changes as it's a substitute to hamburger)

Supply → depends on profits potential. If the production cost goes down, profit margin increases, supply will increase.

Profit = revenue - cost

Change in Supply depends on:

1) Change in Production cost
2) Change in Revenue
3) Prices of related products

Quantity supplied: The amount of a particular good a company will be willing to sell at a given price in a given time frame.
Supply Schedule: It shows how much of a good the company will sell at different price points.

TABLE 3.3 Clarence Brown's Supply Schedule for Soybeans

| PRICE (PER BUSHEL) | QUANTITY SUPPLIED (BUSHELS PER MONTH) |
|---|---|
| $1.50 | 0 |
| 1.75 | 10,000 |
| 2.25 | 20,000 |
| 3.00 | 30,000 |
| 4.00 | 45,000 |
| 5.00 | 45,000 |

Supply schedule is just a table showing the amount supplied at a given price point.

The price is increasing → supply from firm will increase, as profit margin will become higher.

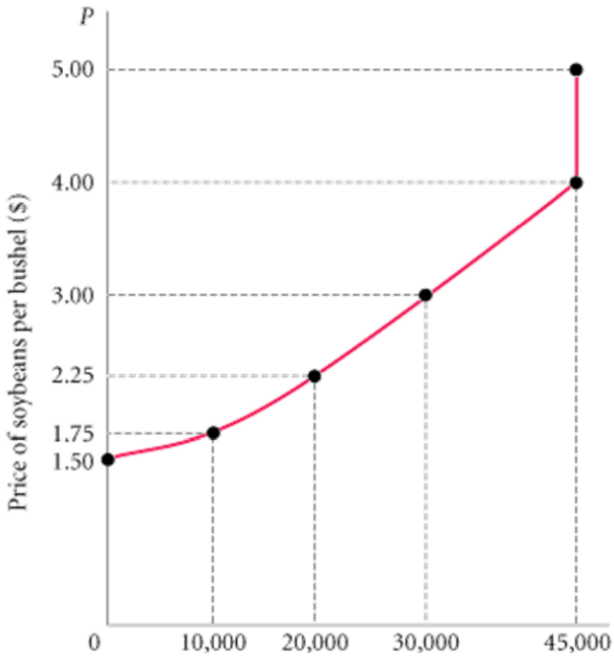
Law of supply: An increase in market price of a good will increase the its supply from firs and vice-versa.
Law of demand: An increase in market price will decrease demand and vice-versa.

Supply curve: Curve plotting the supply schedule. Ie, graph illustrating how much of a product will be supplied at different price points.

## TABLE 3.3 Clarence Brown's Supply Schedule for Soybeans

| Price (per Bushel) | Quantity Supplied (Bushels per Year) |
|---|---|
| $1.50 | 0 |
| 1.75 | 10,000 |
| 2.25 | 20,000 |
| 3.00 | 30,000 |
| 4.00 | 45,000 |
| 5.00 | 45,000 |

## FIGURE 3.6 Clarence Brown's Individual Supply Curve




A producer will supply more when the price of output is higher. The slope of a supply curve is positive.

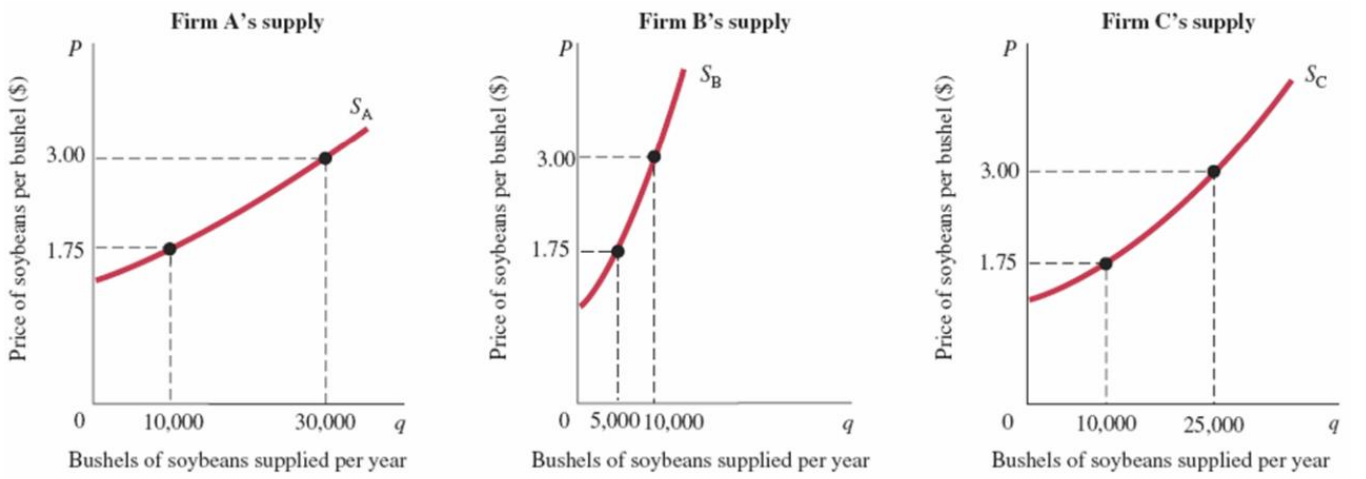
After a point, even higher price will provide same supply because of production limitations.
At $1.5, he isn't gonna sell any because it does not give him any profits.

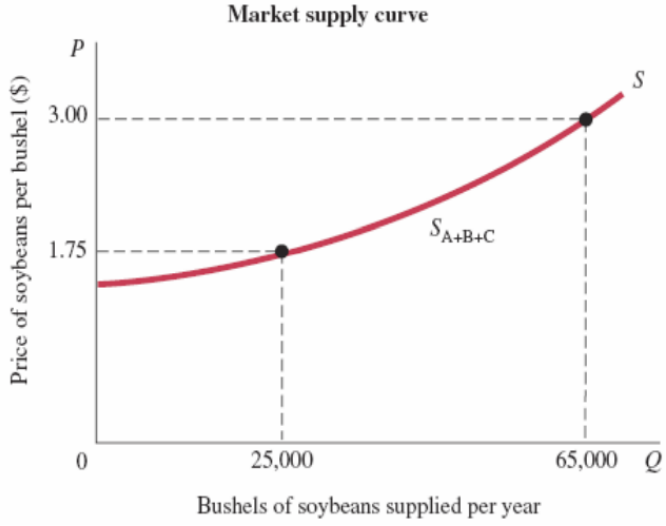
Cost of production depends on a number of factors, including the available technologies and the prices and quantities of the inputs needed by the firm (labor, land, capital, energy, and so on)

Price of final product changes → move along the existing supply curve
Cost, input prices, technology, prices of related goods and services changes → curve shifts to the left or right.

Cost→ Cost price

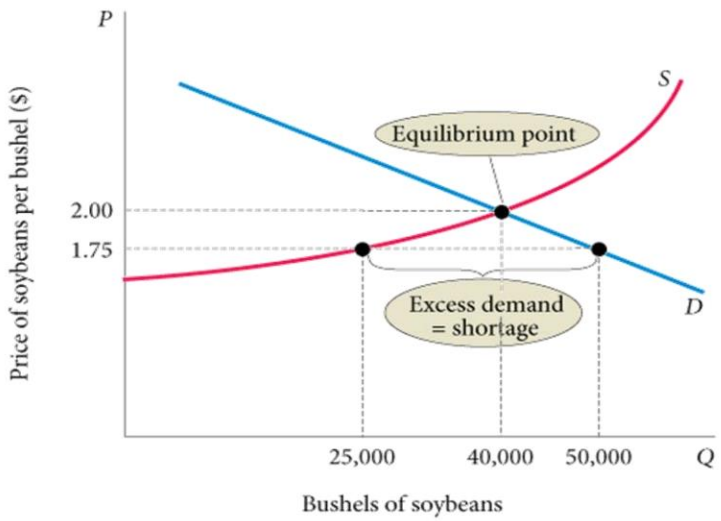
Market demand: total supply made by all the producers for one product.
Deriving market supply form individual firms' supplies:




| Price | Quantity ($q$) Supplied by A | | B | | C | | Total Quantity Supplied in the Market ($Q$) |
|---|---|---|---|---|---|---|---|
| $3.00 | 30,000 | + | 10,000 | + | 25,000 | = | 65,000 |
| 1.75 | 10,000 | + | 5,000 | + | 10,000 | = | 25,000 |

Equilibrium: The point where demand curve and supply curve meet, that is, demand and supply are equal.
As supply = demand in equilibrium, there is very less tendency for price to change.



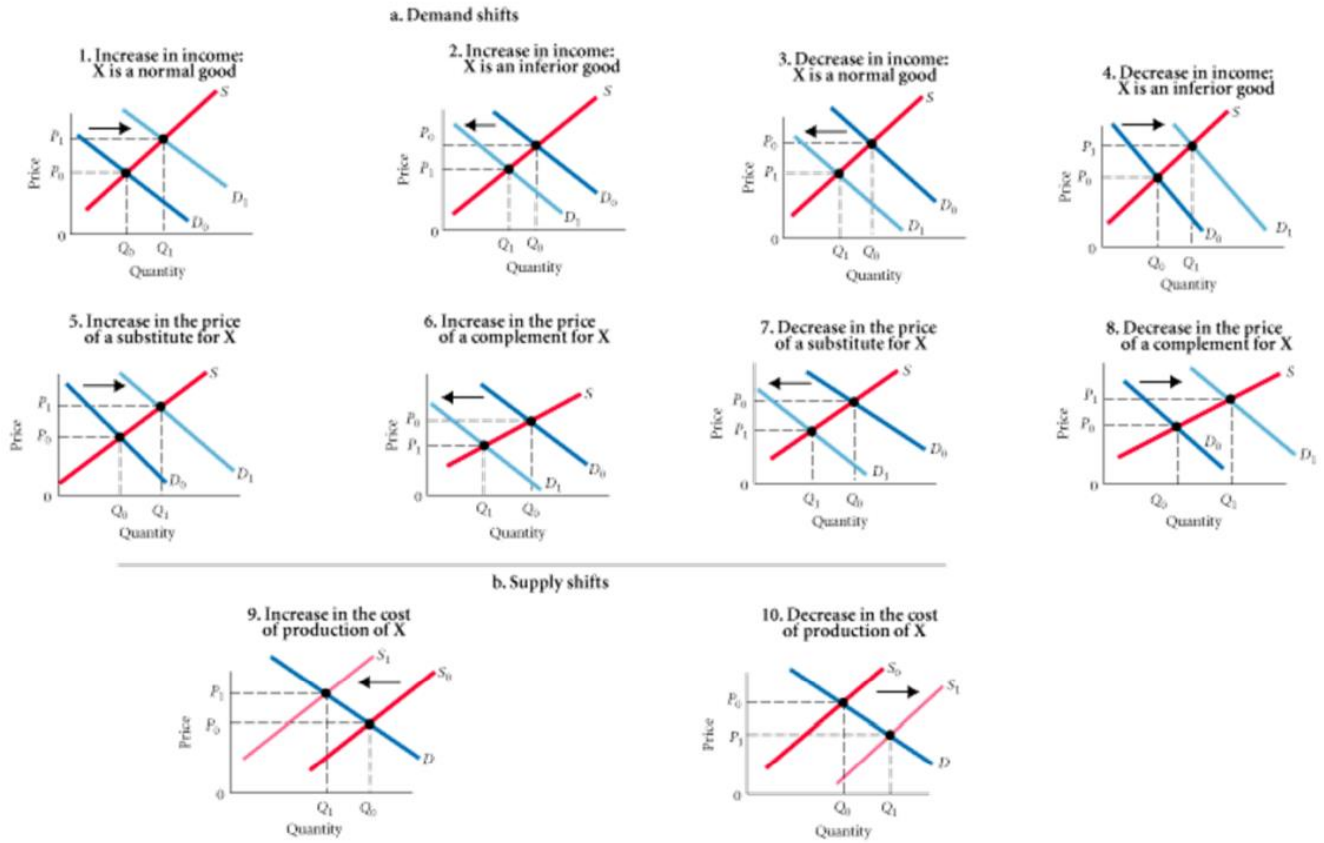

At $1.75, we see that supply is of 25k and demand is of 50k.
This means there is an ***excess demand*** at 1.75$
Which means that there is a ***shortage*** of goods at 1.75$

At 2$, demand and supply are equal → equilibrium point.

Above 2$, demand is less but supply is more→ ***surplus / excess supply***

When supply and demand curves shift, equilibrium point shifts as well.

# FIGURE 3.12 Examples of Supply and Demand Shifts for Product *X*




$D_0$ and $S_0$ → initial demand and supply
$D_1$ and $S_1$ → final demand and supply
Figure shows how supply and demand curves shift.

NOTE:

1) Be careful to distinguish between movements along supply and demand curves and shifts of these curves. When the price of a good changes, the quantity of that good demanded or supplied changes—that is, a movement occurs along the curve. When any other factor changes, the curve shifts, or changes position.

2) Quantity demanded and quantity supplied are always per time period—that is, per day, per month, or per year.

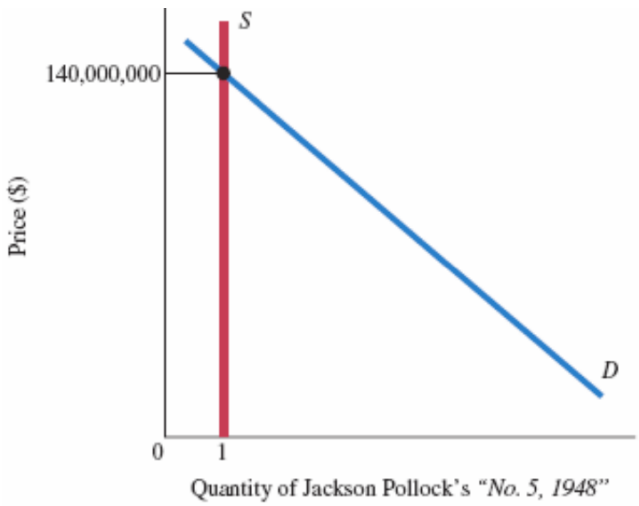
Price rationing: The process by which market system allocates goods to consumers when there is excess demand

One such method of rationing is adjustment of prices → for free market.
What happens in price rationing for a free market is that: when excess demand is there, the price of a good increases and demand decreases to the point where demand = supply. Thus, the market clears.

There is some price that will clear any market, even if supply is strictly limited.

In an auction for a unique painting, the price (bid) will rise to eliminate excess demand until there is only one bidder willing to purchase the single available painting.

Some estimate that the *Mona Lisa* would sell for $600 million if auctioned.




Only 1 quanitity is there, so supply is fixed.

Demand at a cheaper rate is high, so the price keeps increasing such that there is only one person who will finally be able to demand. That'll be the equilibrium for the auction.

Sometimes, both governments and private firms decide to use some mechanism other than the market system to ration an item for which there is excess demand at the current price.
This will make sure that the price doesn't skyrocket or free fall.

Cons of bypassing price rationale of free market:

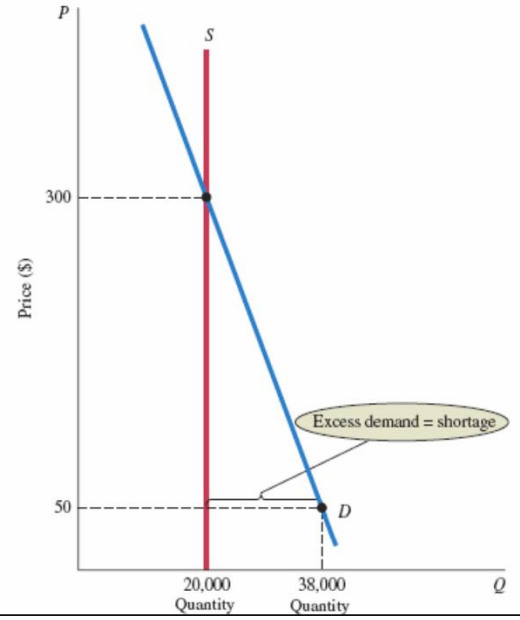
1) Attempts to bypass price rationing of free market and use other systems can be costlier than predicted.
2) Such attempts of providing equal goods to all HH don't go the way they're intended.

- Price ceiling: Maximum price a good can be sold for, usually set by the government.
- Price floor: minimum price at which a good can be sold; usually set by the govt.
- Favoured customers: Receive special treatment from sellers when demand is in excess.
- Ration coupons: Tickets or coupons that entitle individuals to purchase a certain amount of a given product per month.
- Black Market: A market in which illegal trading takes place at market-determined prices

At the face-value price of $50, there is excess demand for seats to the concert.

At $50 the quantity demanded is greater than the quantity supplied, which is fixed at 20,000 seats.

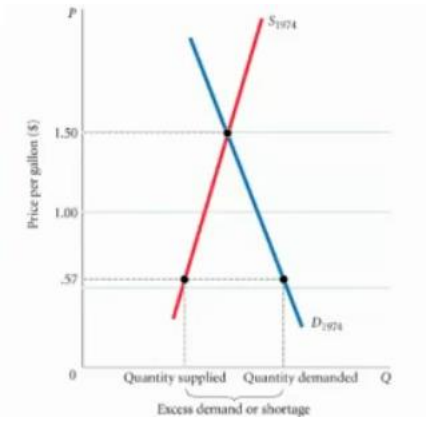
The diagram shows that the quantity demanded would equal the quantity supplied at a price of $300 per ticket.




