

# AEM102: Principles of Economics

## Price Determination & Elasticity of Supply

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# Determinants of Income Elasticity of Demand

- **The nature of the need that the commodity covers:**
  - The percentage of income spent on food declines as income increases (this is known as Engel's Law and has sometimes been used as a measure of welfare and of the development stage of an economy)
- **The initial level of income of a country:**
  - For example, a TV set is a luxury in an underdeveloped ,poor country while it is a necessity with high per capita income nation
- **The time period:**
  - because consumption patterns adjust with a time-lag to changes in income

# Cross Price Elasticity Of Demand

- The cross price elasticity of demand  $\epsilon_{B.A}$ , is the responsiveness of the quantity demanded of good B to a change in the price of another good A.

$$\epsilon_{BA} = \frac{\Delta Q_B / Q_B}{\Delta P_A / P_A}$$

$\epsilon_{AB}$  indicates the change in quantity of A demanded with respect to change in the price of commodity B. If  $\epsilon_{AB}$  is positive, it implies that as price of good B increases, the quantity of commodity A demanded increases.

- **Therefore, commodities A&B are substitutes e g tea and coffee**
- If on the other hand,  $\epsilon_{AB}$  is negative, it shows that as the price of commodity B increases the quantity of commodity A demanded decreases.
- **Therefore, commodities A and B are complements. Example is bread and butter, cars and fuel.**

- The sign of the cross-elasticity is **Negative** if **X and Y are complementary goods**
- The sign of the cross-elasticity is **Positive** if **X and Y are substitutes goods**
- **The higher the value of the cross-elasticity, the stronger the degree of substitutability or complementarity of X and Y**

The main determinant of cross price-elasticity is:

- **The nature of the commodities relative to their uses:**
  - If two commodities can satisfy equally well the same need, the cross-elasticity is high, and vice versa, if they can not satisfy the same need equally.
- The cross-elasticity can be used for the definition of firms which form an industry

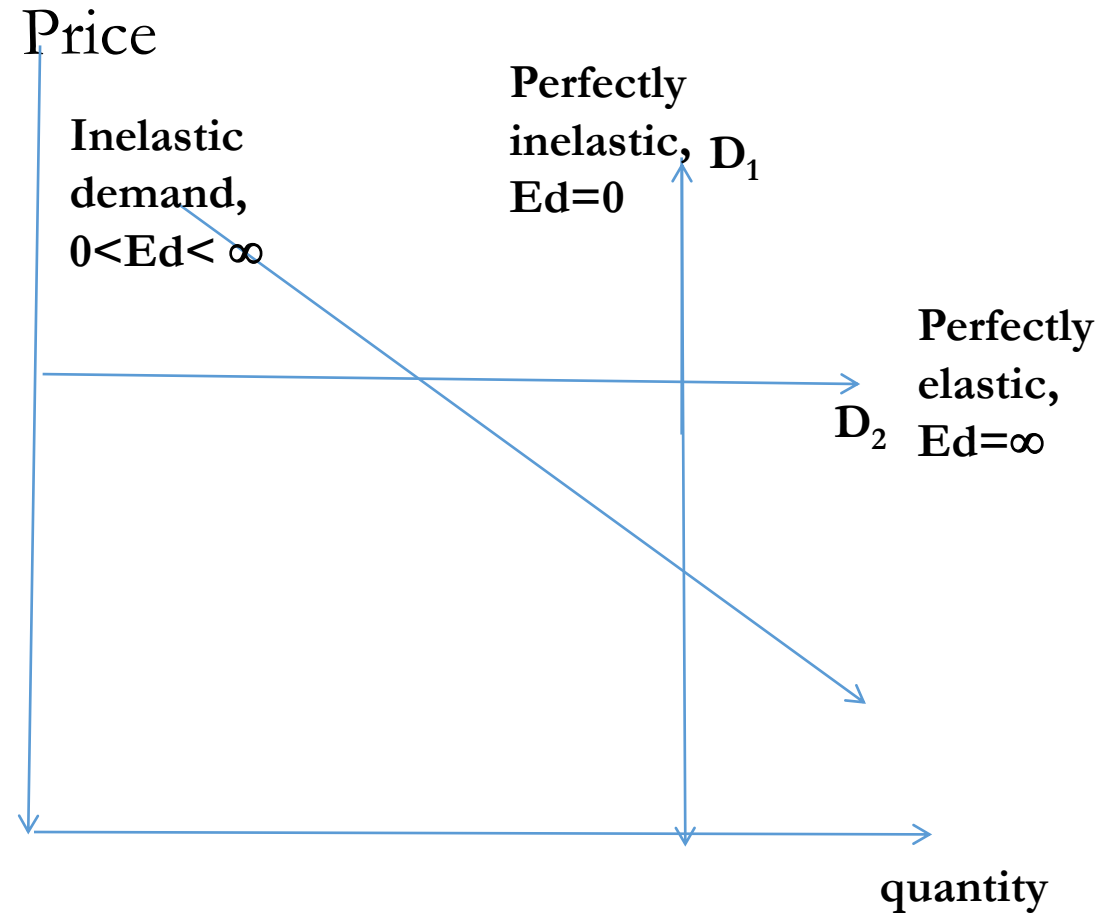
# Value of Elasticity And Total Revenue

- **Recall:**

- A fall in price will generally lead to an increase in total quantity demanded
  - Total revenue will decrease with inelastic demand curve but increase with elastic demand curve.
- 
- The availability of close substitute (e.g fish & beef and margarine & butter ) for a product is the most important determinant of elasticity.
- 
- Substitution between substitute products is possible only if the prices of the substitutes remain constant.
- 
- We expect little decrease in quantity demanded when the price of such commodities go up.

# Application of Elasticity: Perfectly elastic or perfectly inelastic demand

- Note that when the demand curve is perfectly inelastic, its elasticity of demand is zero
- $E_d$  of  $D_1$  is equal to zero because there is no percentage change in quantity demanded, regardless of the change in price.
- When the demand curve is perfectly elastic, its elasticity is infinity (the case of the horizontal demand curve in graph) .
- $E_d$  of  $D_2$  is infinity because the percentage change in quantity is very large for an infinitesimal small percentage change in price



# Government Intervention and Price Determination

## Price ceiling:

- The government can set a legally imposed maximum price that suppliers can not exceed in an attempt to prevent the market price from rising above a certain level. To be effective, a maximum price has to be set below the market price.

## Price floor:

- A minimum price is a legally imposed price floor, below which the market price cannot fall. To be effective, the minimum price has to be set above the market equilibrium price.