A concert sells tickets for 50$. But the demand is higher than supply.
Supply become equal to demand when price is at 300$.
This price will be reached for equilibrium, this will happen with the help of black markets.
People lucky enough to get extra seats will sell them for a high price.

The ticket's face value here is $50.

Willingness to pay a higher price isn't something only the rich will have, poor people who are ready to cut down on other things and are willing to pay higher for a certain good also have willingness to pay.




If the govt. sets a price ceiling on price per gallon as 0.57$, then we see from the demand and supply curve that quantity supplied is lesser than the quantity demanded for 0.57$, thus, excess demand/shortage is created.

This is how non-priced ways of rationing can be harmful.

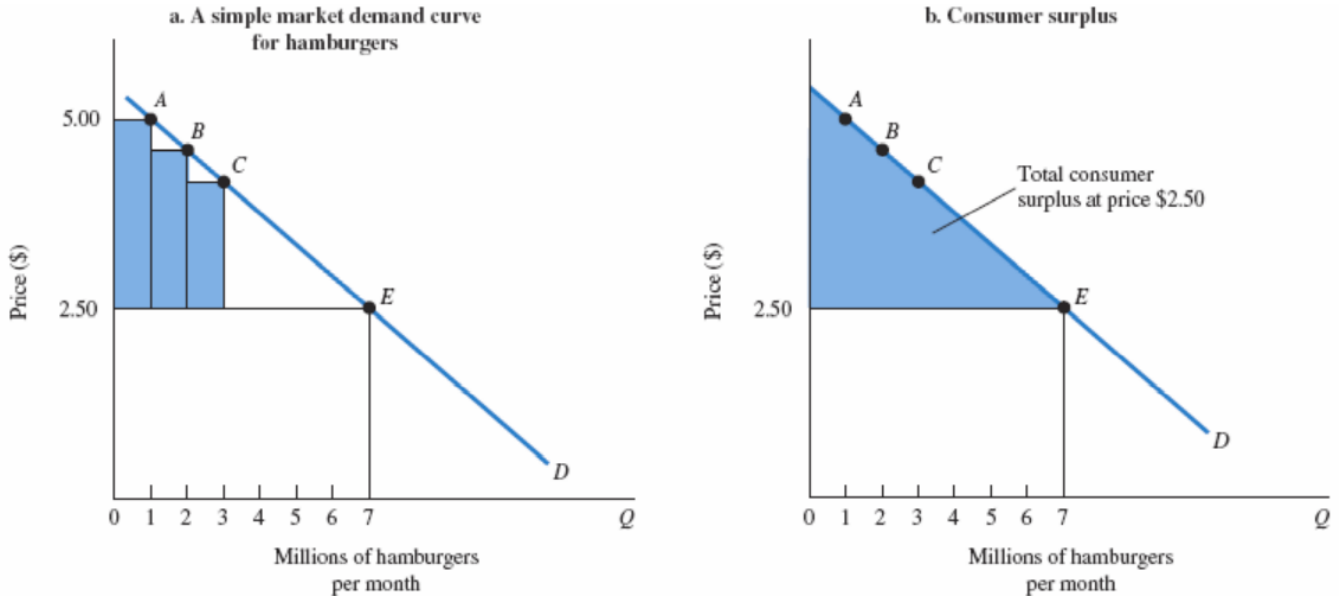
Non-price rationing mechanism: mechanism of rationing which is not price rationing

Queueing: a non-price rationing mechanism, where people stand in line to get goods.
Cons of queueing→

1) Loss of time, if price rationing was used time wouldn't waste as it would go directly to the highest bidder.
2) Loss of additional value. Someone who might've been ready to pay more did not get the goods but someone who paid less got the goods as he stood first in line.

Favored customer rationing: customers pay hidden charges to the seller to sell the goods to them when the demand is too high to meet, the demand may have increased due to the price ceiling. In this way, sellers can work around the price ceiling and earn more. This actually increases the real price of the good.

Consumer surplus = max. amount a consumer is willing to pay – current market price
➔ Difference between max. amount a consumer is willing to pay and current market price.




a. 2.5$ is market price for hamburger, but Consumers at A are willing to pay 5$, so their consumer surplus is 2.5$.
There are people willing to pay at every point on the line, so their consumer surplus keeps changing by very little fraction. Someone wishes to pay 4.99$, someone wishes to pay 4.98$. So their consumer surplus keeps varying. It keeps going like that.

b. The total consumer surplus → area between mex. willingness to pay and market price (here, triangle).

Producer surplus: Difference between market price and cost of production.
Market price – cost of production.

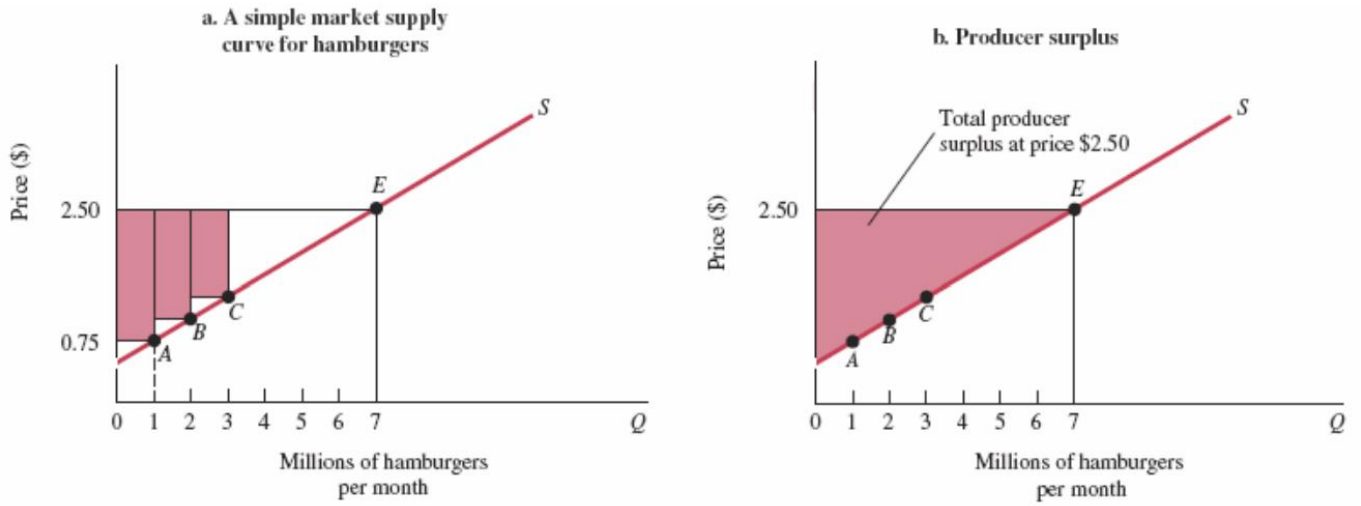
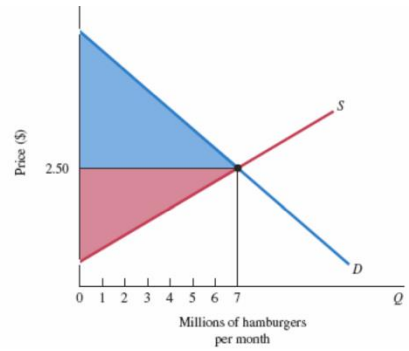


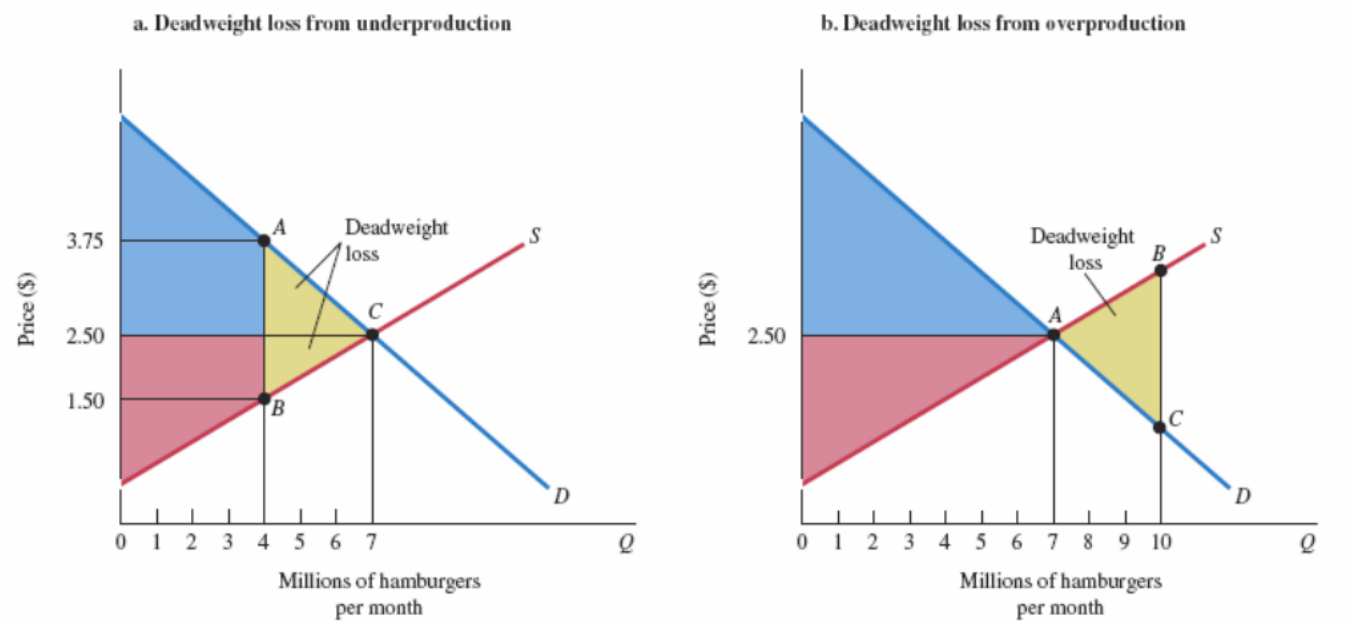

Fig: Producer surplus.
Someone makes it for 0.75$, someone makes it for a little more than that. But they all sell at 2.5$. Therefore, Producer Surplus → area between market price and production cost.




Supply curve shows the cost of production.
Demand curve shows the max. willingness to pay
Blue area→ consumer surplus
Red area → producer surplus

Deadweight loss: The total loss of producer and consumer surplus from underproduction or overproduction.

## FIGURE 4.9 Deadweight Loss




Panel (a) shows the consequences of producing 4 million hamburgers per month instead of 7 million hamburgers per month. Total producer and consumer surplus is reduced by the area of triangle *ABC* shaded in yellow. This is called the deadweight loss from underproduction.

Panel (b) shows the consequences of producing 10 million hamburgers per month instead of 7 million hamburgers per month. As production increases from 7 million to 10 million hamburgers, the full cost of production rises above consumers' willingness to pay, resulting in a deadweight loss equal to the area of triangle *ABC*.

Due to underproduction, we see in (a) that equilibrium is not achieved, therefore, complete possible consumer and production surplus is not achieved, acc. To figure. This lost surplus is called deadweight loss and is equal to area ABC.

Due to overproduction, cost of production (S) increases above consumer's willingness to pay, resulting in a deadweight loss equal to area ABC.

Competitive markets are efficient because when supply and demand interact freely, markets produce what people want at the least cost.

There are a number of sources of market failure:

- Monopoly power gives firms the incentive to underproduce and overprice.
- Taxes and subsidies may distort consumer choices.
- External costs such as pollution and congestion may lead to over or underproduction of some goods.
- Artificial price floors and price ceilings may have the same effects

Profits attracts capital; losses lead to disinvestment
Higher wages attract labor and encourage them to upskill themselves.

Thus, supply, demand, prices in input and output markets determine allocation of resources and form the ultimate combination of goods and services produced.

In labor market, if equilibrium of supply and demand of labor is at a wage of 5$.
Govt. comes in and says that 7.25$ is min. wage, then demand of laborers will be lesser and supply will increase.
Supply is more, demand is less → excess supply→ in labor markets, its called ***Unemployment.***

# *Chapter 5:*

***Elasticity:*** A concept used to measure change in one variable when the other variable is changed.

Elasticity of A wrt B = ( %Δ A / %Δ B )

We are trying to find Price Elasticity of Demand (ie) how does demand change wrt to price.

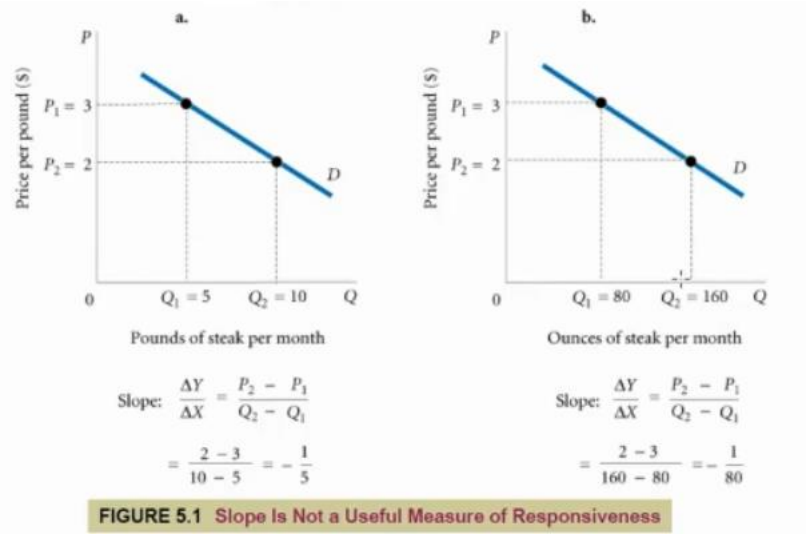



**FIGURE 5.1** Slope Is Not a Useful Measure of Responsiveness

Elasticity of Quantity wrt Price (ie) Price Elasticity of Demand can be found by finding slope here as it follows the formula.

But
In a, we see that the slope (ie) Elasticity found is -1/5.
In b, we see that slope is -1/80.

Elasticity should not change with change in unit of quantity, if that happens, then elasticity found is wrong.

Therefore, slope of Quantity and Price is not elasticity.

To make sure that change in units doesn't change Elasticity, we use % change instead of absolute change. Therefore,

**Price Elasticity of Demand** = $\frac{\text{\%change in quantity demanded}}{\text{\%change in price}}$

$E_P$ = ( %Δ $Q_d$ / %Δ P ) %Δ $Q_d$ → Percentage change in $Q_d$ wrt initial $Q_d$
%Δ $Q_d$ = (Q2-Q1/Q1)*100%

Types of Elasticity:

1) Elastic Demand: When %ΔQ > %ΔP. Therefore $|E_P| > 1$
   $|E_P| > 1$ As change in quantity is more than change in price, their ratio($E_p$) is greater than 1.

2) Inelastic Demand: When %ΔQ < %ΔP. Therefore $|E_P| < 1$
   $|E_P| < 1$ Example: Petrol→ in short term, even if you increase its prices, people will have to buy it out of necessity. So, even if price increases a lot, Quantity demanded wouldn't change much.

3) Perfectly Inelastic Demand: Quantity demanded doesn't change at all with change in price.
   $E_P = 0$ As %Δ Q = 0, $E_P = 0$.
   Eg: Life-saving medicines

4) Unitarily Elastic: Change in quantity is exactly equal to change in price.
   $|E_P| = 1$ Eg: Price become +10%, quantity becomes -10%. $E_p = -1$.

5) Perfectly Elastic Demand: If price increases even by a little, demand drops to absolute zero.
   Eg: In a hypercompetitive market where everyone sells same quality wheat for the same price, if one of them hikes his price, no one will buy from him as they'll get the same quality from someone else. Hypothetical Example.

$|E_P| < 1$ → $-1 < E_P < +1$

**Quantity change < Price change → Inelastic**
**Quantity change > Price change → Elastic**

Q)
Use Initial values of Q and P as base values to find Percentage change in this question.
(In some questions, they might ask you to take some other value(eg: avg) as base to find % change)

| Case-1 | Case -2 |
|---|---|
| P1 = 3 , P2 = 2 | P1 = 2 , P2 = 3 |
| Q1 = 5 , Q2 = 10 | Q1 = 10 , Q2 = 5 |
| Δ %P = (2-3 /3) * 100 = -33.3% | Δ %P = (3-2/2) * 100 = +50% |
| Δ %D = (10-5 /5) * 100 = +100% | Δ %P = (5-10/10) * 100 = -50% |
| $E_P$ = -3 | $E_P$ = -1 |
| Price decreases by 33.3% of its initial value | Price increases by 50% of its initial value |
| Price increases by 100% of its initial value | Price decreases by 50% of its initial value |

Therefore, We see $E_p$ values don't necessarily keep same value and different signs when initial and final states are interchanged.

Here, we were using initial value as base value. Base value→ value used to compare elasticity b/w initial and final.

But, we can also use avg. of initial and final value as base price to compare elasticity b/w initial and final prices.

$$E_p = \frac{(Q2 - Q1) / [(Q2 + Q1)/2]}{(P2 - P1) / [(P2 + P1)/2]}$$

(Q2 + Q1)/2 = avg of initial and final quantity

$$E_P = \frac{\%\Delta Q_d}{\%\Delta P}$$

$\%\Delta Q_d$ → Percentage change in $Q_d$ wrt initial $Q_d$
$\%\Delta Q_d$ = (Q2-Q1/Q1)*100%

$E_P$ → Price Elasticity of Demand → measures the change in demand when price changes.

When the demand curve is a diagonal line, moving along the curve doesn't change the slope.
But moving along the curve changes the elasticity as base price and base quantity will change.

When we decrease price of a product by a little margin, demand increases hugely.
But as we keep decreasing the prices, the demand doesn't increase that much (it increases, but not much).
Demand saturates.
This happens because almost all people who wanted to buy that product have bought it already.
This is nothing but elasticity, as we keep going down on the demand curve, we see that continuous decrease in prices doesn't increase demand that much.

Therefore, demand becomes less elastic as the price is reduced.

Therefore, as we go down the demand curve $E_p$ becomes more inelastic.

Hence, at high prices, there is great potential to increase demand by reducing prices a little.
At lower prices, there is not much potential to increase demand because ppl who wanted to buy already did.

## *Total Revenue*

$E_P$ helps to measure change in total revenue when price or demand changes.
$E_P$ measures change in demand when price changes.

Total Revenue (TR) = P*$Q_d$

Eg: petrol exporting country & banana exporting county increases price by 20%.

Petrol, being a necessity, its price will be *inelastic*, that is, price change will not affect demand much.
So, price change = +20%, demand change = -2% for petrol. Thus, TR for petrol will increase.

Banana, not being a necessity, its price will be *elastic*, that is, its price change will affect demand hugely.
So, price change = +20%, demand change = -40% for banana. Thus, TR for banana will decrease.

Therefore, for petrol, It makes more sense to increase prices. While it makes more sense for banana to decrease prices.
Main aim is to increase total revenue, whether that happens by increasing/ decreasing prices.

Banana is not a necessity but petrol is a necessity because banana has substitutes like apples, oranges. But petrol doesn't have substitutes, atleast not in the near future.

**Price Elasticity of Demand → Always negative value.**
**$E_P$ = -ve always**

**Income Elasticity of Demand** = $\frac{\text{\%change in quantity demanded}}{\text{\%change in income}} = \frac{\%\Delta Q_d}{\%\Delta I}$

Income elasticity of demand measures the change in quantity demanded when income changes.
It can be measured only when all other factors are constant, like when $E_I$ is being measured, price should be constant.

If increase in income increases quantity demanded of a pdt → normal good
So for normal good, %Δ I = +ve, then %Δ Q will also be +ve.
Therefore, normal goods → $E_I$ = +ve

If increase in income decreases quantity of a pdt → inferior good
So for inferior good, %Δ I = +ve, then %Δ Q will be -ve.
Therefore, inferior goods → $E_I$ = -ve

**Cross-Price Elasticity of Demand** = $\mathbf{E_{YX}} = \frac{\text{\%change in quantity of Y demanded}}{\text{\%change in price of X}}$

**Cross-Price Elasticity of Demand →** change in quantity of Y demanded when price of X changes.

$E_{YX} = \frac{\%\Delta Q_Y}{\%\Delta P_X}$

If price of X is increasing which leads to increase in demand of Y, then X & Y are *substitute products* to each other.
Increase in price of X will make ppl search for substitutes and thus demand of Y will increase, thus they are substitutes to each other.

If X & Y are complementary products, then increase in price of X will lead to decrease in demand of Y. Thus $E_{XY}$ will be negative.

$E_{XY}$ = +ve → X & Y are substitutes

$E_{XY}$ = -ve → X & Y are complementary

**Elasticity of Supply = $E_{SS}$** = $\frac{\text{\%change in quantity supplied}}{\text{\%change in price}} = \frac{\%\Delta Q_S}{\%\Delta P}$

Elasticity of Supply → Change in quantity supplied when price changes.

If the price of good increases, then the supply should increase because cost of production is const, so profit margin increases.

Ball Point pen→ increase in price will increase supply hugely → elastic → $|E_{SS}| > 1$
Petrol → increase in price will not change the supply much → inelastic → $|E_{SS}| < 1$

Supply of petrol is quite saturated already.

**Elasticity of Labor Supplied** = $\frac{\%\Delta \text{ Labor Supplied}}{}$ = $\mathbf{E_{Lbr\ SS}}$

% Δ Wage Rate

We might think that increase in wage will increase labor supplied and decrease in wages will make labors leave. But, this is not the case always.

At very high wage rates, people will demand for leisure time, so labor hours supplied will be lesser for the same wage, thus wage rate per hour increases but labor supplied decreases, so $\mathbf{E_{Lbr\ SS}}$ **=** -ve.

$\mathbf{E_{Lbr\ SS}}$ **=** -ve → At very higher wage rates.

$$e_P = \frac{\% \Delta Q}{\% \Delta P} = \frac{\frac{\Delta Q}{Q_1} * 100}{\frac{\Delta P}{P_1} * 100}$$

$$= \left(\frac{\Delta Q}{\Delta P}\right) * \left(\frac{P_1}{Q_1}\right)$$

$E_P = (\Delta Q / \Delta P) * (P_1 / Q_1)$

$E_P = \dfrac{1}{\text{Slope of demand curve}} * \dfrac{P_1}{Q_1}$ $P_1, Q_1$ → given price and quantity of the pdt

$(\Delta Q / \Delta P)$ = 1/slope of demand curve

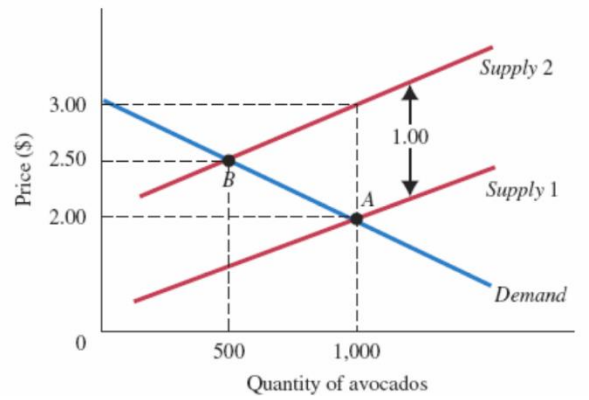
Above mid-point of demand curve → Elastic
At mid-point of demand curve → Unitary Elastic
Below mid-point of demand curve → Inelastic

What happens when we change taxes acc. to elasticity?

Excise tax→ tax is levied on every unit of pdt.

Eg: A mayor of a city imposes a tax of $1.00 per avocado in a city where 1,000 avocados are sold per day.
Will the city add $365,000 per year in taxes?

No, because taxation will increase prices and thus, the demand will go down.
The number of avocados sold will then depend on the new equilibrium.




Supply 1 is the supply before taxation.
Supply 2 is the supply after taxation.

Supply curve shifts up by 1$ because the price change is made on the supply side.

Demand curve stays the same, but equilibrium demand changes because of supply curve shifting.

**Problem 10: Demand Function: P=2000- 50Q**

**At what price the demand for the good is unitary elastic?**

**$E_P$ is always -ve.**
Because increase in price will always lead to decrease in demand, but how much demand decreases, that is a different topic.

$E_p = (\Delta Q / \Delta P) * (P_1 / Q_1) = -1$
= (1/slope) * (P1/Q1)
= (1/50) * (P1/Q1) {Slope is found from eq given}
Substitute Q1 using eq given and then find P1.

P = mQ + c P → y-axis
y = mx +c Q → x-axis

# *Chapter 6 : Behaviour of HH*

Firms → maximise profits
HH → maximise utility

Assumptions made are:

1) Perfect knowledge: It is assumed that every decision making unit (all HH and firms) knows about all the offers available on the table and then chooses the best one.
2) Perfect competition: It is assumed that all companies are making identical products and none of them are big enough to control market prices on their own.
   Products in a perfectly competitive market are called *Homogeneous products.*
3) It is assumed that HH have no control over prices. HH are very small compared to the huge market and thus they cannot influence market prices.
   It is assumed that they have no control on wage rates they get and pdt prices they buy.
   HH → Price Takers

Farmers are supplying wheat to firms.
When the no. of farmers is huge and their wheat is identical, there is a lot more competition for farmers and thus they will be ready to sell to firms at cheaper prices.
Farmers here take whatever price they get → called *Price Taker*

No control over market price of the output → Price Takers

Decisions made by HH:

1) How much of each product to demand
2) How much labor to supply
3) How much capital to provide to Firms (depends on saving behaviour of HH)

Budget Constraint: Limits put on HH's choices by income, wealth and product prices.

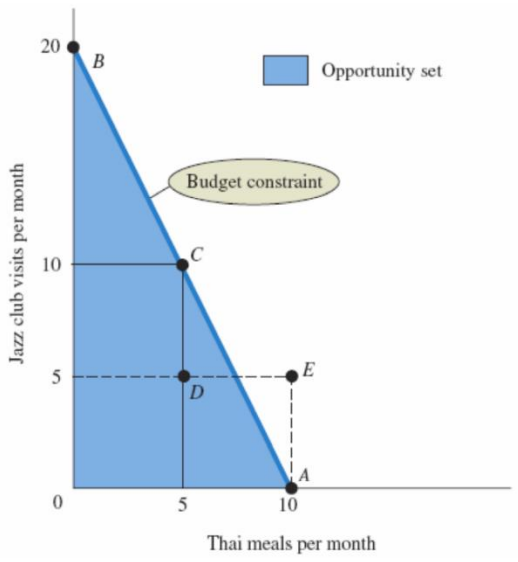
**TABLE 6.1** Possible Budget Choices of a Person Earning $1,000 Per Month After Taxes

| OPTION | MONTHLY RENT | FOOD | OTHER EXPENSES | TOTAL | AVAILABLE? |
|---|---|---|---|---|---|
| A | $ 400 | $250 | $350 | $1,000 | Yes |
| B | 600 | 200 | 200 | 1,000 | Yes |
| C | 700 | 150 | 150 | 1,000 | Yes |
| D | 1,000 | 100 | 100 | 1,200 | No |

Choice set or Opportunity set:
Set of options defined and limited by a budget constraint.

A,B,C are the available choice/opportunity sets.
D is out of budget, so it isn't an option, obvio.

Any one choice set will be selected by the HH according to their preferences and opportunity costs of selecting that set over the other sets.




The line AB is budget constraint, any point outside the area covered will not be under budget.

Area under the budget constraint curve is collection of all points and combinations that fit into budget.

E→ out of budget, thus, we cannot have 5 Jazz and 10 Thai.

B,C,A → on the budget constraint line, no money is saved.
D→ Money is saved as we are under the budget constraint.

Over the budget constraint line → out of budget
On the budget constraint line → just in budget, nothing saved.
Under the budget constraint → under budget, something saved.

Area under the Budget constraint → opportunity set → set of all possible combinations of goods which are in budget.

If price of goods go down, but income = const. → opportunity set gets bigger, as more goods can be bought under budget → HHs are better off → Thus, Real Income increases even though income is const.

How to draw the opportunity set → suppose the decision is to be made for two goods, draw them on x & y axes, then mark how many pieces of one good you can buy when the other is not being bought at all. These are x & y intercepts, join them.

Opportunity set gets bigger → Real Income increases.

Real Income depends on the amount of goods you can buy, it may increase due to increase in income or decrease in prices.

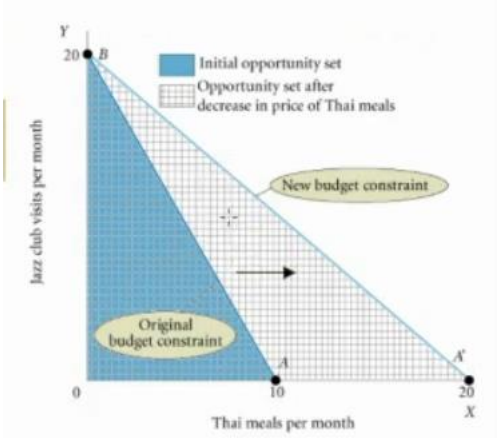
If price increases and income also increase proportionally → real income is const.

Equation of Budget Constraint: $P_X X + P_Y Y = I$

Equation of opportunity set: $P_X X + P_Y Y <= I$ (The choice chosen could be spending lesser than I, remaining will saved)

I → Income X→ no. of goods on x-axis $P_X$→ price of goods on x-axis

Opportunity cost to buy 1 unit of X = $-(P_X / P_Y)$




If the price of thai meals decrease, then the x-intercept will be more as more meals can be bought for the same price.

Therefore, decrease in prices widens the opportunity set.

Utility: satisfaction a product gives compared to its alternatives.

Marginal Utility: Additional satisfaction gained by consuming one more unit of a good or service.

Diminishing Marginal Utility: The phenomenon where marginal utility decreases with increase in consumption of a specific good.
Eg: We have one ice cream → very good utility
Another one → good utility → marginal utility diminished (satisfaction from 2nd one not as much as 1st one )
Another one → utilised enough

Total Utility: Utility gained from all units consumed.

This explains the fact that IPL has limited months and not all year long. People will get bored.

Marginal Utility is derived from the last unit consumed.

To maximize utility for both X & Y → $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$ $MU_X$ → Marginal Utility from last unit of X
This condition should be satisfied $P_X$ → Price per unit of X

Suppose, $\frac{MU_X}{P_X} > \frac{MU_Y}{P_Y}$ → HH aim is to equalize the two ratios.
Then more money will be spent on x as it is giving more utility per dollar, less money spent on Y
But as we spend more on x and less on y, $MU_X$ will decrease while $MU_Y$ will increase
Because of this, $MU_x$ falls and $MU_Y$ rises to a point where
$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$

Therefore, when we compare two goods, one is bought more and the other is bought less in such a way that $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$ becomes true → HHs try to achieve this relationship by buying one good more and the other less.

Price change in one good affects the entire budget constraint, for example, cheaper petrol prices will affect your choice of car purchase, the number of times you go for movies and shopping etc.

**Marginal Rate of Substitution** = **$MRS_{XY}$** = $-MU_X / MU_Y$ → The ratio at which HH is willing to substitute X for Y. (Give Y and take X in return.)

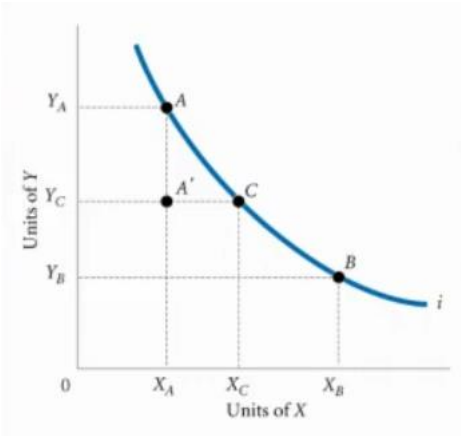
If marginal rate of substitution is 4. That means I will give 4 units of Y for 1 additional unit of X.

$MU_X / MU_Y = -4 / 1$ → $4Y = 1X$ (Cross multiply)

Diminishing marginal rate of substitution → As more of X is consumed and less of Y → $MU_X / MU_Y$ decreases

The value of X decreases as we consume it more, the value of Y increases as we consume it less. So marginal rate of substitution decreases → diminishing marginal rate of substitution

You would trade burgers for biryani, but once you keep having biryani over and over, you would feel burgers now will give you more utility. Thus the marginal rate of substitution for biryani has decreased.



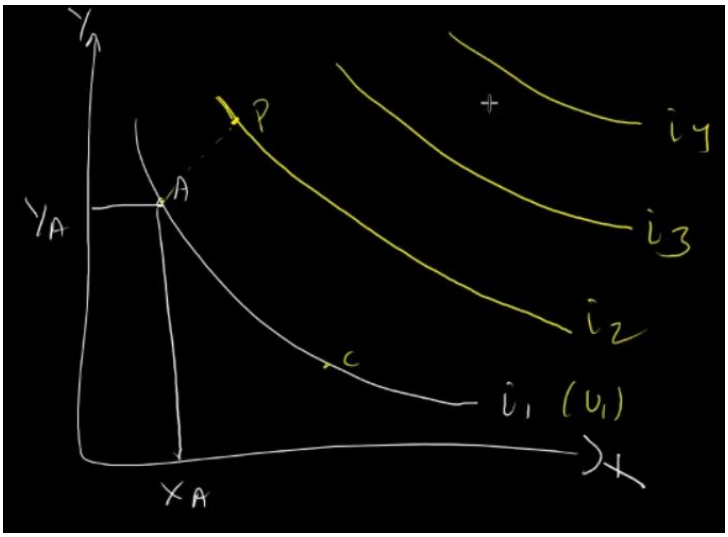

**Indifference curves**: All points on this curve have same total utility.

$U_A = U_B = U_C$ $\{U_A = U_{XA} + U_{Ya}\}$

$U_A$ not equal to $U_{A'}$ → A' not on indifference curve

If number of units of Y consumed is decreased, then number of X units consumed has to be more for total utility to be constant.

**Deriving IC curves:**
You have a point A, you want to draw the IC Curve it is on.
From A, remove some unit of Y, you will come to A'
See how much total Utility is gone by coming to A'
Add that much Utility with X.
Utility becomes same as A, that is how you got C.
Do the same again, you need three points at least to draw the curve.