- Example of Price Ceiling:

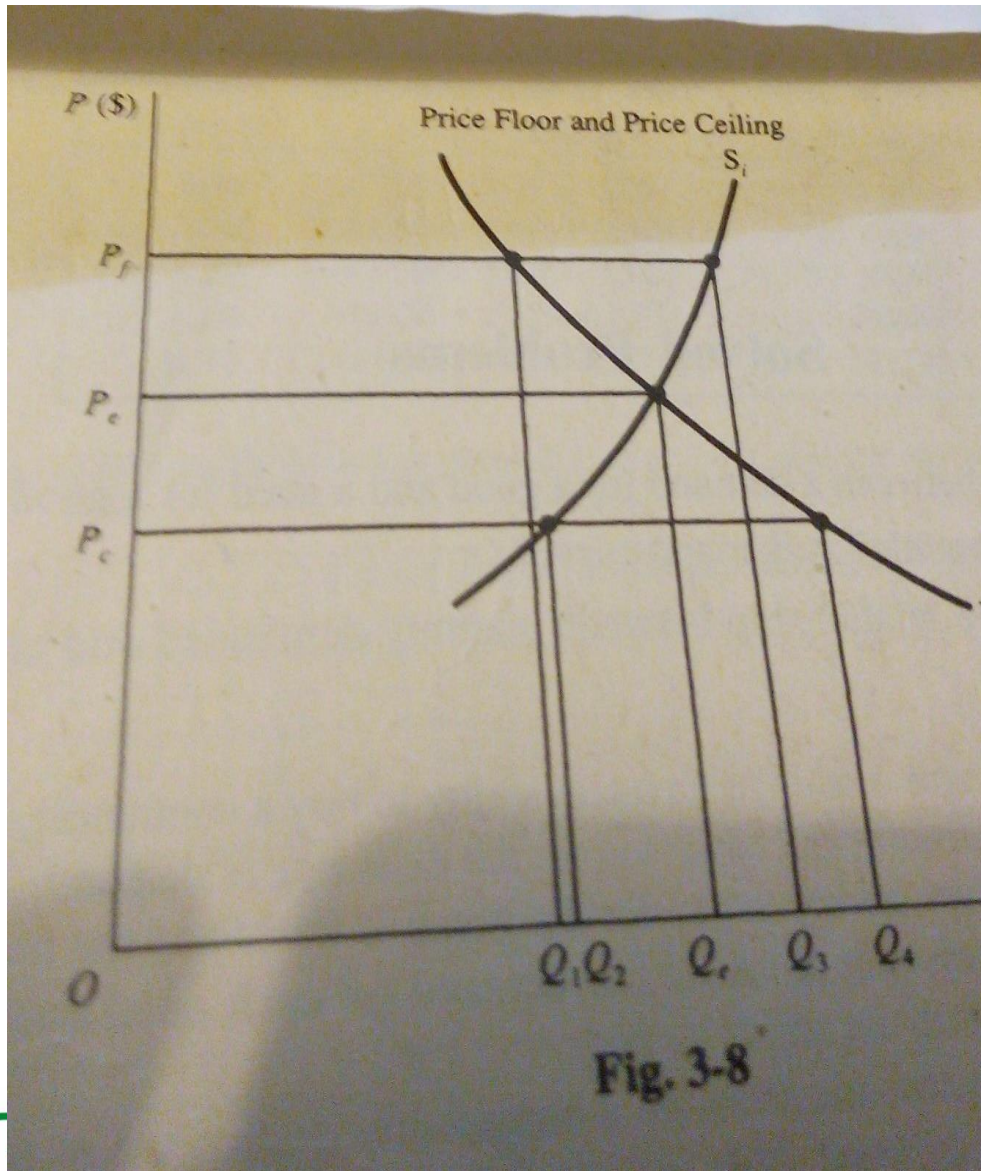
- Government can legislate on the maximum price landlords can charge a tenant for rent.
- Such rent control policy result in a disequilibrium in the housing market since at the government mandated price ceiling, the quantity supplied falls short of the quantity demanded
- Another example of price ceiling is the price of petrol. It is fixed in Nigeria at about N160/litre

# Price Floor

- An example of minimum price (price floor) is the government minimum wage which specifies the lowest wage an employer can pay an employee.
- Minimum wage rate in Nigeria is N30,000/month
- Price floor result in market disequilibrium as the quantity supplied at the mandated price exceeds quantity demanded



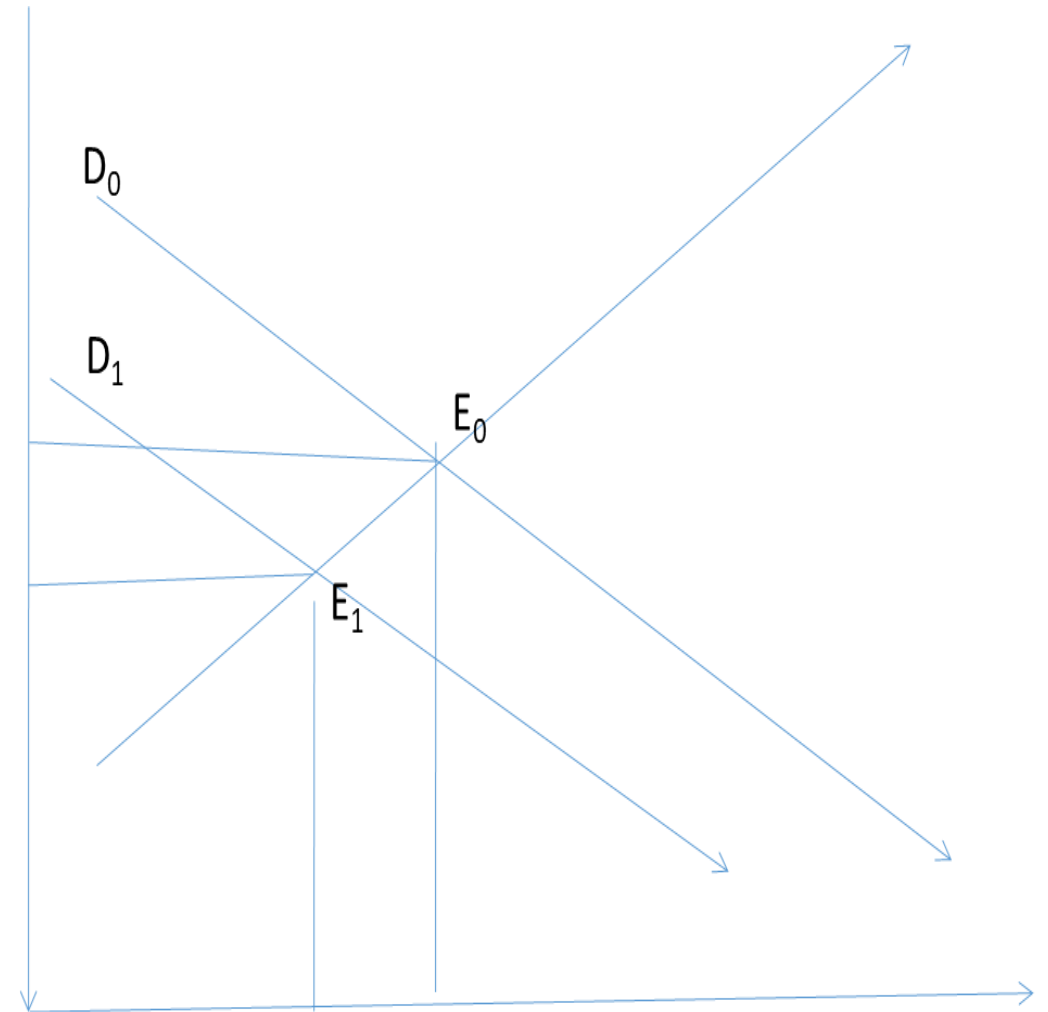
# Graphical Illustration: Price Floor & Price Ceiling