We have an indifference curve $i_1$.

If we consume $Y_a$ & $X_a$ and then we increase consumption of both goods. Then we reach a point P

P forms a new curve $i_2$, P has more total utility than $i_1$.

We see that rightwards shift of curve increases total utility.

Moving along indifference curves → same total utility

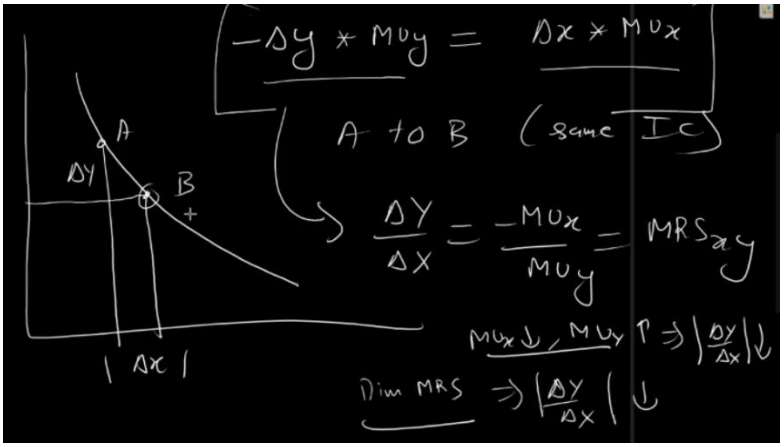
Shifting the indifference curve → changes total utility

If the consumer is ready to spend a little more for a little more X & Y, then a new curve is formed, like this many curves are formed based on consumer's preferences. The set of all these curves is called preference map.

Preference map → set of all indifference curves

IC curves are convex to the origin → slope is constantly decreasing.

IC Curve → when we move from one point to the other → loss in TU on one axis = gain in TU on other axis, as TU is const.

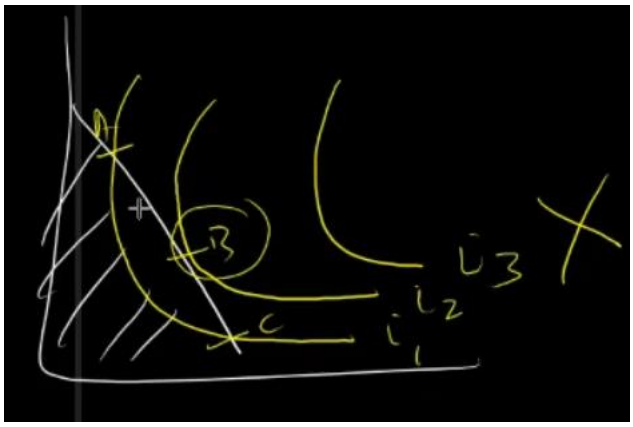



When we move from A to B.
Y decreases by Δ Y and X increases from Δ X.

A and B are on same IC, so
Decrease = increase in TU, thus,
$-\Delta y * MU_Y = \Delta x * MU_X$

$\Delta y / \Delta x = - MU_X / MU_Y = MRS_{xy}$

*Slope* of indifference curve = Marginal Rate of Substitution = $MRS_{xy} = - MU_X / MU_Y$




The triangle area shaded is the collection of points under budget constraint.
i1, i2, i3 → indifference curves.

A,B,C are on ICs and are under budget constraint.
Thus, we can choose among A,B,C.

B will be chosen because it is under budget and gives max utility. (i2 has more TU than i1)

Max. Utility is achieved at the point where budget constraint and IC are tangent to each other.

Budget constraint and IC are tangent → point of contact = Max. Utility

At pt. of contact, Budget Constraint will be a tangent to IC, thus at that point, they'll have the same slope.

Slope of IC at pt. of contact = Slope of budget constraint

**$MRS_{yx} = MU_X/MU_Y = P_x/P_Y$ → at point of contact.** **{ $MRS_{yx} = -MRS_{xy}$ }**

**Point of Contact → Consumer's equilibrium (or) interior solution**

## Utility Maximization

Let the consumer has a utility function of the form $U = f(x,y)$ and the total income available to her is $m$ while the prices are $P_x$ and $P_y$. The consumer's problem is choose the affordable bundle that maximizes her utility.

**The feasible set:** The consumer cannot spend more than the total income $m$. Thus,

$$P_x * x + P_y * y \leq m \qquad (1)$$

Since *monotonicity*, i.e., *more is better* holds for the consumer's choice of bundle, so the inequality of eq.2 becomes equality

$$P_x * x + P_y * y = m \qquad (2)$$

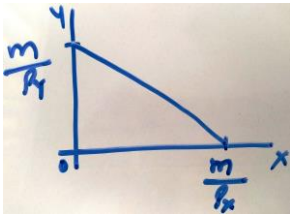



Figure 1: The Budget Constraint (Feasible Set)

The slope of the budget constraint is given as:

$$slope = -\frac{P_x}{P_y} \qquad (3)$$

We know that the indifference curve exhibit *diminishing marginal rate of substitution* and this is reflected in the slope of the indifference curves. The slope is given by

$$MRSyx = -\frac{dy}{dx}|du = 0 \qquad (4)$$

i.e., the marginal rate of substitution of $y$ for $x$ is the negative of the slope of the indifference curve in figure 2.

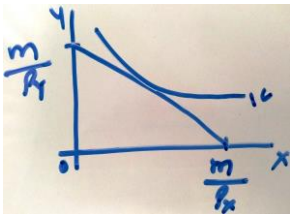



Figure 2: Consumer's Equilibrium

Also, we know that:

$$MRSyx = \frac{MU_x}{MU_y} \qquad (5)$$

The optimal bundle for the consumer is one where the following two conditions are fulfilled:

**a.** The bundle must lie on the budget line;

**b.** The indifference curve must be tangent to the budget line at the point of optimal bundle.

As Consumer equilibrium is the pt. of contact b/w IC curve and BC, slope of IC at pt. of contact = Slope of BC

From (3), (4), and (5), we get that at point of consumer's equilibrium (ignoring the negative signs):

$$MRSyx = \frac{P_x}{P_y} = \frac{MU_x}{MU_y}$$ → This happens At point of contact (consumer equilibrium)

**Using Lagrange multiplier to find consumer's equilibrium:**

Let the Utility function of the consumer be given by $U = f(x,y)$ and the feasible set by $P_x * x + P_y * y = m$. We set the Lagrange function as:

$$L = U(x,y) + \lambda(m - P_x * x - P_y * y) \quad (7)$$

getting the first order conditions for the eq.7 and setting it equal to zero shall give us values of $x$ and $y$ that are in the optimal bundle.

**Example:** Let $U = x_1^{0.25} x_2^{0.75},\ m = Rs100;\ Px_1 = Rs2$ and $Px_2 = Rs4$. Find the optimal bundle of $x_1$ and $x_2$ for the consumer.

**Solution:**

Set the Lagrangian function as:

$$\mathcal{L} = x_1^{0.25} x_2^{0.75} + \lambda(m - Px_1 * x_1 - Px_2 * x_2) \quad (8)$$

Setting the *first order conditions* equal to zero, we get:

$$\frac{\partial \mathcal{L}}{\partial x_1} = 0.25 x_1^{-0.75} x_2^{0.75} - 2\lambda = 0 \quad (9)$$

and,

$$\frac{\partial \mathcal{L}}{\partial x_2} = 0.75 x_1^{0.25} x_2^{-0.25} - 4\lambda = 0 \quad (10)$$

and,

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 100 - 2x_1 - 4x_2 = 0 \quad (11)$$

Solving eq. 9 and 10 gives $x_2 = \frac{3}{2} x_1$.

Substituting value of $x_2$ in eq. 11 gives $x_1^* = 12.5$ and $x_2^* = 18.75$.

Cost-Benefit Analysis → If benefit of public project > cost of the project → project is done

Price Effect → Change in demand of goods when price changes

Income Effect → Change in real income when price of goods changes

Substitution Effect → When price of a good increases, demand for it decreases and demand for lower-priced substitute increases. Vice-versa

Diamond or water Paradox → Something which we use a lot has no value for exchange. EG: water. & Something which we don't use much has a lot of value. Eg: Diamond.

| Impact of a fall in the price of good X | | | | |
|---|---|---|---|---|
| **Nature of Good X** | **Substitution Effect** (Direction of Change) | **Income Effect** (Direction of Change) | **Substitution & Income Effects** (Magnitude of Change) | **Price Effect** |
| Normal Good | Increase in quantity demanded of Good X | Increase in quantity demanded of Good X | - | Positive |
| Inferior Good | Increase in quantity demanded of Good X | Decrease in quantity demanded of Good X | SE > IE | Positive |
| Giffen Good | Increase in quantity demanded of Good X | Decrease in quantity demanded of Good X | SE < IE | Negative |

Giffen good is a type of inferior good, only difference is:

Inferior → SE dominates
Giffen → IE dominates

SE → sub effect
IE → Income Effect


| Impact of a fall in the price of good X | | | | |
|---|---|---|---|---|
| **Nature of Good X** | **Substitution Effect** (Direction of Change) | **Income Effect** (Direction of Change) | **Substitution & Income Effects** (Magnitude of Change) | **Price Effect** |
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| Giffen Good | Increase in quantity demanded of Good X | Decrease in quantity demanded of Good X | SE < IE | Negative |


Even if it is an inferior good, decrease in its prices will increase its demand against its pricier sub.

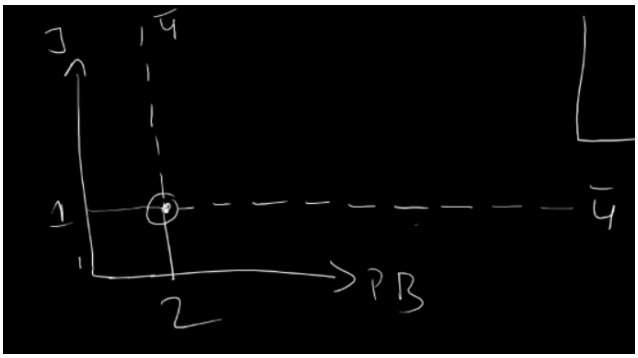
Increase in Income effect will cause the demand of inferior good to decrease as ppl would want better pdts.

Items which do not follow the law of demand → Demand is inversely proportional to price.

1) Giffen Goods: essential goods for the poor. If prices of these goods are increased to decrease demand, the reverse will happen because they would buy the same good, but inferior versions. This will thus not decrease the demand as expected. Eg: bread, vegetables.

2) Snob Items: When price of these luxury items is decreased, they lose their exclusiveness and so the demand among the wealthier for these goods decreases.
Wealthier ppl want exclusive goods, if price falls, more ppl are able to afford it, exclusivity lost.
Eg: Rolex, Rolls Royce

3) Speculative Goods: Goods whose prices depend on market speculation. Eg: shares of a company, real estate.




Q: If we take two complementary products on the curve. (Toothpaste and Toothbrush)
The consumer prefers 2 TP for every TB.
TB = PB in pic TP = J
Now, if I increase amount of TB consumed, we see the dotted line parallel to x-axis. Total Utility should increase, but it doesn't because the pdts taken are complementary. Same for y-axis. Surplus toothpaste will give no utility if it will not be used by more TB
Complements-> both pdts have to be increased to increase TU
One's utility doesn't increase without the other.

Q: Nuts (consumer neither likes nor dislikes) and Ice cream (consumer likes.)

**Neither Likes nor dislikes → No utility change, as it doesn't matter to the consumer.**

Ice cream → positive utility change.

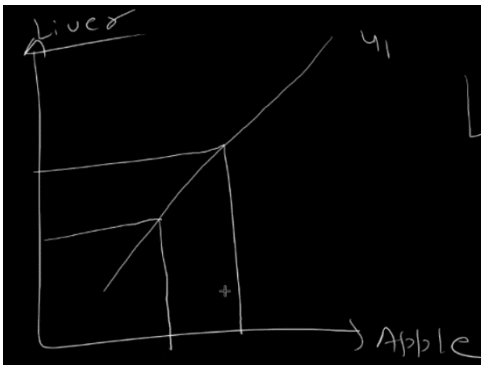
IC curve will be || to no utility change good.

This is because on IC, TU should be constant.

When he has 5 Ice creams and any number of Nuts, the utility should be same, therefore you see $U_1$ graph.

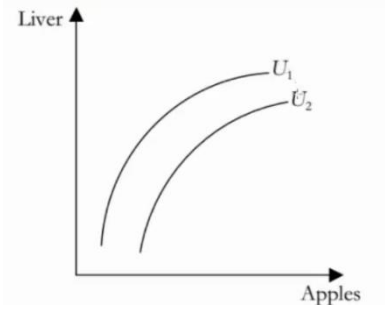
TU is same at all points on $U_1$ graph as nuts don't matter.

Q: Apple (consumer likes), Liver (Consumer Dislikes)




IC will be upward sloping curve.
In IC, TU should remain constant.
If liver is increased, TU decreases, but to keep TU const, we have to increase consumption of Apple.

Therefore consumption of disliked good is to be balanced by a liked good to keep TU constant.




The figure in the right is also possible.
Because MRS might start to decrease.
If the number of apples needed to diminish loss in utility by consuming liver is always same, then it will be the first figure.

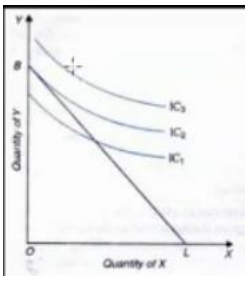
If the number of apples needed to diminish the loss in utility by consuming liver keeps changing as we consume more of a good (diminishing law), then fig 2 is right.

Basically we need the MRS to determine what curve will it exactly be.

But, we know for sure that it will be an upward sloping curve.

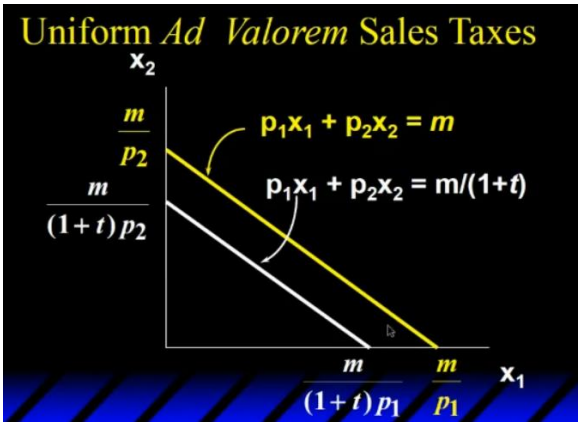
When drawing IC, we have to keep in mind that TU should always be constant.

Corner solution/ corner equilibrium → point where only one good is being bought, (point is on one of the axis)




If the cost of X is so high that consumer decides to have only Y, then IC and BC will have consumer eq at y-axis, like the fig given.
That point is called corner equilibrium / solution.

Concave IC : Happens when MRS is increasing (ie) Consumer wants to have more and more of X only, doesn't want Y.
As we consume more and more of a good, its marginal utility decreases, but here opposite happens.
Consumer here doesn't like variety and diversification.




Q: P1 and p2 are the price of goods and this is the curve for BC.

M is your total income.
If the govt levies a uniform tax on all goods of u%.
Then price of all goods will increase by u%.
Suppose 5%, then price = p1*(1+0.05), generalize:

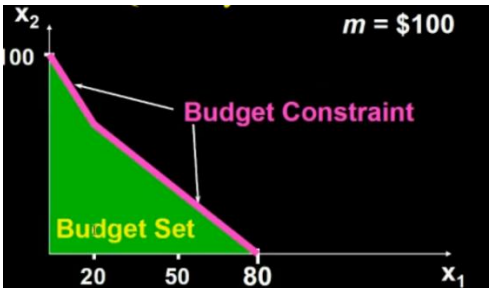
New price = p1*(1+t). For all goods this happens, so your real income decreases and thus your ability to buy goods decreases.

If prices get multiplied by 1+t, then new equation becomes:
$P_1(1+t)*x_1 + P_2(1+t)*x_2 = m \rightarrow P_1x_1 + P_2x_2 = m/(1+t)$

Therefore, the increase in uniform taxes changes the equation and thus decreases your BC.

Q: p2 is constant, p1 is 2$ till x1 = 20. Once x1> 20, p1 = 1$. Draw the budget constraint.

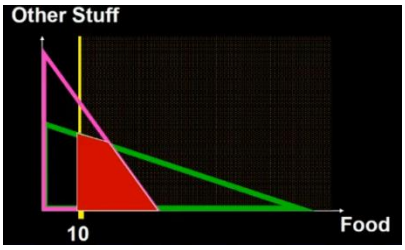
Slope of BC = -p1/p2, find the $slope_1$ till x1 =20 and then find $slope_2$ for x1>20.
Now plot the two slopes.




$$-p_1/p_2 = \begin{cases} -2, & \text{for } 0 \le x_1 \le 20 \\ -1, & \text{for } x_1 > 20 \end{cases}$$

Till x =20 it is one slope, then it is another.

‘




If there are multiple constraints like a curve with
1) time constraint and food
2) Minimum food consumption
3) Money constraint

Simply plot all these graphs given in one paper and find the intersection, like here, that will be the final constraint.

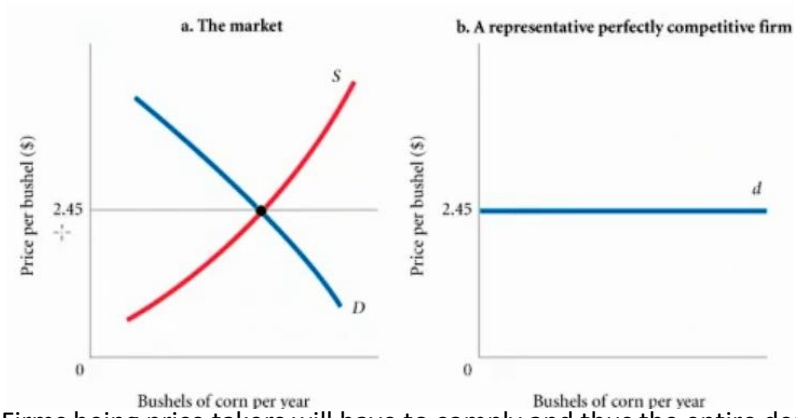
## *Chapter 7 : Behaviour of Firms*

Firms: Demand factors of production in input markets and supply goods and services in output markets.
HH: supply factors of production in input markets and demand goods and services in output markets.

Profit maximizing firms: Firms that aim to maximize profit. The firms which we learn about have no control over pricing, so they try to reduce cost of production to max profit.

Assumptions
1) Perfect Competition: No firm is big enough to control prices. Competitors can freely enter and exit the market.
2) Homogeneous products are made by the firms, as there is nothing for them to differentiate and stand apart. They will take whatever price people give.
   Firms→ Supply pdts in output market → Firms are price takers in output market
   HH → Supply pdts in input market → Also Firms are price takers.

   Basically, Firms have no control over price of input and output, the only thing they can control is production method.




Firms supply corn bushels in output market.
a→ Corn bushel market 's demand and supply curve
b→ demand curve for one firm in the perfectly comp. market of corn bushels

As we see the market is perfectly competitive, Firms are supplying goods, so they are price takers here.
Supply and demand curve of the entire industry matches at 2.45$. People will buy at that price. HH demand the pdt at that price.

Firms being price takers will have to comply and thus the entire demand curve is on 2.45$ for the firm.

In a perfectly comp. mkt, a firm has to make three decisions:

1) How much to supply (Depends on production method, machines will give more output to sell)
2) Which production method to use (Depends on production cost per unit)
3) How much of each input to demand (amount of input demanded depends on production method)

We see that 1) and 3) depend on 2)
Therefore, we see that all decision indirectly depend on the final production cost per unit.

Profit = Total Revenue – Total Cost

Economic Profit = Total Revenue – Total Economic Cost

Accountants and Economists calculate Total cost differently.
Total Economic Cost (ie) Total cost = out of pocket costs + normal rate of return on capital + Opp. Cost of factors of production

1) Out of pocket costs→ Explicit costs or accounting costs are the costs as an accountant would calculate.

2) Opp. Cost of factors of production (Implicit): If a family owned business employs three family members, they are not paid, you also hire a worker for 50rs, as an accountant you will take the cost of labor as 50.
But as an economist, you will take the cost of labor as whatever the market rate for that job is. That is, you consider the opportunity cost of labor. So, the cost of labor here is 50 + opp. Cost of 3 family members' job.

Eg: Dad hires a labor for 100rs/day and hires his two children for zero-cost. IF they would have worked somewhere else, they would have got 400rs/day each

Implicit cost → 100rs/day
Explicit cost → 400*2 = 800rs/day

If dad decides to pay the kids as well.
Implicit cost → 800 + 100 = 900rs/day
Explicit cost = 0

3) Normal Rate of return on capital: To expand or start a business you need capital to setup plants, rent land etc.
Whenever capital is used in business, there is an opportunity cost to consider.
What if I had invested the capital in a bond, that would have given me a rate of return as well. That rate of return is an opportunity cost.

When I put capital in production, I will get a rate of return in the form of profit. If 100rs is put and 15 rs is profit I get, then ROR or yield of investment is 15%.

Normal Rate of Return: RoR just sufficient enough to keep investor satisfied.

IF ROR falls below normal rate, then there is no incentive for the investor to put capital in the production.
The normal rate of return decided by investors is included in the total cost.

The cost of capital and machines are not considered as it is assumed that they can be sold at original price when they wish to stop using it. Yearly maintenance comes under cost as that cant be recovered when they're resold.

Firm earns normal rate of return→ it is earning zero profit as normal rate of return is in the total eco cost
Firm earns more than NRR → it is earning profit.

Q: Sue and Anne buy a cart for 20,000. Hire a worker for 14,000 a year. Buy 3,000 belts for 5$ each and sell them for 10$. Had they put their capital in bank, they would get 10% RoR.
Are they in a profit?

TR= 3,000* 10$ = 30,000$
TEC = 14,000 + 3,000*5 + (10% of 20,000)

NOTE that capital put in (20,000$) is not considered in TEC as per definition. But interest we would have got on that is considered. It is also assumed that it doesn't depreciate.
Profit = TR – TEC = -1000
Therefore, it is a loss.

Total Economic Cost = Explicit Costs + Implicit Costs

Explicit cost = out of pocket costs (which are paid simply)
Implicit Costs = Opportunity costs of doing something else (NRR, Opp. Cost of factors of production)

Q: Two guys worked with a salary of 60k each year for 2 years. Then they decided to start a business with their combined savings of 50k. They used all 50k to buy computers and chairs and desks.
Their business' revenue is 40k each year.
They together annually pay 18k as rent and pay themselves 10k each annually.
Before their savings were in a bond of 10% return.
Are they in profit?
Sol:
Explicit cost = 18k + 10k*2 (They are owners, but they are being paid labor wages)
Implicit Cost = 10% of 50k + 50k*2 (The opp. Cost of leaving 60k job to get paid 10k is 50k.) → TRICKY QUESTION
TEC = Explicit + Implicit

Therefore, TR = 40k
Profit = -ve, TC is way higher

Positive Profit → they are earning more than NRR, keeping investors happy
Negative Profit → they are earning less than NRR, investors are not happy.

A time period is defined ***Short Run*** when:

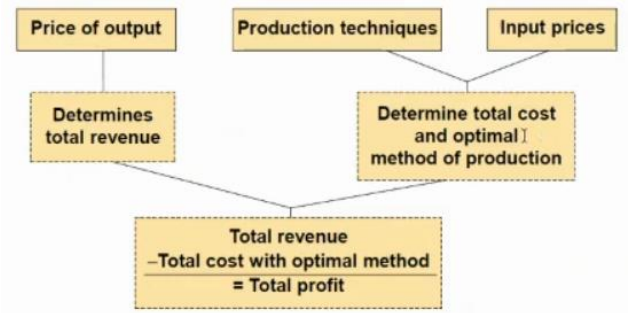
1) Atleast one factor of production is fixed in the given period.

   Eg: For manufacturing plant fixed factor would be plant and machinery. (It takes time to expand machines)
   For doctor, it might be labor hours, ie, the time he gives to patients.
   For farmer, it'll be land.

2) No company can enter or exit the market in the given period.

***Long Run:***

1) None of the factors of production are fixed. Factors can be changed to plan for any output level they want.
2) Companies can freely enter and exit the market.




Price of output gives TR.

Production method and input prices given TEC.

Optimal Method: Production Method that minimises cost of production.

Firms → Price takers in both input and output market
Therefore, Firms have no control over price of input it gets and price of output it sells for.
The only thing it has under control is the production method. Thus, Firms try to choose optimal method of production.

Countries with low labour rates have firms that set up labour-intensive prod. method.

Production Function: 1 unit of output as a function of units of input.
1 U of output = f(units of input)

There is a sandwich shop with 1 grill.

| (1) LABOR UNITS EMPLOYEES | (2) TOTAL PRODUCT (SANDWICHES PER HOUR) | (3) MARGINAL PRODUCT OF LABOR | (4) AVERAGE PRODUCT OF LABOR (TOTAL PRODUCT LABOR UNITS) |
|---|---|---|---|
| 0 | 0 | – | – |
| 1 | 10 | 10 | 10.0 |
| 2 | 25 | 15 | 12.5 |
| 3 | 35 | 10 | 11.7 |
| 4 | 40 | 5 | 10.0 |
| 5 | 42 | 2 | 8.4 |
| 6 | 42 | 0 | 7.0 |

If there's just one guy, he has to take orders, attend calls, make sandwiches and serve them.

If there are two guys, one guy is employed just to make sandwiches, this increases the rate at which they're being made.

If there are three guys, productivity will increase, but not much because there is only one grill to work on.

Hiring more & more will lead to a dip in marginal productivity. But, output will still keep increasing to a certain point because someone else will work on the grill when the other person is resting.

Marginal Product of Labor: Additional Units of product made when labour is increased by 1.

We see that MPL increases and then dips once it has reached peak utilisation. MPL still remains +ve or zero. Not -ve.

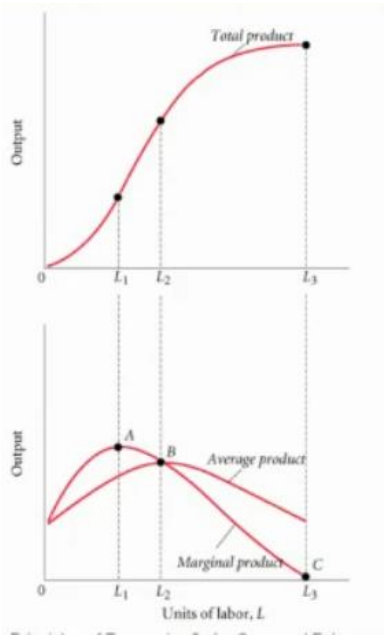
Avg. product of labor = no. of units of product made by every labor on an avg. = total pdt/total labor

Is adding the 4th person worth it? → Depends how much the worker costs and how much they can sell pdts for, if its +ve increase in profit, then worth it.

**Law of diminishing returns** states that after a certain point, increase in fixed inputs (land, in this case grills) will not increase marginal product of variable input (in this case, labor).

Basically, extra returns we get by hiring more keeps diminishing.

In short run, there is atleast one factor of production which is constant throughout.
Additional Returns will keep diminishing as we increase other inputs because that factor of prod. is acting as a constraint.




We see that total product reaches a maximum after which increasing labor also doesn't increase pdts, even by a little.

The peak increase in productivity also starts falling down and thus, marginal product falls down too.

This fall in marginal product and happens because capital doesn't increase as much as labor does.

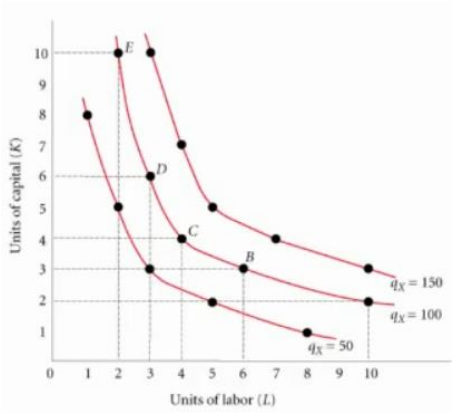
Capital and labor are complimentary products.

Added capital increases productivity of labor.

Until now we saw production as a function of one input(labor only).
What happens when we see prod as func of labro and capital.
That is, both these variables change.

IN chapter 6, we learnt about Indiff Curves and Budget Constraint → used to maximise utility by HH
Here, we learn about Isoquant and Isocost → used to minimise cost by Firms

IC → Isoquant (Both are similar)
BC → Isocost (Both are similar)




Isoquant graph: Similar to IC, but here Units of Labor(L) and Units of capital(K) are on x&y axes.

Quantity produced is same throughout the curve

For ex: On C, 4 units of L and 4 units of K are required to produce $q_x$=100 products.

B,C,D have different production methods but produce the same quantity as they're on the same curve.

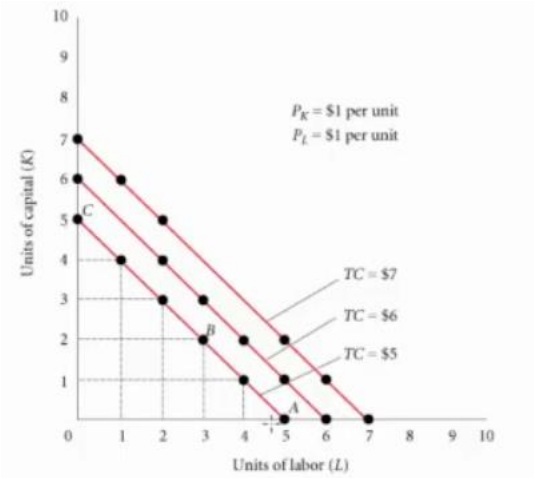
Slope of Isoquant = $-MP_L / MP_K$ (Derived in the same way as IC, NOT imp)

$MP_L$ → Marginal Product of Labor → No. of Additional outputs generated when labor is increased by 1.
$MP_K$ → Marginal Product of Capital → No. of Additional outputs generated when capital is increased by 1.

Marginal Rate of Technical Substitution = MRTS = $-MP_L / MP_K$ = Slope of Isoquant → For Isoquant

Marginal Rate of Substitution = MRS = $-MU_X/MU_Y$ = Slope of IC → For IC

MRTS = The rate at which firm can substitute labor for capital while keeping output constant.




Isocost line: The curve that shows all combinations of capital and labor possible for the given total cost.

A,B,C have different combinations but are on the same line because they have the same Total Cost.

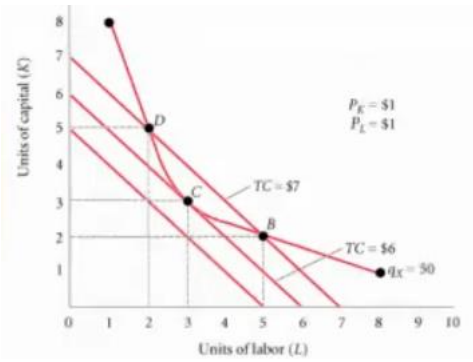
Slope of isocost line = $-P_L/P_K$

Q: Now suppose question is that you have to produce 50 quantity, choose the method which will minimize cost.
Sol:
We first draw the isoquant curve for q=50.

Then we draw all possible isocost lines.

Whichever isocost line is tangent to isoquant curve, its point of contact is the method to be used.

Eg: Here, its C.




$MP_L/P_L = MP_K/P_K$ → This equilibrium is to be achieved. (Similar to chapter 6)

$MP_L/P_L$ → Product derived from last dollar spent on labor

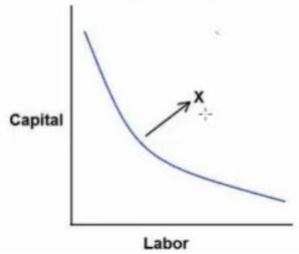
$MP_K/P_K$ → Product derived from last dollar spent on capital

If the last dollar spent on labor and capital are not equal, then we will increase on or decrease the other in such a way that they become equal, this is done to reduce costs→This is for firms
HH try to maximize utility similarly in chapter 6

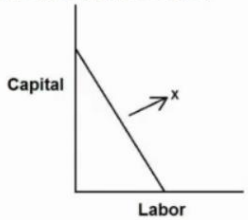
If $MP_L/P_L > MP_K/P_K$ → Then they will buy more labor as they're getting more value for money and decrease capital.
Doing this will bring down the value of $MP_L$ and increase $MP_K$, thus eq. will be achieved.

Types of Isoquant curve:

**Smooth and Convex Isoquant:**
In a two-product framework, when one of the factors of production can be continuously substituted by the other, we get a smooth and convex isoquant

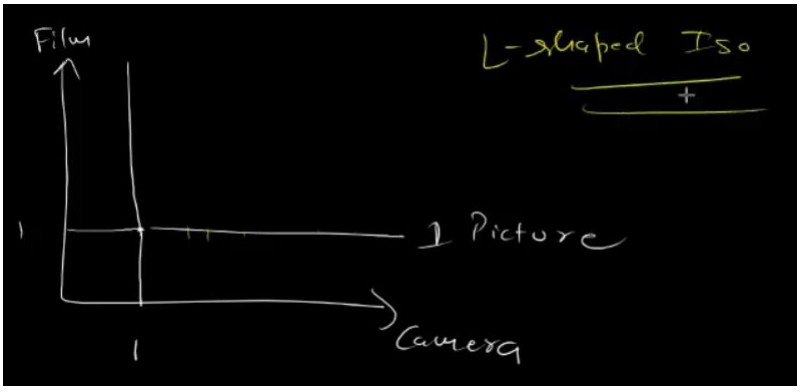



**Linear Iso-quant Curve**: This curve shows the perfect substitutability between the factors of production.
This means that any quantity can be produced either employing only capital or only labor or through "n" number of combinations between these two.




Convex curves are drawn when K and L can substitute each other but they cant completely substitute. That is, You cant completely rely on capital without labour and you cant completely rely on labor without capital.
You need both factors, but ratio is something that depends on costs.

Linear Curves are drawn when you need not use both factors. You can rely completely on one of the factors for entire production also.
Whether you do a combination of the two factors or you use only one factor in linear curve depends on the cost.




L-Shaped Isocost curve:
When fixed ratio of factors are only required for production.

EG: To produce 1 picture, you need 1 camera and 1 film.