- Suppose the market equilibrium price is at  $P_e$ .
- If the government mandates a price floor at  $P_f$ , **which is above equilibrium price  $P_e$** ,
- quantity supplied will be  $Q_3$ , which is greater than the  $Q_1$  demanded at the  $P_f$  price
- A mandated price ceiling of  $P_c$ , **which is below equilibrium price  $P_e$**  on the other hand, causes quantity demanded  $Q_4$  to exceed the  $Q_2$  quantity supplied.
- This is what is shown diagrammatically

# Rationing:

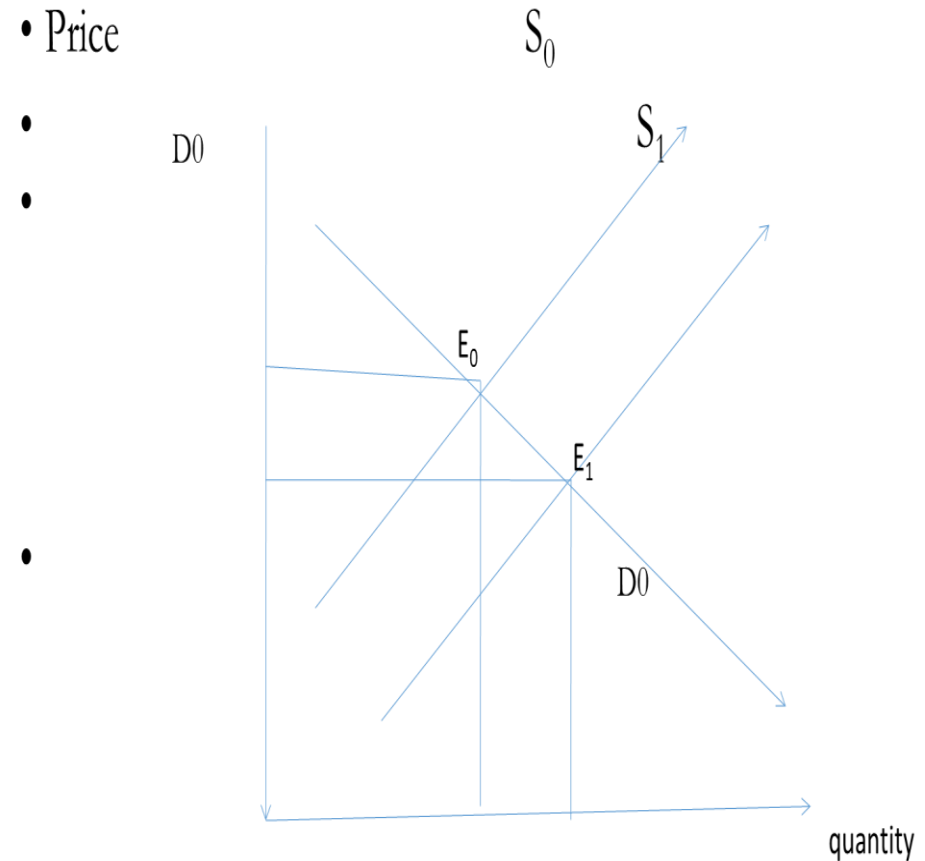
- The government can alter an equilibrium price by changing market demand
- The government can restrict demand by rationing a good that is, by shifting the demand schedule down and to the left
- When a good is rationed, an individual not only must be willing and financially able to buy a commodity but also must possess a government issued coupon which permits purchase



Rationing shifts Demand curve down to the left, that is, from  $D_0$  to  $D_1$

# Subsidy:

- A subsidy to the producer lowers the commodity's supply price
- Subsidy shifts market supply down and to the right
- Subsidy results in a lower equilibrium price and larger equilibrium quantity.



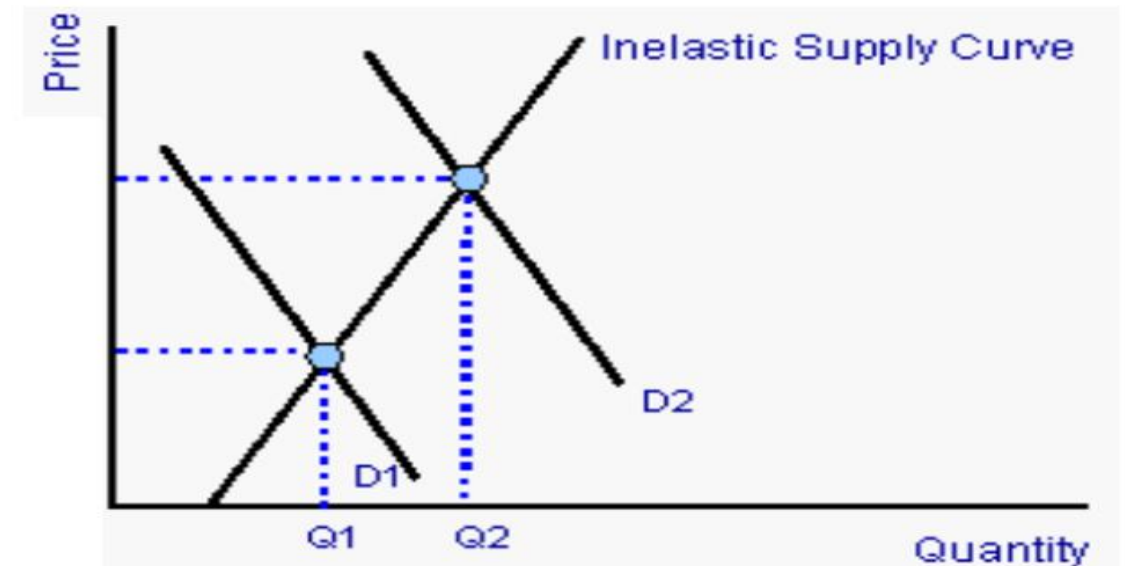
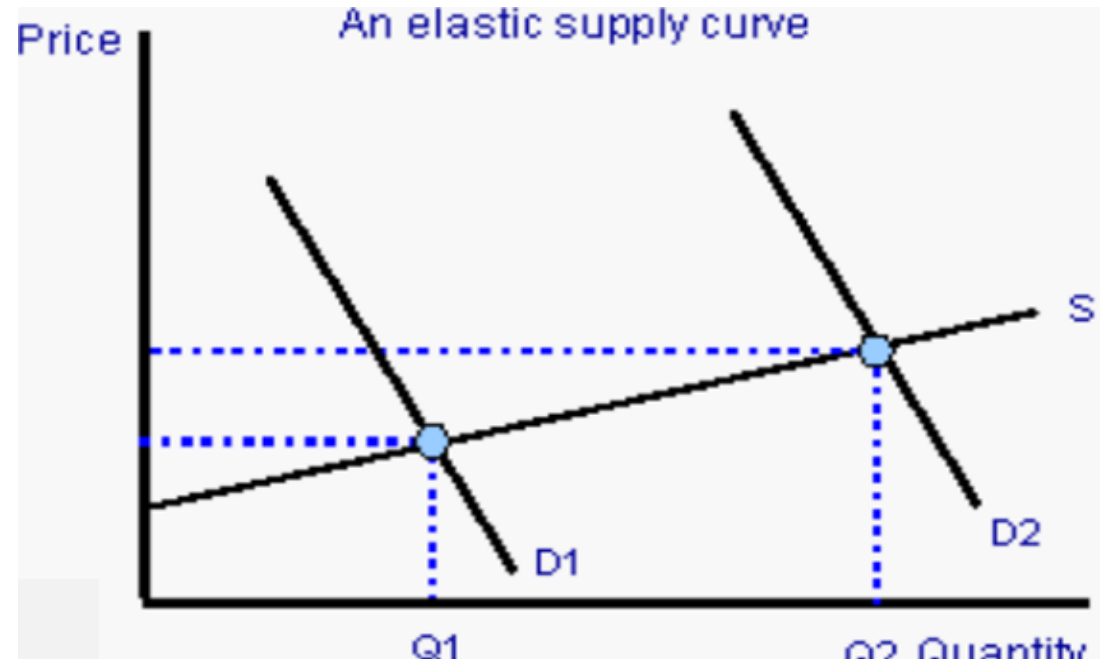
Subsidy Shifts down the Supply Curve to the right from  $S_0$  to  $S_1$