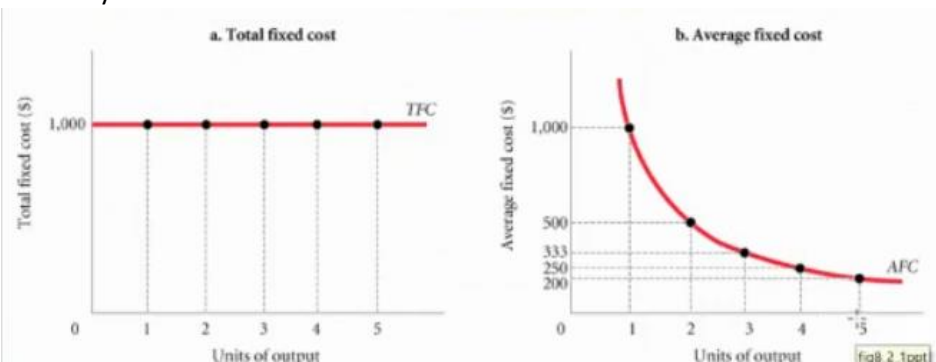
Here, q=1pic and isoquant thus will be line || x-axis. This is because the no. of cameras we have doesn't matter as long as we have only one film, thus in the entire curve, only one pic can be produced regardless of the no. of cameras.

## *Chapter 8: Short Run Costs and Output Decisions*

In short runs, the company has fixed costs that it has to bear regardless of it producing stuff or not. Eg: Rent
The company can do nothing to change their fixed costs in the short run.

In long runs they can avoid fixed costs like rent payment by deciding to exit the market and shut down its operations.
This can not be done in short run as in short run period, companies cant enter or exit the market.

Total Fixed Cost / Overhead Costs : All costs that do not change with output, even if output is zero.
You have to pay security guard to safeguard your machinery. You will have to keep heating the pipes to make sure that they don't freeze.



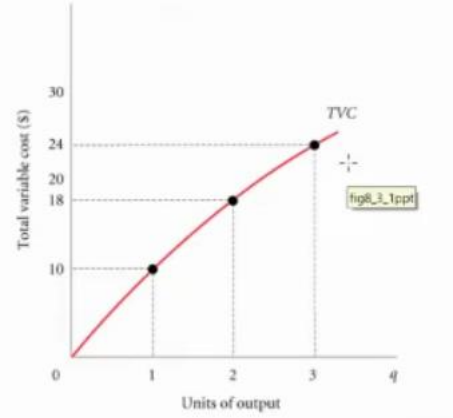

Total Cost = Total Fixed Cost + Total Variable Cost

TFC doesn't depend on output.
Avg Fixed Cost = FC/Ouput

FC doesn't change with change in output.
Avg fixed cost will decrease with increase in output as the fixed cost per output unit will decrease.

Avg. fixed cost = fixed cost per unit of output.

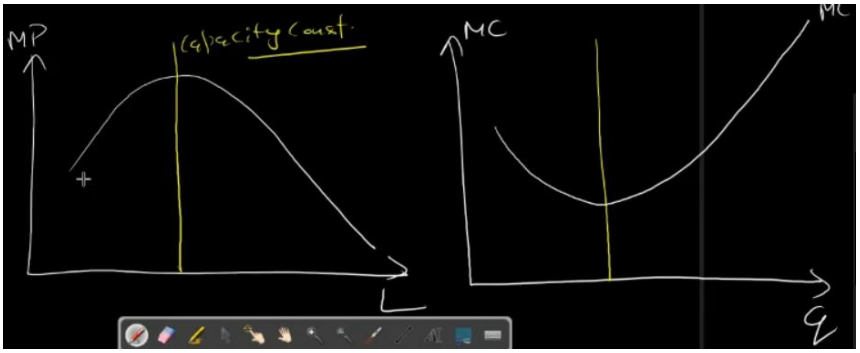
In the short run, Firms don't have control over fixed costs, they only have control over variable costs which they will try to minimise by minimising the cost of production.
In short run, they also do not have control over the scale of output.




Total Variable Cost curve: Units of output & TVC on x&y axes.
For suppose 1 unit of output, there will be many methods which will have different TVC.
Method with min. cost is only plotted.

Marginal Cost: Cost of producing one additional output.

MC curve derivation:




First curve is Marginal Product of Labor curve.
There we see that more Labor is increasing additional production by a lot until the capacity constraint.
After capacity constraint, increasing labor is not able to give as much additional output as before.
The cap. Constr. Cant be removed in short run.

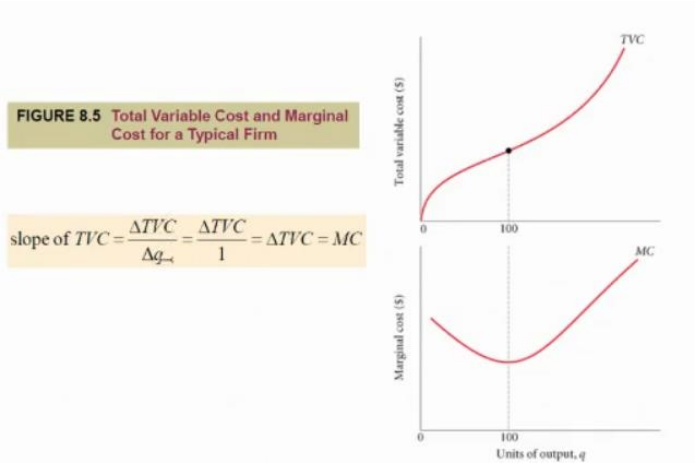
Second Curve is for MC
This is because until capacity constraint, increasing labor by a little was increasing output by a lot, thus we had to spend little to increase output by a lot. So, MC was decreasing.
Once we reach capacity constraint, the increase in output when more labor was hired starts to decrease. Because of this we have to hire more labor to increase output by a little. Thus, we have to spend more to increase output by a little. So, MC started to increase.

Marginal Product is inversely proportional to Marginal Cost.

**In MC curve, we see that the Marginal Cost falls until capacity constraint and then rises.**

**In MP curve, we see that the Marginal Product rises until capacity constraint and then falls.**

**MP is inversely proportional to MC**




First curve is Total Variable Cost (TVC)

Slope of TVC is given.

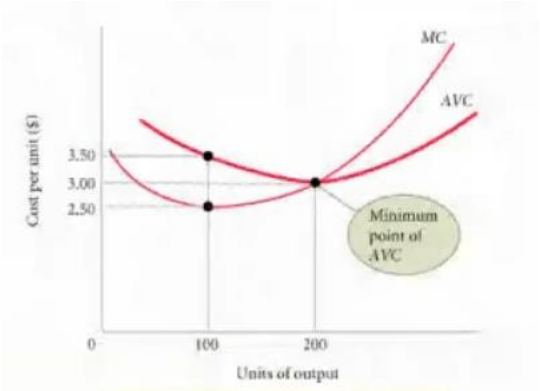
Slope of TVC = Marginal Cost Curve.

If someone asks for curve of slope of TVC, give them MC curve.

Avg variable cost → Variable cost per unit of output.

Avg Variable Cost = AVC = TVC / q

Avg fixed Cost → Fixed Cost per unit of output.



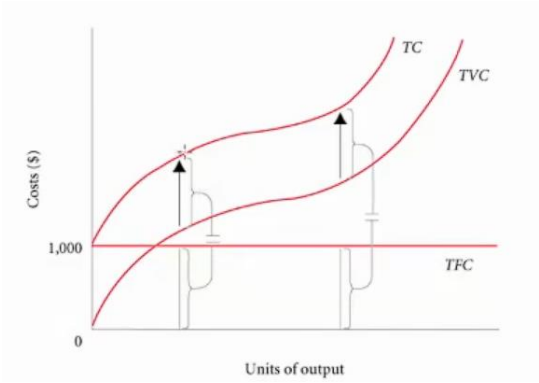

AVC curve and MC curves are given

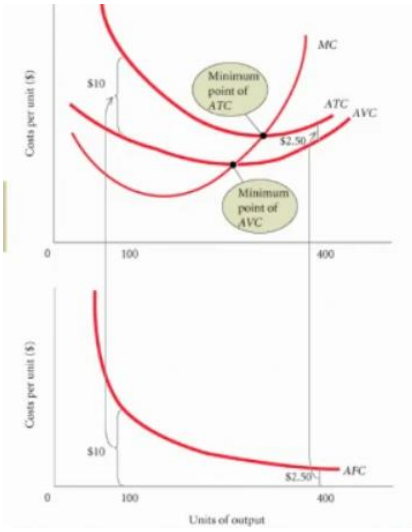
AVC = MC at min. point of AVC.

AVC trails MC at any given output.
When MC < AVC, AVC moves down towards MC.
When MC > AVC, AVC moves up towards MC.

Total Cost Curve = TVC + Fixed Cost

We have TVC curve, we just move it up by the fixed cost.

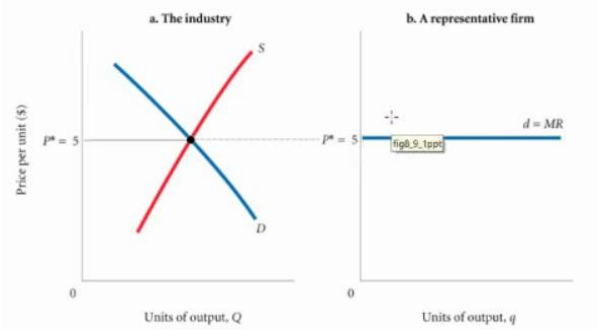



Average Total Cost = Avg fixed cost + avg var cost

AFC is given in the 2nd graph.
ATC & AVC is given in the 1st graph.

It is a perfectly comp. market, so the firms have no control over selling prices. Therefore, we see that the price at equilibrium pt. is the price that firms have to take. They're price takers, so in the 2nd graph we see that how much ever output they give, they will get the same price.




Marginal Revenue = MR = Additional revenue generated when output is increased by 1
In Perfectly comp. market, MR = Price of one unit of output.
For perfectly comp. firms, profit maximizing condition is P = MC.

A person who has a salaried job might go on to start his own business.

**Profit = TR – TC**
**Economic Profit = TR -TEC = TR – TC – Opp. cost**

The business might have profit, but it doesn't necessarily mean it has economic profit. Maybe the opp. Cost of doing business would be more than profit, thus it'll make the Eco profit negative.
Eg: The salary you were getting in your previous job before starting business is your opp cost.
If that salary is more than the profit, then you're in an eco loss even though you're in a profit.

MR = MC → Profit Maximised (Firms try to achieve this equation always)
Firms will hire more people or increase working hours, all of this will be done to achieve MR = MC.

## Chapter 7 Tute:

**HH vs. Firm Behaviour**

| | Household | Firm |
|---|---|---|
| | Indifference Curve (Same Utility) | Isoquant Curve (Same Output) |
| | Budget Constraint | Isocost Line |
| **Objective** | Max Utility | Min Cost |
| **Constraint** | Budget Constraint | Production Function |
| | Max U(X,Y)<br>s.t. $P_XX + P_YY = M$ | Min $P_XX + P_YY$<br>s.t. $f(X,Y) = Z$ |
| **Lagrange (L)** | $L = U(X,Y) + \lambda [M - P_XX - P_YY]$ | $L = P_XX + P_YY + \lambda [Z - f(X,Y)]$ |
| **First Order Condition** | $\partial L/\partial X = 0$; $\partial L/\partial Y = 0$; $\partial L/\partial \lambda = 0$ | $\partial L/\partial X = 0$; $\partial L/\partial Y = 0$; $\partial L/\partial \lambda = 0$ |

HH used IC, Firm uses Isoquant
HH has BC, Firm has prod func
HH aims to max utility, firm wants min cost

Q Prod^n Fn: $Z = x^{\alpha} y^{\beta}$ $[\alpha + \beta = 1/2]$

$P_x = P_y = 1$

What is the total cost for $Z = 5$

Find Lagrange Function by sub. equations
Then, just like in ch6, find dL/dx =0, dL/dy=0, dL/dλ =0.

With these, you will be able to find X & Y. Then substitute them in Production function to find cost.

(2)

Example:

Consider the production function: $Z = x^{0.5} y^{0.5}$

Given $P_x = P_y = 1$ & $Z = 5$

F.O.C's:

$$\frac{\partial L}{\partial x} = 1 - \lambda\, 0.5 \frac{y^{0.5}}{x^{0.5}} = 0 \quad \text{—— (1)}$$

$$\frac{\partial L}{\partial y} = 1 - \lambda\, 0.5 \frac{x^{0.5}}{y^{0.5}} = 0 \quad \text{—— (2)}$$

$$\frac{\partial L}{\partial \lambda} = 5 - x^{0.5} y^{0.5} = 0 \quad \text{—— (3)}$$

From (1) & (2) $= \lambda = \frac{1}{0.5} \frac{x^{0.5}}{y^{0.5}} = \frac{1}{0.5} \frac{y^{0.5}}{x^{0.5}}$

$\Rightarrow x = y$

Putting this in (3)

$5 - x^{0.5} x^{0.5} = 0$ (as $x = y$)

$\Rightarrow x = 5$

$\therefore y = 5$

Total cost $= x + y = (5 \times 1) + (5 \times 1) = 10$

- A grocery shop is owned by Mr. Moore and has the following statement of revenues and costs:

| | |
|---|---|
| Revenues | $250,000 |
| Supplies | $25,000 |
| Electricity | $6,000 |
| Employee salaries | $75,000 |
| Mr. Moore's salary | $80,000 |

- **Mr. Moore always has the option of closing down his shop and renting out the land for $100,000. Also, Mr. Moore himself has job offers at a local supermarket at a salary of $95,000 and at a nearby restaurant at $65,000. He can only work one job, though. What are the shop's accounting costs? What are Mr. Moore's economic costs? Should Mr. Moore shut down his shop?**
- The accounting costs are simply the sum: $25,000 + $6,000 + $75,000 + $80,000 = $186,000.
- The economic costs also include the opportunity cost of the land rental ($100,000) and the *extra* salary Mr. Moore would earn if he selected his next best alternative ($95,000 - $80,000 = $15,000). So, the economic costs are $186,000 + $100,000 + $15,000 = $301,000.
- Should Mr. Moore shut down his shop? His economic costs exceed his revenues by $301,000 - $250,000 = $51,000. Since his economic costs are greater than his revenues, he should shut down his shop.

Opp. Cost would be the land rent which he isn't getting now. He is receiving a salary of 80k now, but he has an offer from a nearby shop for 95k. SO the difference becomes opp. Cost as well.

- A firm uses two inputs, capital and labor, to produce output. Its production function exhibits a diminishing marginal rate of technical substitution.
- a. If the price of capital and labor services both increase by the same percentage amount (e.g., 20 percent), what will happen to the cost-minimizing input quantities for a given output level?

- If the price of both inputs change by the same percentage amount, the slope of the isocost line ($-P_L/P_K$) will not change. Since we are holding the level of output fixed, the point at which the isocost line is tangent to the (fixed) isoquant does not change.

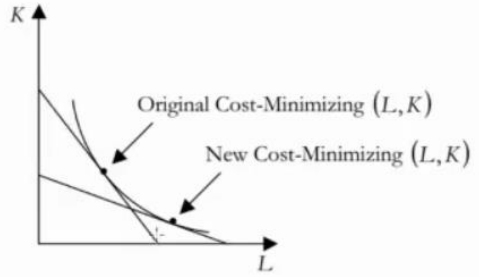
- Therefore, the **cost-minimizing quantities of the inputs will not change.**

Slope of isocost line doesn't change.
Iso quant curve depends on total quantity produced. As that isn't changing either, isoquant will remain same too.
As graph is unchanged, pt of contact will also remain unchanged.
Therefore, there will be no change in the graphs and thus cost-min inputs will not change.

**b. If the price of capital increases by 20 percent while the price of labor increases by 10 percent, what will happen to the cost-minimizing input quantities for a given output level?**

,

If the price of capital increases by a larger percentage than the price of labor, **the isocost lines become flatter** (since $P_L/P_K$ decreases). This means that the point of tangency will move to the southeast as shown in the diagram below:




Here, we see that $P_K$ increases more than $P_L$. So the slope decreases.

Isoquant curve remains unchanged because required output is not changing.

As the slope decreases, the pt of contact with isoquant goes southeast.

Another way to understand this is that price of capital has increased more than labor, firms want to minimise costs, the firm will respond to these changes in prices by substituting away from capital in favor of labor to save costs, thus we see that capital is used lesser and labor is used more making the new slope flatter.

## *Chapter 8 Tute:*

$$MR = \frac{\partial(Rev.)}{\partial Q} \; ; \; Rev = P * Q$$

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

MR = P → in perfectly comp market; so in our questions, MR = P always

MR = MC for q* (ie) MR =MC at profit maximising condition which all firms want to achieve

q*→ profit maximising quantity; q* exists at equilibrium

MR = P → always,

And for profit maximising firms MR = MC, so

**P = MC = MR → profit maximising condition; all firms aim for this; happens at equilibrium**

The labor hired, capital increased, everything is done to achieve this. So, if you're asked to find how much labor the company would hire, use P = MR = MC

MC = AVC → at shutdown
AVC slope = 0 → at shutdown

1. Given cost: $C(q) = 120 + 2q^2$

Revenue $R(q) = 100q$ ie $p = 100$

Find profit maximising quantity $(q^*)$?