# Price Elasticity of Supply, $E_s$

- $E_s$  measures the percentage change in quantity supplied of a commodity as a result of a given percentage change in its price
- As in elasticity of demand ( $E_d$ ), we get different values for elasticity of supply if we use the original or the new price and quantity.
- To avoid this, we also use average price and quantity FOR ARC ELASTICITY OF SUPPLY.
- $$E_s = \frac{\text{change in quantity supplied}/(\text{sum of quantity supplied}/2)}{\text{change in price}/(\text{sum of price}/2)}$$
- $E_s$  is a pure number and it is positive because price and quantity move in the same direction
- Supply is price elastic, if  $E_s > 1$ ,                      Supply is price unitary elastic, if  $E_s = 1$
- And Supply is price inelastic, if  $E_s < 1$

# Types of Elasticity of Supply

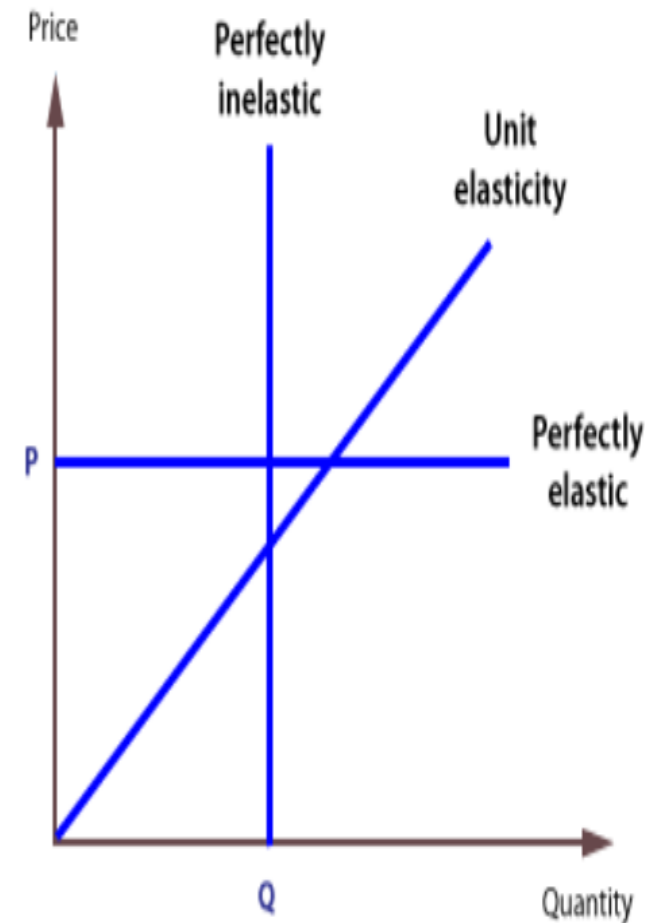
- **Types of Elasticity of Supply**
- **Elastic Supply ( $E_s > 1$ ):** a given percentage change in price leads to a larger change in quantity supplied.
- **Inelastic Supply ( $E_s < 1$ ):** a given percentage change in price causes a smaller change in quantity supplied.





# Categories of Elasticity of Supply

- **Unitary elasticity of supply:** the change in quantity supplied of a commodity is exactly equal to the change in its price ( $E_S = 1$ )
- **Zero elasticity /perfectly Inelasticity of Supply:** a given quantity of a commodity can be supplied whatever might be the price ( $E_S = 0$ )
- **Infinite elasticity/perfect elasticity of supply:** suppliers are willing to supply any quantity of a commodity at a higher price ( $E_S = \infty$ ). That is, quantity supplied is unlimited at a given price, but no quantity can be supplied at any other price.



## Example: Elasticity of Supply

- Suppose at points G and H on supply curve, the price and supply are given as coordinates (4,5.5) and (5,5.7),
- The price elasticity of supply between points G and H is:

$$E_s = \frac{\text{change in quantity supplied}/(\text{sum of quantity supplied}/2)}{\text{change in price}/(\text{sum of price}/2)}$$

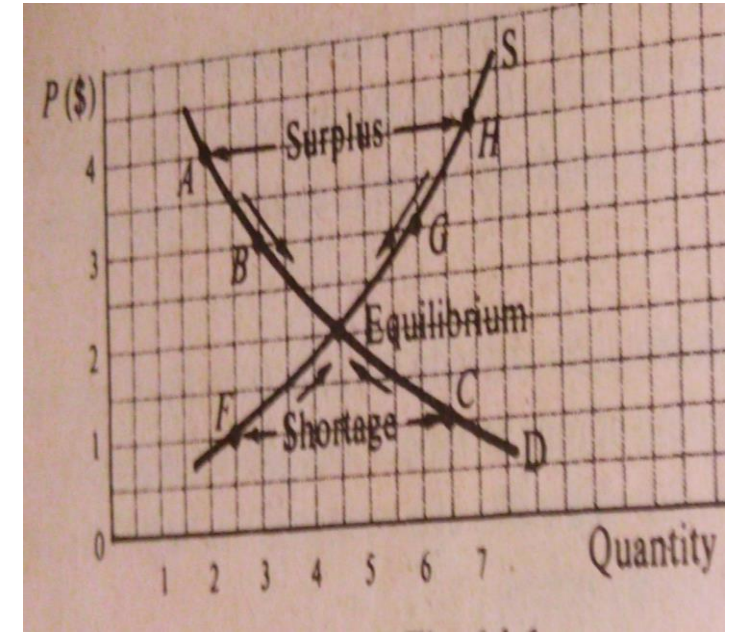
$$= \{0.2/(5.5+5.7)/2\} \div 1/(5+4)/2\}$$

$$= \{0.2/5.6\} \div 1/4.5 = 0.16; \text{ supply is price inelastic}$$

- The(average) elasticity between points F and E along the supply curve is:

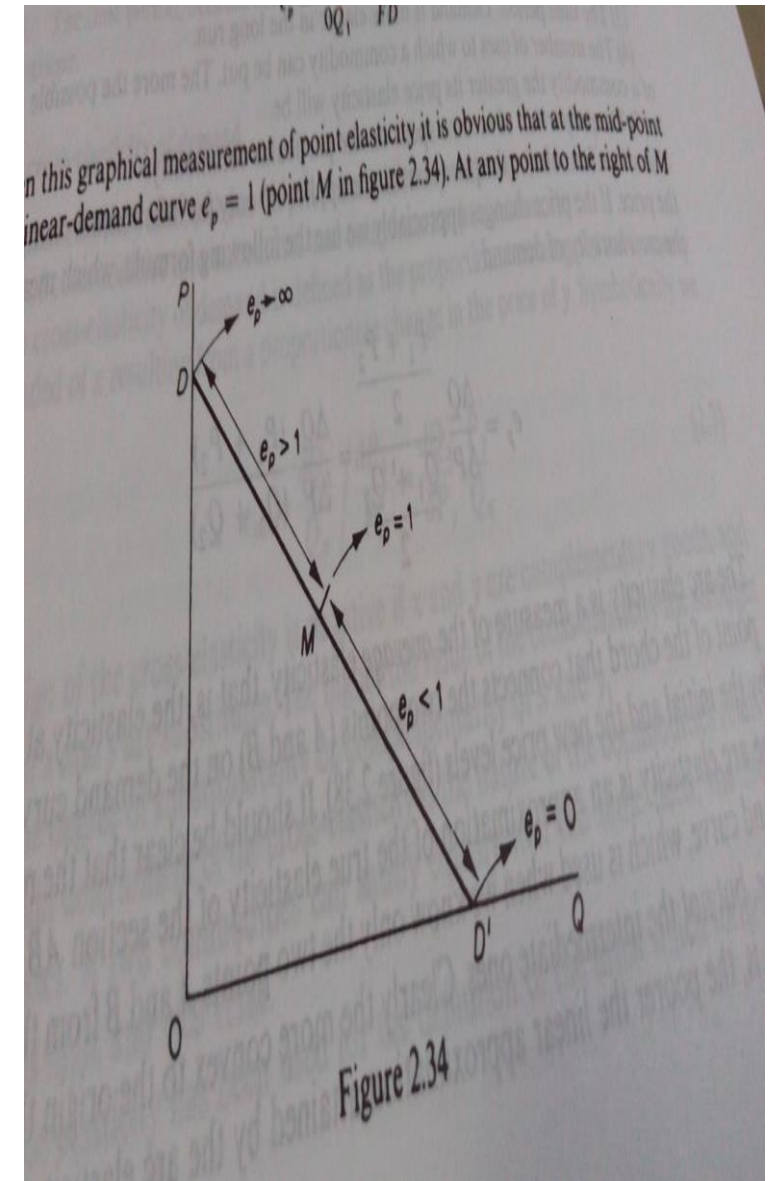
$$E_s = \frac{2/\{(2.5+4.5)/2\}}{2(1+2)/2} = 1/3.5 * 1.5 = 0.43$$

$$E_s = 0.43, \text{ indicating that supply is price inelastic}$$



## Elasticity on Linear Demand Function

- The graphical measurement of point elasticity of linear demand function is the ratio of the segment to the right of the point to the segment to the left.
- Thus at the mid-point of a linear–demand curve,  $e_p = 1$ ,
- That is point M in the figure.
- **At any point to the right of M, the point elasticity is less than unity,  $e_p < 1$**
- At any point to the left of M,  $e_p > 1$
- **At point D,  $e_p = DD'/0$ ,  $e_p \rightarrow \infty$**
- At point D',  $e_p = 0/DD'$ , thus  $e_p = 0$