$MR = P = 100$

$MC = \frac{\partial C(q)}{\partial q} = 4q$

At equilibrium $MR = MC$

$\Rightarrow 100 = 4q$

$\Rightarrow q^* = \frac{100}{4} = 25$

2. Given cost: $C(q) = 420 + 3q + 4q^2$

Revenue: $R(q) = 100q - q^2$

Determine $q^*$.

$MR = \frac{\partial R(q)}{\partial q} = 100 - 2q$

$MC = \frac{\partial C(q)}{\partial q} = 3 + 8q$

At equilibrium $MR = MC$

$\Rightarrow 100 - 2q = 3 + 8q$

$\Rightarrow 97 = 10q$

$\Rightarrow q^* = 9.7$

3. Given the demand function $q = 80 - 2p$, calculate marginal revenue as function of $q$

If cost function is $C(q) = 120 + 2q^2$, find $q^*$

$TR = P \cdot q$

$= \left(40 - \frac{q}{2}\right) \times q$

$\because q = 80 - 2P$

$\Rightarrow 2P = 80 - q$

$\Rightarrow P = 40 - \frac{q}{2}$

$\therefore TR = 40q - 0.5q^2$

$MR = 40 - q$

$MC = \frac{\partial C(q)}{\partial q} = 4q$

At equilibrium: $MR = MC \Rightarrow$ ~~$40q - 0.5q^2$~~ $40 - q = 4q$

$\Rightarrow$ ~~$36q - 0.5q^2 = 0$~~ $5q = 40$

$\Rightarrow$ ~~$q(36 - 0.5q) = 0$~~ $\Rightarrow q = 8$

$\because$ ~~$q = 0$, $36 - 0.5q = 0 \Rightarrow q = 72$~~

4. Cost function of a firm : $TC = 500 + 10q + 5q^2$

Market demand is given by : $Q_D = 105 - \frac{1}{2}P$

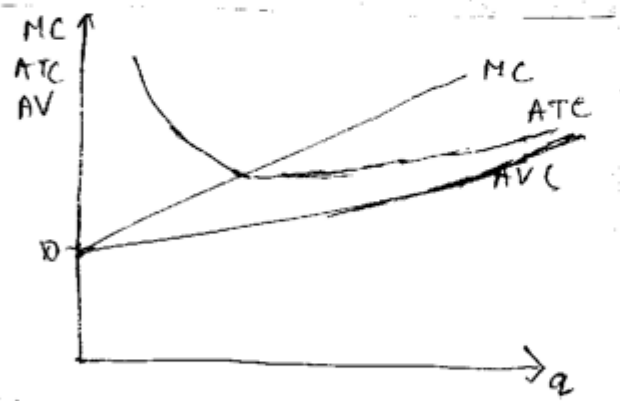
a) Find marginal cost (MC), average total cost (ATC), average variable cost (AVC) and average fixed cost (AFC). Show the firm's MC, ATC and AVC on one graph.

$$MC = \frac{\partial TC}{\partial q} = 10 + 10q$$

$$ATC = \frac{500 + 10q + 5q^2}{q} = \frac{500}{q} + 10 + 5q$$

$$AVC = 10 + 5q$$

$$AFC = \frac{500}{q}$$




b) Find break even price and quantity in the short-run?

Break even : $MC = ATC$

$$\Rightarrow 10 + 10q = \frac{500}{q} + 10 + 5q$$

$$\Rightarrow 5q = \frac{500}{q}$$

$$\Rightarrow 5q^2 = 500$$

$$\Rightarrow q^2 = 100$$

$$q = 10$$

Now, $q = 10$ and equilibrium is $\therefore$ $P = MC$

$$P = 10 + 10q = 10 + (10 \times 10) = 110$$

a) ATC = TC / quantity

To find AFC, we need FC first. In TC, we see there is a cost that is independent of q (ie) 500.
So, FC =500 → AFC = 500/q
In the same way, we find AVC.

b) MC = ATC → At Break Even point
At equilibrium, P = MC. This is how we find price.

c) Find shut down price and quantity.

At shut down point, $q = 0$

At shut down $MC = AVC$

$\therefore P = 10$

d) If market price is Rs. 50, how many units will this firm produce?

If price is given as 50, & $MC = 10 + 10q$.

$\therefore \quad P = MC$

$50 = 10 + 10q$

$\Rightarrow 10q = 40$

$\Rightarrow q = 4$.

e) If market price is Rs 50, how many firms are there in this market.

Market demand curve: $Q_D = 105 - \frac{1}{2}P$

At $P = 50$, $Q_D = 105 - \frac{1}{2} \times 50$

$= 80$

If firms are identical, number of firms $= \frac{80}{4} = 20$

f) Assume the industry to be perfectly competitive, what output will be produced in long run equilibrium? What is long run equilibrium price?

In long run equilibrium, there must be zero profits.

$\therefore$ Profit: $\pi$ = Total revenue − Total cost

$= TR - TC$

$= Pq - ATC \cdot q$

$= (P - ATC)q$

$\because q \neq 0$, for long run equilibrium: $P = ATC$.

Normal equilibrium condition $P = MR = MC$.

Combining, $P = ATC = MC$

$\Rightarrow 10 + 10q = \frac{500}{q} + 10 + 5q$

$\Rightarrow 5q^2 = 500 \Rightarrow q = 10$

MC = ATC, at shutdown AFC=0, so only AVC remains

At shutdown, MC = AVC
At shutdown, AVC slope = 0

As FC =0 at shutdown.

D,e,f,g & 5 → watch tute recording

$P = 10 + 10q = 110.$

g) How many firms will be there in the industry in long run equilibrium?

$Q_D = 105 - \frac{1}{2} \times 110$

$= 50$

$\therefore \quad N = \frac{50}{10} = 5$

5) Find the returns to scale for the following production functions:

a) $Q = 2K + 3L$ b) $Q = 0.5KL$

c) $Q = K^{0.3} L^{0.2}$

Increase capital and labour by same proportion 'm' to find the effect on output.

i) $Q = 2K + 3L$

$\therefore \quad 2Km + 3mL = m(2K + 3L) = mQ$

$\therefore$ Constant returns to scale.

ii) $Q = 0.5KL$

$\therefore \quad 0.5(mK)(mL) = 0.5m^2KL = m^2(0.5KL)$

$= m^2Q$

$\therefore$ ~~Increasing~~ Increasing returns to scale.

iii) $Q = K^{0.3} L^{0.2}$

$\therefore \quad (mK)^{0.3} (mL)^{0.2}$

$= m^{0.3+0.2} K^{0.3} L^{0.2}$

$= m^{0.5} K^{0.3} L^{0.2} = m^{0.5} Q$

$\therefore$ Decreasing returns to scale.

### OPENING LONGER HOURS: MARGINAL COSTS AND MARGINAL REVENUES

The store's normal hours of operation are noon until 8 P.M. On an experimental basis, the owner extends its hours until 11 P.M. for 1 month. The following table shows the average number of additional customers for each of the added hours:

| Hours (P.M.) | Customers |
|---|---|
| 8–9 | 41 |
| 9–10 | 20 |
| 10–11 | 8 |

Owner would extend the working hours permanently only if the changes would result into MR = MC.

MR = MC → firms try to achieve.

We might be given many options like changing labor hours, or increasing labor, or increasing selling price.
But whichever option makes MR = MC, that option will be chosen.

## ***Chapter 9*** Long Run costs and Output Decisions

In long run, firms have very less constraints, they can setup additional machinery and plants or remove some.
Final aim is to make MR = MC.
So, firms aim to supply output till the point where MR = MC.

In short run, we see that MC decreases at first and then increases. This is because in short run, we are increasing labor to increase production, costs will fall initially as more will be produced, but without more machinery, the output will saturate, anymore increase in output would only lead to increase in MC. Therefore, we see that MC first decreases the increases.

But, in long run, MC could keep decreasing forever as less machinery would not be an issue. You could increase labor and increase machinery at the same time to prevent fall in marginal product of labor.

Total Cost includes manufacturing cost, opportunity cost and normal rate of return.

So, even if there is a positive rate of return, it doesn't mean they have positive profit as the return might be lesser than normal rate of return.
Normal rate of return → return expected by the investors; it is included in the total cost.

RoR > NRR → Investors are happy and surplus money is there.
RoR = NRR → Investors are just happy. → break even point
RoR < NRR → Investors are not happy.

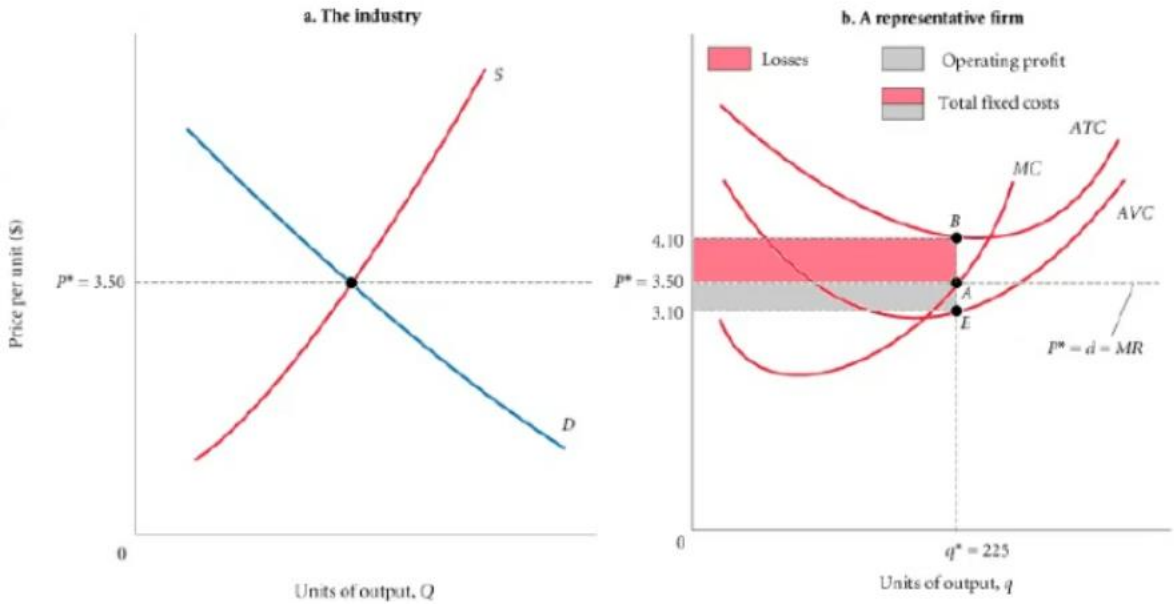
If a company is running in overall losses, it can either
1) Shut down and incur only fixed costs
2) Operate as usual and incur fixed costs, variable costs and total revenue.

Note that in both the cases fixed costs have to be paid, which is a loss.
But if revenue is more than variable costs, then the operating profit gained could be used to pay fixed costs thereby minimising losses.
But if revenue is less than variable costs, then the operating losses widen the overall loss as fixed costs are to be paid too.

So, if operating profits are there even though company is in overall loss, the company might run as it would be actually minimising the losses they incur. You will pay lesser for fixed costs as op. profit will cover some up.
But if operating losses happen, then it is better to shut down as losses are lesser if you aren't operating only. You will have to pay fixed costs and no extra loss on that.

TR > TVC → operating profits → losses reduce
TR < TVC → Operating loss → losses increase
**Even if you shut down, you have to give fixed costs in short run, which is loss.**

## Graphic Presentation [Continue Production as long as P > $ 3.10]




ATC is 4.1
P* is the market price which is 3.5 here.
Above 3.1 you keep selling even though you're making overall losses as the revenue generated is more than TVC, which means an operating profit that can reduce the losses, as it contributes to payment of fixed costs.

Price (AR) < min. point of AVC curve → operating loss

Therefore, min. point of AVC curve → shut down point → any price below that and you shut down.

Price above min. AVC → operate as operating profits are there.

When plants are machinery is increased, outputs will increase and ATC might increase, decrease or stay same.

Increasing production decreases ATC → increasing returns to scale

Changing production keeps ATC constant → constant returns to scale

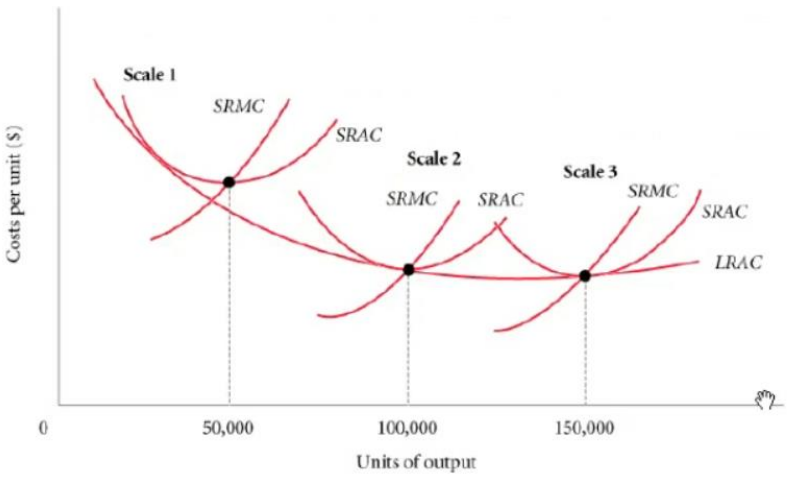
Increasing production increases ATC → decreasing returns to scale

Economies of scale → the fact that increasing scale of production reduces cost per unit.

This happens because bulk orders of raw materials get discounts, you have to hire less extra labor to increase production by a lot. Shipping items in bulk reduces travel costs.

In short run, firms are fixed with a specific output. All the short run graphs like MC, ATC graphs are based on this specific output.
In long run, output can also be changed, so the graph will have short run graphs at every output scale.

Long Run Average Cost (LRAC) → graph which has short run graphs for every Output point.




LRAC given here has short run graphs for three output points.

LRAC has SRMC and SRAC graphs for every output scale.

SRMC → short run MC
SRAC → short run AC

We see due to economies of scale, LRAC steeps down as the no. of units fall.

A firm that retains earnings is actually borrowing that money from its shareholders as all the profits after expenses belong to them.
Retaining earnings doesn't decrease shareholders' net worth as the company is borrowing from them.

Minimum Efficient scale: Lowest output at which price per unit is minimum.
In LRAC given above, 100k units is MES.

Firms wish to produce only MES.

Constant returns to scale: Average price per unit doesn't change by increasing production. This happens when we have to increase input and output in equal proportion.
Eg: Doubling output is done when input is doubled. This makes the ATC same. So, economies of scale doesn't apply here.

Decreasing returns to scale: ATC increases when production increases. This is called Diseconomies of scale.
Cost per unit doesn't fall down, but rises instead when output is increased here.
Happens because of inefficient bureaucracy → too many managers are required for a large workforce which makes coordination difficult compared to a smaller company.
When the production unit becomes larger, it might increase union strikes, higher wage demands.

LRAC for increased returns to scale → decreases; slope downward → economies of scale
LRAC for constant returns to scale → constant throughout
LRAC for decreased returns to scale → increases; slope upward → diseconomies of scale

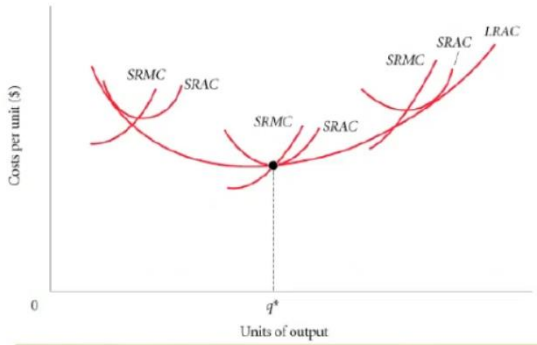



FIGURE 9.6 A Firm Exhibiting Economies and Diseconomies of Scale

Firm here exhibits both economies and diseconomies of scale.

Till q* → economies of scale
After q* → diseconomies of scale

At q* → Min. Efficient Scale (MES).

MES → amount of output produced for which ATC is least.

Q* → optimal scale
Firms will produce q* only as ATC is min.

Long Run equilibrium → no firm enters or leaves the industry.
→ This happens when there is zero economic profit.
→ new firms enter when there is profit and old firms exit when there is loss, so the only way for no firm to enter or exit is that there is no economic profit or loss in the industry

Total Revenue = Total Cost → Long run equilibrium

Assume that an industry sells products in long run eq (TR = TC) at p* price
If suppose the demand increases suddenly, the price will increase, the firms will try to gain some more profit by making more output in short run(until MR = MC) , as the price has increased, revenue is higher than cost, so they get profit.

But as they're getting profit, in long term new firms will enter the market, which means the LR eq. is now broken.
Once new players enter the market, supply will increase. Demand had previously become higher, now suppy increases making demand = supply and thus bringing the price back to p*.

Thus, we see that there is a long run equilibrium maintained.

Basically, demand suddenly increases, in short run firms cant keep up with the demand, price increases, profit comes in an industry which had zero eco profit (long run eq) so new firms in long run enter, this increases supply which again makes supply = demand, price falls back to the initial price where TR =TC. Equilibrium achieved.

When a new firm enters, it enters with optimal production capacity (ie) output where the LRAC is minimum (q*).
It will initially enter with specific production output such that cost is minimum in long run.