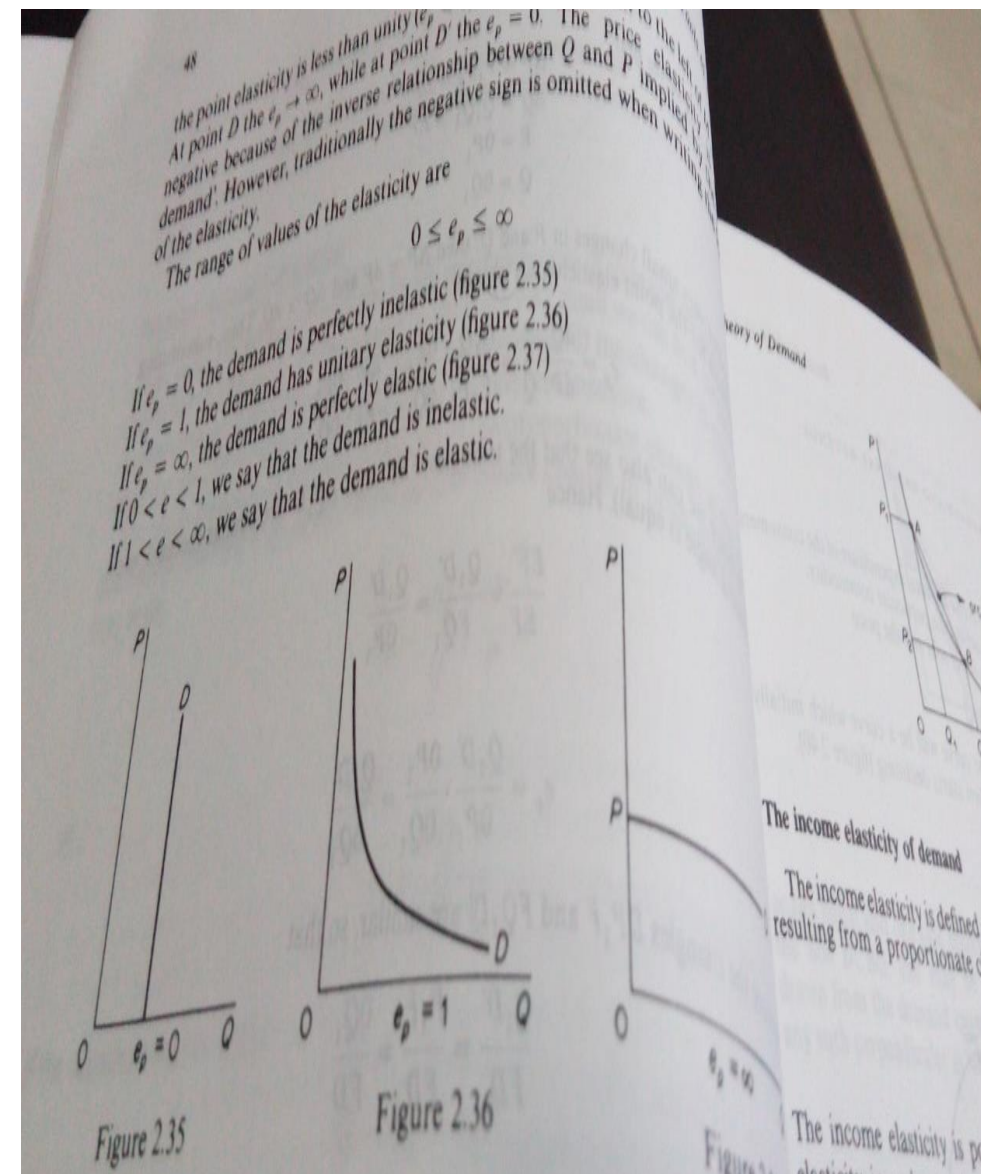


# Range Of Elasticity Values

The range of values of the elasticity are

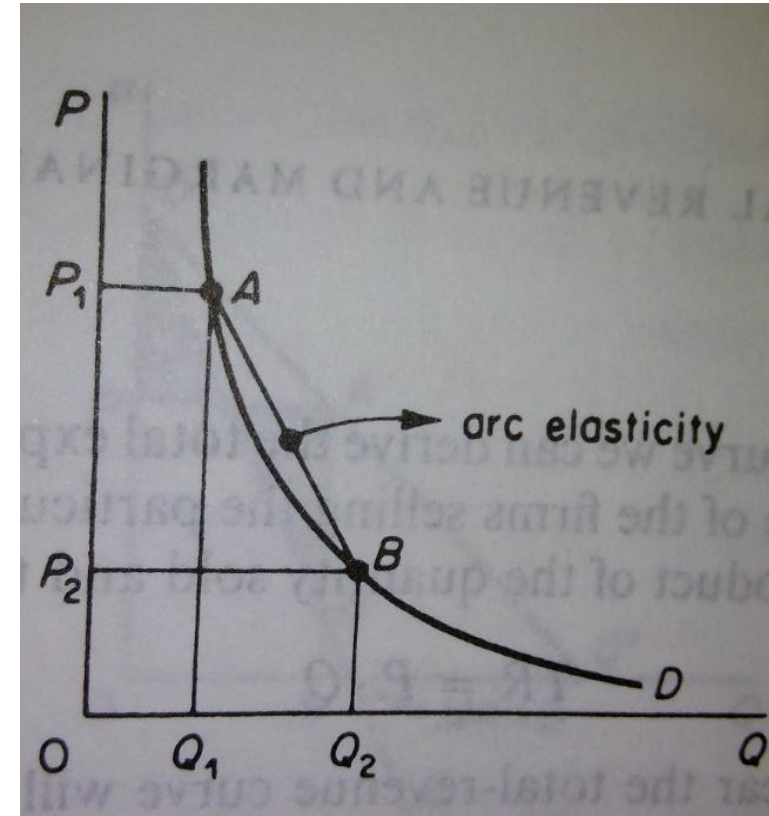
$$0 \leq e_p \leq \infty$$

- If  $e_p = 0$ , the demand is perfectly inelastic, (figure 2.35)
- If  $e_p = 1$ , the demand has unitary elasticity, (figure 2.36)
- If  $e_p = \infty$ , the demand is perfectly elastic, (figure 2.37)
- If  $0 < e_p < 1$ , we say that the demand is **inelastic**
- If  $1 < e_p < \infty$ , we say that the demand is **elastic**



# Arc Elasticity of Demand

- The formula for the price elasticity discussed is applicable only for **infinitesimal changes in the price**
- If the **price changes appreciably** we use another formula which measures the,
- **ARC ELASTICITY** of demand which is:
- $$e_p = \frac{\Delta Q}{\Delta P} \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2} = \frac{\Delta Q}{\Delta P} \frac{(P_1 + P_2)}{(Q_1 + Q_2)}$$
- The arc elasticity is a measure of the **AVERAGE ELASTICITY**,
- That is the elasticity at the mid-point of the chord that connects the 2 points A and B on the demand curve defined by the initial and the new price levels



## Exercise:

An economist conducted a study on the consumption of eggs in Kebbi State, Nigeria. His report shows that the quantity of eggs demanded varies from time to time. He equally reported the demand function as:

$$q = 24 - 0.2p$$

Where  $q$  = quantity of eggs demanded

$p$  = price

Using the above information:

- i. If the price of egg falls from N70/crate to ~~N~~50/crate, determine the price elasticity of demand
- ii. What conclusion can you draw from the result obtained in (i) ?