P* = SRMC = SRAC = LRAC → In long run equilibrium

P* → equilibrium price.
If price > P* → firms are making profit and more firms will enter
Price = P* → only at this point, there is no economic profit which means no enter or exit → long run eq.
Price < P* → firms are making losses and they will exit

When Price < P* → they're making losses

If the firms are making zero economic profit in long run equilibrium, why are they still in business?
A: they're in zero eco profit, yes. But they're in accounting profit still.

Eg: a farmer has 1 million, he could have put it in a bank to get 50k a year and could have taken up a job for 30k a year. But, he instead decides to invest 1 million into his farm.

Opportunity cost here become 50+30 = 80k
If he is in long run eq, it means he is getting zero eco profit. But eco profit considers opp cost
Which means in acc profit he has 80k, similar to what he would have got had he put the money in bank and taken up a job instead.
This acc profit keeps him in business.

## The U-shaped curve:

For a particular level of equipment and scale the average cost of a firm is represented by a U-shaped curve. Suppose $U_1$, $U_2$, and $U_3$ in Fig. 7.5, are three different short run average cost curves for three different scales of production. For each of these scales there is an optimum output. The producer would ordinarily like to produce the optimum output because his average cost is least at this point. But if demand changes it may be necessary to increase or decrease his output and he may consider it desirable to alter his scale of production.

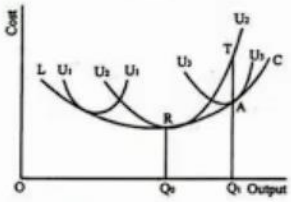



Fig. 7.5. Relation between short-run and long-run average cost curves

Suppose at a particular time, a producer is under cost curve $U_2$ and produces $OQ_0$. He finds it necessary to produce $OQ_1$. If he continues under the old scale his average cost will be $Q_1T$. Suppose he alters his scale so that his new cost curve is $U_3$. The average cost of producing $OQ_1$ is now $Q_1A$. $Q_1A$ is less than $Q_1T$. So the new scale is preferable to the old and will be adopted. In the long run the average cost has changed from $Q_0R$ to $Q_1A$.

As we see the text suggests, producer was in $U_2$ method of prod. Demand increased, so in short run, he increased prod in $U_2$ method which actually increased his ATC.

But if the increased demand persists, he could move to $U_3$ where he would produce the same amount and meet the increased demand but at a lesser ATC.

In short run he had to stick with same method to meet demand.
But in long run he can change the method based on demand such that ATC is reduced.

Long run marginal costs is equal to short run marginal costs.
Long run marginal costs → slope of LRAC
Short run marginal costs → slope of SRAC
If they both are equal, it means

Slope of LRAC = Slope of SRAC at point of contact

LRAC and SRAC are tangential to each other. Tangential → pt of contact is a tangent

## *Chapter 10 : Input Demand : The labor and Land Markets*

The difference here being firms demand and households supply.

Demand for input → also called derived demand;
Demand for input in input markets depends on the demand for outputs.
Eg: Demand for labor will depend on how much the factory wants to supply to the markets and how much HH demand for that product.

Productivity of input → amount of output produced for every unit of input.

If you have more capital, labor will be more productive as you can get better skilled workforce.
If you have more labor, capital will not sit idle, increasing capital's productivity.
This thus says that inputs can be complementary to each other.

Having more machines reduces labor demand.
Labor can be used instead of machines.
This thus says that inputs can be substitutable to each other.

Therefore, inputs can be complementary or substitutable to each other.
Inputs are firmly linked to each other.
Increase or demand in labor affects demand of capital and machinery.

Marginal Unit of labor = Marginal Product of Labor → additional pdt made when labor is increased by 1 unit.

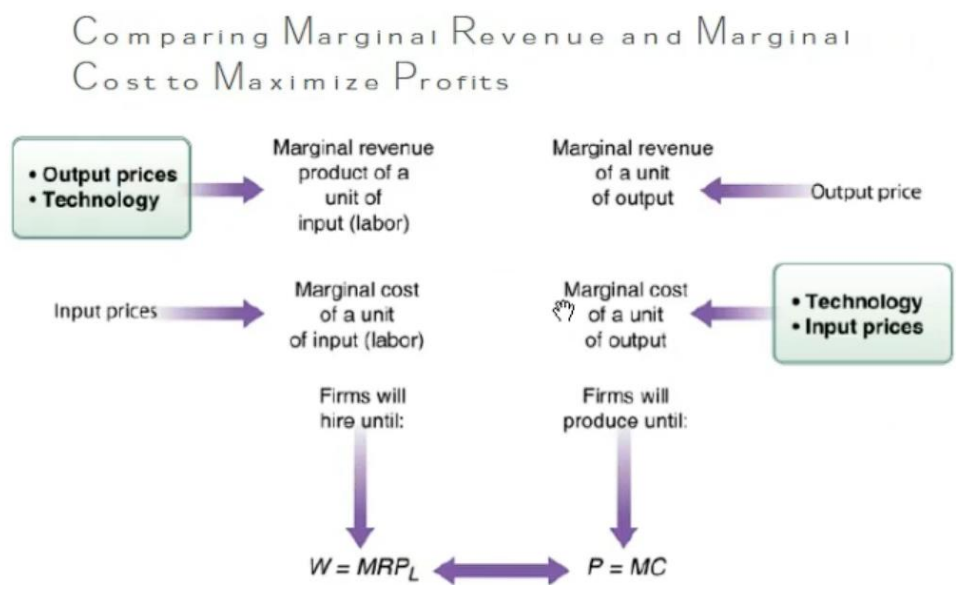
Marginal revenue product: additional revenue generated by marginal pdt of labor.
(MRP)

$MRP_L = MP_L * P_X$ $P_X$ → Value added by labor to the pdt.

Eg: If sandwich sells for 5$. Raw materials cost 4.5$. That means labor adds value of 0.5$. So, $P_X$ = 0.5$
As we were finding MRP wrt labor, we will consider the value added by labor to the pdt.

As long as $MRP_L \geq P_L$ → makes sense to hire labor; this just says that the revenue added by additional labor is more than his wage, which increases business' profit.

$MRP_L = W = P_L$ → firms try to achieve this for input demand. W→ wage rate




Land Market

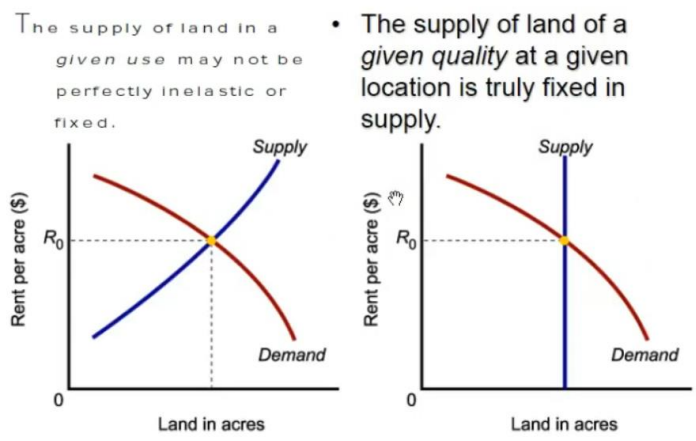
A specific quality of land at a specific location is demanded → supply is fixed.

A specific quality of land wherever found is demanded → supply isn't fixed.

Because land is fixed in supply, its price is demand determined. (ie) price of land is determined by what HHs are willing to pay.

If any pdt is fixed in suppy, its price is demand determined (ie) its price is determined by what price it is demanded at.

Return from any factor of production which is in a fixed supply is called pure rent.




Land of a given quality in a given location is fixed, so the supply is fixed and thus the supply curve is a straight line with land as constant.

Supply of a land for a given use is not fixed always, because location can be wherever they get the land.

A profit-maximising firm will employ an additional unit of factor of production only when its marginal revenue product is more than its market price.

A firm will pay for land as long as production on that land generates costs sufficient enough to cover its rent.

$MRP_A = P_A$  A→ land (in acres)  ($P_A$ → rent)  ($MRP_A = MP_A * P_X$)

$MRP_A$ = Output generated by add$^{nal}$ unit of land * value added by land to the pdt

Value of any one parcel depends on the parcels around it.  P
Eg: if there's a dumping ground, adjoining parcel's value will decrease
If there's a highway, adjoining parcel's value will increase.

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K} = \frac{MP_A}{P_A} = \frac{1}{P_X}$$

Marginal Product of last dollar spent on labor = capital = land = $1/P_X$
→ cost minimization formula
Use this formula to find optimal (least costly) combination of inputs

If demand for a product increases, then price of the pdt increases, then value added to the product by labor also increases as overall price of the product increases.

Thus, increase in demand of pdt increases $MRP_L$ → MRP curve shifts right

Capital and labor are complementary inputs → increase in capital will enhance productivity of labor and thus will increase demand of labor which will in turn increase wage rate.

Capital increase → $MP_L$ increase → $MRP_L$ increases → MRP curve shifts right

If cost of energy increases → firms will shift to more labor intensive method → labor demand increases.

Technological change → changes made to increase efficiency of existing inputs.
Productivity increase → $MP_L$ increase → $MRP_L$ increase

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K} = \frac{MP_A}{P_A}$$

If productivity of labor increases, it means $MP_L$ increases, but the ratio has to be constant, so $P_L$ increases.

## *Chapter 11*

Capital: Goods used to produce other goods and services

1) Tangible Capital: Materialistic Capital inputs used in the production of future goods and services.
2) Social Capital: Public works (roads) and public services(police and fire dept.)
3) Intangible Capital: Non-materialistic capital inputs used in production. Eg: Brand name and goodwill
4) Human capital: Intangible capital that includes skill and other knowledge acquired through training and education.

New technology involved in production can also be considered as capital.

Capital Stock: Current market value of the firm's plants, machinery, inventories and tangible assets.

Investment→ addition of capital; in the form of any type of capital from the 4 given above.
Capital → measured at a given time
Investment → measured over the years.

Depreciation → decline in an asset's value over time.

Capital Maket → HHs supply their savings to the firms that demand funds here.
Fin capital market → part of cap market where savers and investors interact thru fin intermediaries(like bank).

Supply of capital → done by savings of HH; Fin institutions act as a mediator b/w HH and firm

If interest rate given is increased, saving by HH will increase. (Sub effect > Income Effect)

Bond → a contract b/w borrower and lender(bond issuer) that the lender will return the principal amount and fixed interest payments at some time in the future.

Capital Income: Income generated from savings that have been put into use in the cap market.

Capital Income = Interest + Profit (stocks entitle you to change in stock prices and dividends)

Stock: A certificate that entitles you to be a shareholder in a company. This entitles you to get a share of the company as well.

Dividend: Payment of profits to the shareholder.

Corporations pay interest to HHs to buy their bonds
Interest rate → expressed annualy

Fixed rate of interest: No change in rate of interest, regardless of market conditions.
Floating rate of Interest / Adjustable rate: borrower and lender agree to change interest rate periodically depending on the market conditions.

Firms with bad credit ratings will give higher interest rates as they're risky.
Firms like govt have good credit ratings, which means they're less risky, so less interest rate.

Firms:
1) Proprietors or partnerships: Owned by individuals or partners. Profits go directly to owner(s).
2) Corporations: Owned by shareholders who are not otherwise connected with the firms. Shareholders can not lose more than what they have invested, they don't have to pay company's liabilities back.

Capital Income's functions:
1) Acts as an incentive to postpone consumption and focus more on savings.
2) Acts as reward for risk taking and innovation

If a company retains its earnings, that means it is borrowing that money from its shareholders as the profit belongs to the shareholders. When a company retains earnings to buy capital assets, the total value of the firm goes up, as does the value of shares.

When household buys shares, the share value becomes a part of HH's net worth.

Ways to receive investment:
1) Business Loans from Banks
2) Venture Capital Funds: Firms can approach Venture Capital Funds who take money from HH and give them to many risky firms. Diversifying HH's investments into many firms helps in reducing risks
3) Retained Earnings: Company retains its profits and uses it to expand.
   If a company retains its earnings, that means it is borrowing that money from its shareholders as the profit belongs to the shareholders. When a company retains earnings to buy capital assets, the total value of the firm goes up, as does the value of shares.
4) Stock Market: Company releases its shares and lists itself on exchanges. They receive money in exchange of shares of the company.

$MRP_K = P_K$ → Firms will keep investing more capital upto this point.

$MRP_K$ → how much value is added by one unit of capital to entire production
$P_K$ → Price of one unit of capital

NRR → min RoR which will keep investors happy
Expected RoR → RoR the company expects to get through capital investment

Eg: If a new computer network worth 400k is estimated to save 100k every year forever thereafter, then:
The expected return is 100k a year, so Expected RoR will be 25% (25% of 400k = 100k)

The expected RoR will be less than 100k if the network wears out or if the cost saving of 100k ceases.

If we buy new machinery which saves costs, then the saved costs is nothing but returns from the capital investment made to buy the machinery.

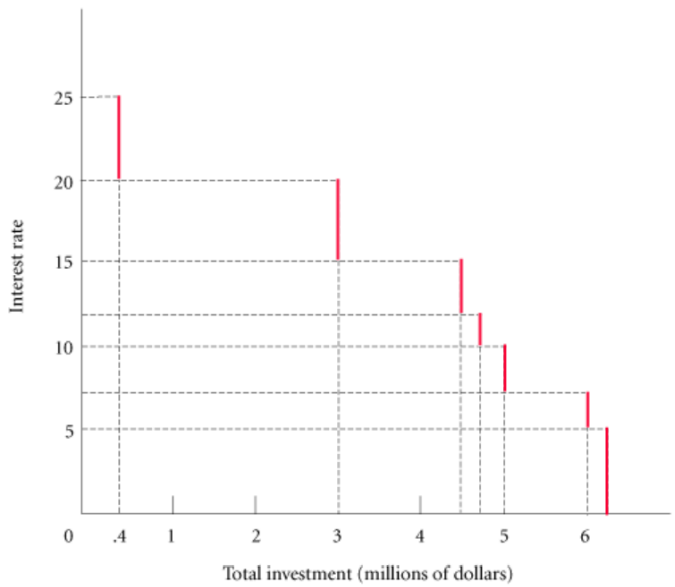
| PROJECT | (1) TOTAL INVESTMENT (DOLLARS) | (2) EXPECTED RATE OF RETURN (PERCENT) |
|---|---|---|
| A. New computer network | 400,000 | 25 |
| B. New branch plant | 2,600,000 | 20 |
| C. Sales office in another state | 1,500,000 | 15 |
| D. New automated billing system | 100,000 | 12 |
| E. Ten new delivery trucks | 400,000 | 10 |
| F. Advertising campaign | 1,000,000 | 7 |
| G. Employee cafeteria | 100,000 | 5 |

The company is taking an investment. Investors demand a specific rate of return.

If investors demand RoR as 21-24%, then only A would be undertaken as other projects would be a loss to the company.

If investors demand 18%, then A&B happen.

Expected rate of return from a project has to be greater than/equal to the interest demanded for the capital used, only then will the company be in profits.
ERR = Interest rate




This graph shows how much capital would be taken as investment as a function of the interest rate it has to pay.

(20-25)% → 400k dollars (A only)
(15-20)% → 3mn dollars (A&B)

Demand of Investment as a function of interest rate.

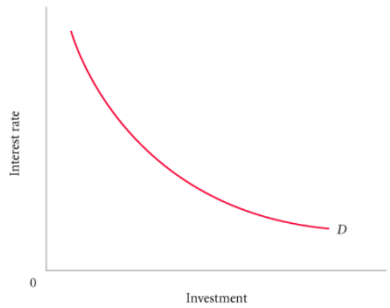


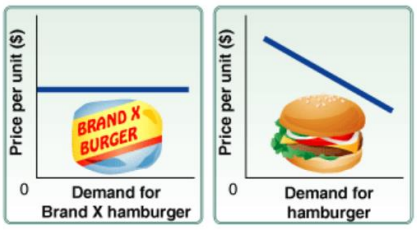

FIGURE 11.4 Investment Demand

Interest rate is nothing but price paid for the capital taken.

Capital generates services → services act as an input to generate goods and services
Capital is produced by the economic system itself.

Chapter 13:
Oligopoly: A few companies majorly control pricing in the market.

Pure monopoly happens when:
1) A company produces a product which has no close substitute
2) New firms are not allowed to freely enter the monopolistic market, there are barriers in place.




Perfect competitor→ no monopoly

Pure monopolist and perfect competitor both want to reduce costs, they'll choose the tech which would reduce their prices.
The difference arises on the revenue, or demand, side of the equation, where we begin our analysis.

The demand curve facing perfect competitor firm is thus a horizontal line.
♣ Raising the price of its product means losing all demand because perfect substitutes are available.
♣ The perfectly competitive firm has no incentive to charge a lower price either since it can sell all it wants at the market price.

Monopolist market has only one firm, he sets the market price. He is the market.

Even a firm that is a monopolist in its own market will nevertheless compete with other firms in other markets for a consumer's dollars. ♣ Even a monopolist thus loses some customers when it raises its price.

A monopolist too will maximize profits by expanding output so long as marginal revenue exceeds marginal cost.

Firms will keep increasing their production when MR>MC and will keep doing so until MR = MC.

MR<P → for a monopolist

$P = a - bQ$, $MR = a - 2bQ$