## Solution:

$$q = 24 - 0.2p; \quad P_1 = 70; \quad P_2 = 50$$

$$q_1 = 24 - 0.2P_1$$

$$q_1 = 24 - 0.2(70) = 10$$

$$q_2 = 24 - 0.2P_2$$

$$q_2 = 24 - 0.2(50) = 14$$

$$E_p = \{(q_2 - q_1) / (P_1 - P_2)\} * (P_1 / P_2)$$

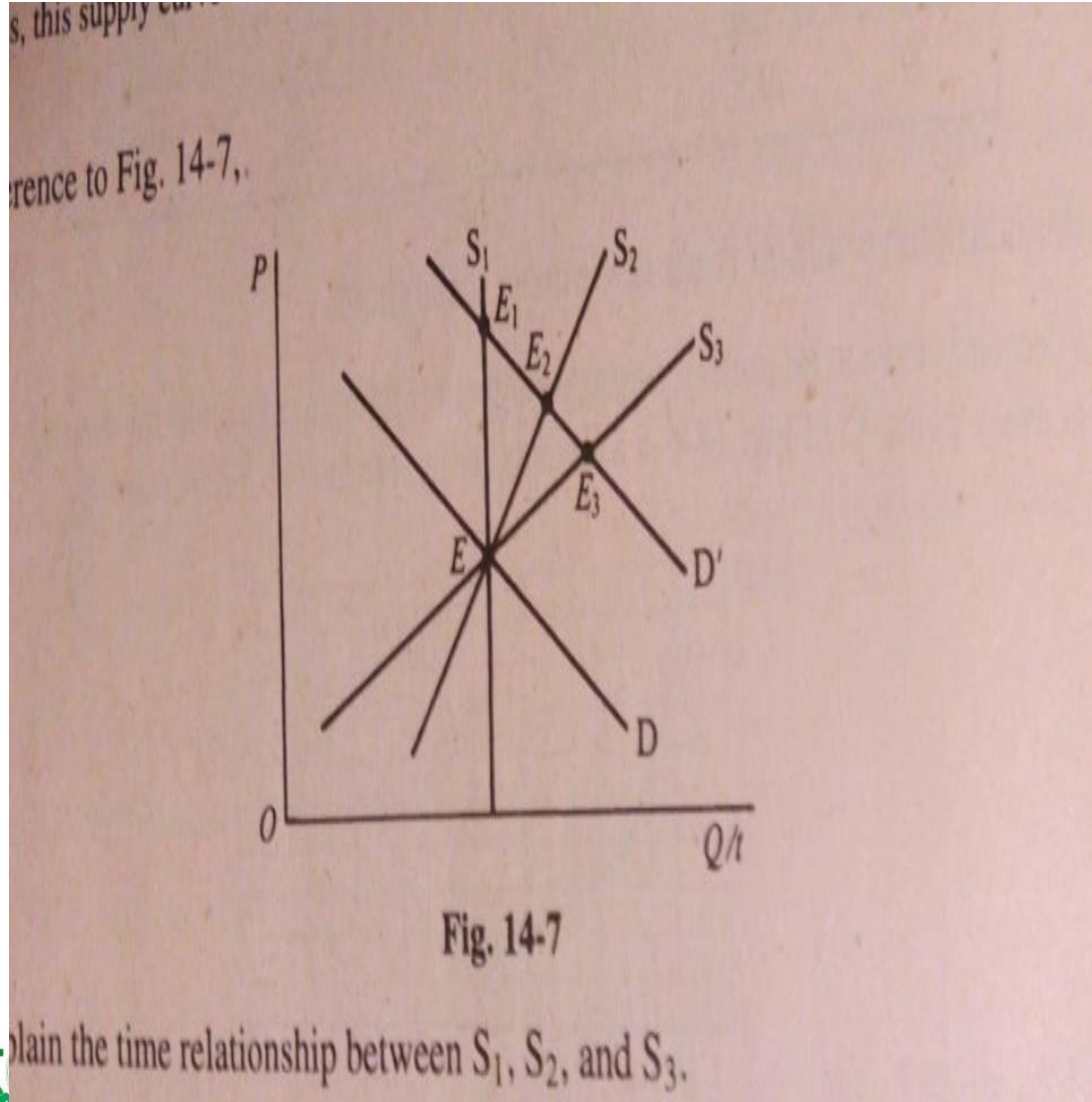
$$E_p = \{(14 - 10) / (70 - 50)\} * (70 / 10) = 1.4$$

### ii. Conclusion:

- Since the price elasticity of demand is greater than one i.e  $E_p > 1$ , it shows that the demand is elastic.
- Therefore, a small increase in the price of egg will significantly affect the quantity of egg demanded.

•

# Application of Elasticity: Market period, short-run and long-run



- Given the diagram of demand curves  $D$ ,  $D'$  and supply curves  $S_1$ ,  $S_2$  and  $S_3$ ,
- What happens to equilibrium price and quantity,
- if  $D$  increases to  $D'$
- and  $S_1$ ,  $S_2$  and  $S_3$  respectively become the relevant supply curves?.

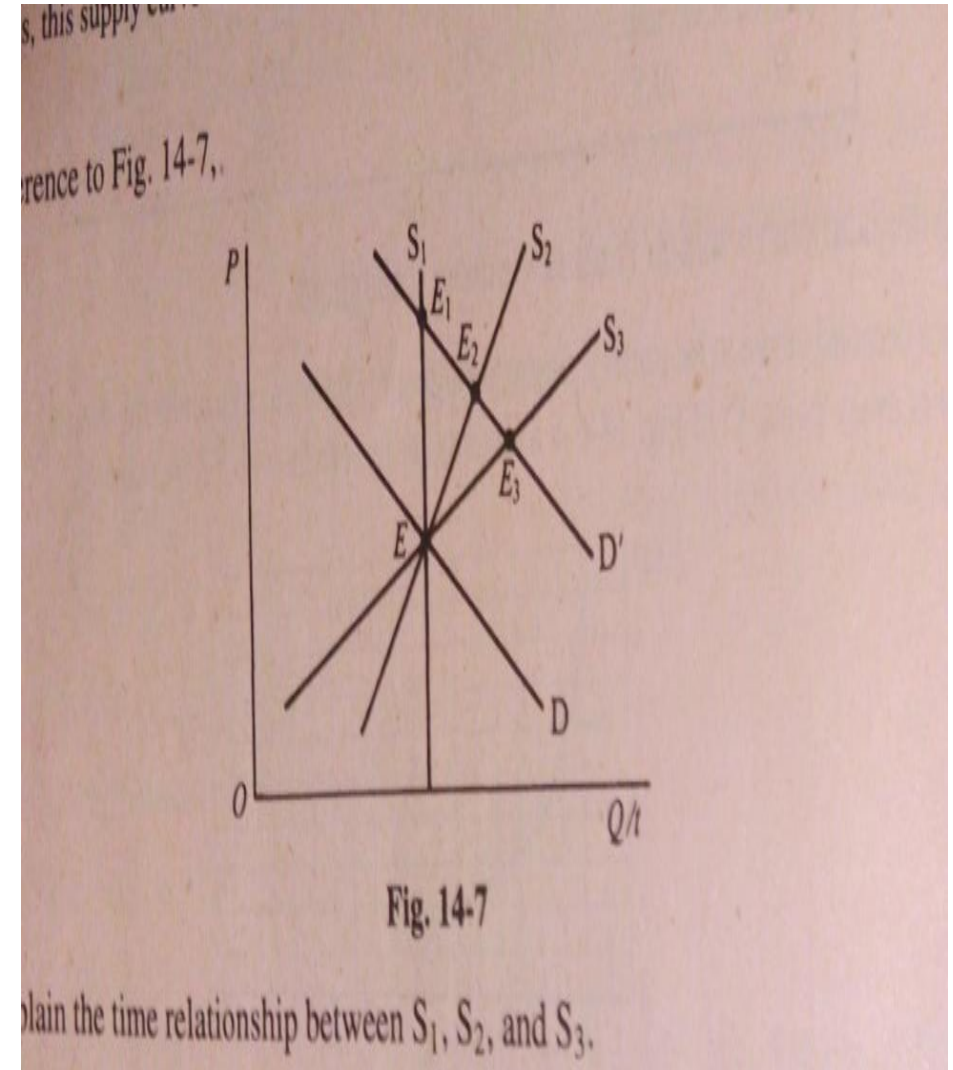


# Application of Elasticity: Elasticity of Supply & Time Period

- $S_1$ ,  $S_2$  and  $S_3$  illustrate supply curve in different periods. Given the difference in elasticity of the supply curves:
- $S_1$  is **Market period supply**.
- **At market period supply** there is no change in quantity supplied; this is otherwise called – the **Very short-run supply**.
- $S_2$  is a case of **Short-run**, and
- $S_3$  is a case of **Long-run**

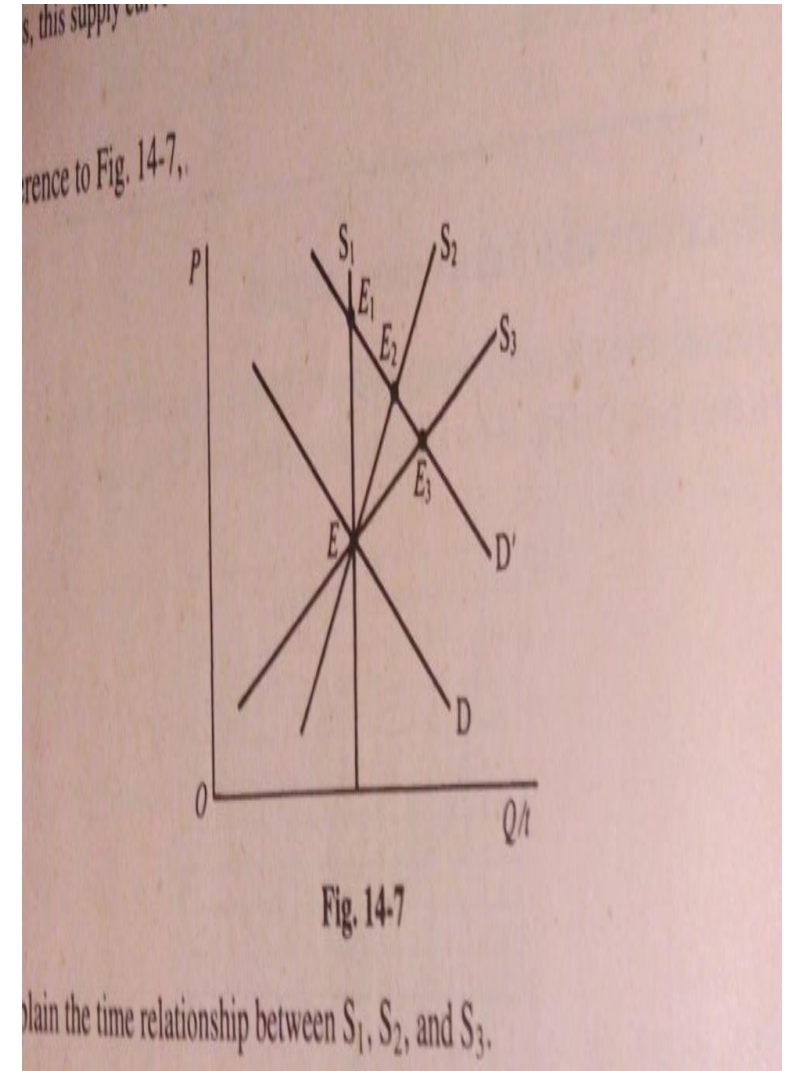
We would explain what happens to equilibrium price and quantity,

- if  $D$  increases to  $D'$
- and  $S_1, S_2$  or  $S_3$  respectively become the supply curves



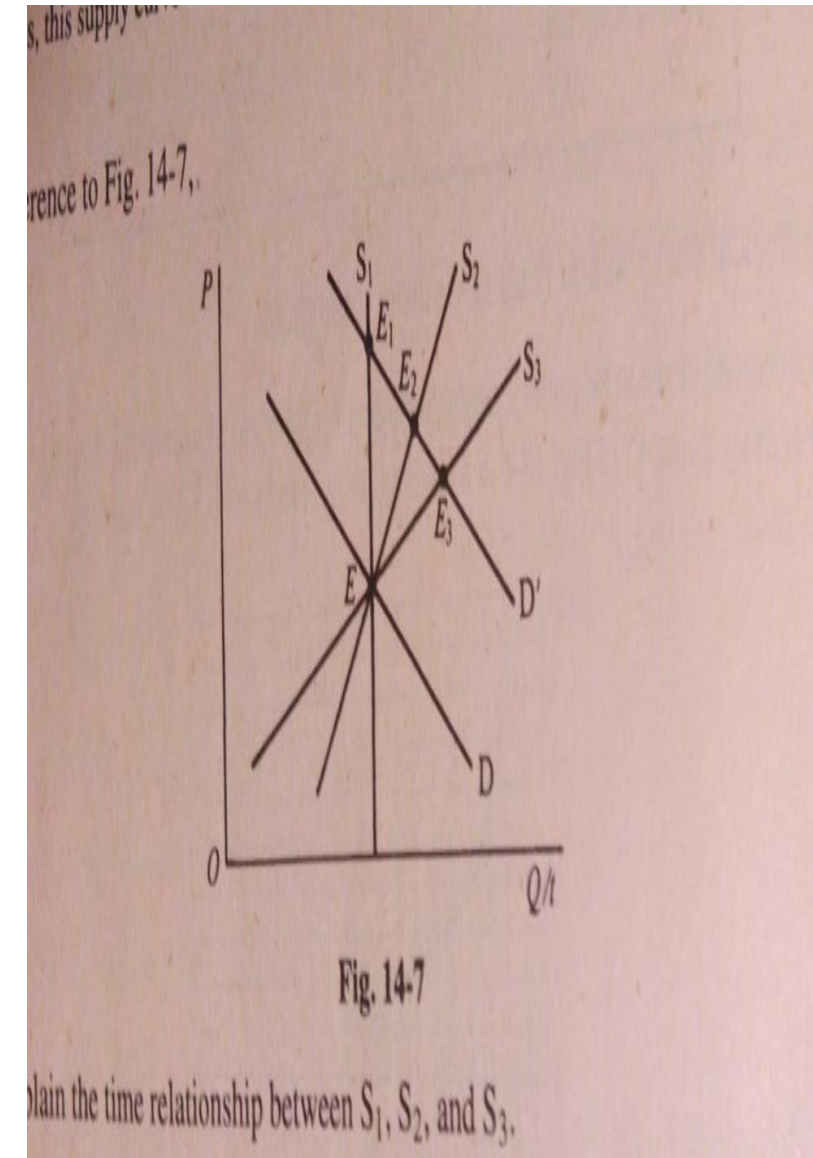
# Application of Elasticity: Elasticity of Supply & Time Period

- $S_1$  is vertical, it means no matter what value  $P$  assumes,  $Q$  remains unchanged.
- Thus the elasticity of  $S_1$  is zero since  $Q$  does not change. Supply is said to be **perfectly inelastic**
- This is said to be **the market period** or the **very short run**, there is no change in quantity supplied in the **very short-run**
- $S_2$  is positively sloped and shows that producers are willing to supply more of the commodity at higher price
- The elasticity of supply at  $S_2$  is greater than zero, **thus, this is a short run case**



## Long-run Elasticity Of Supply, $S_3$

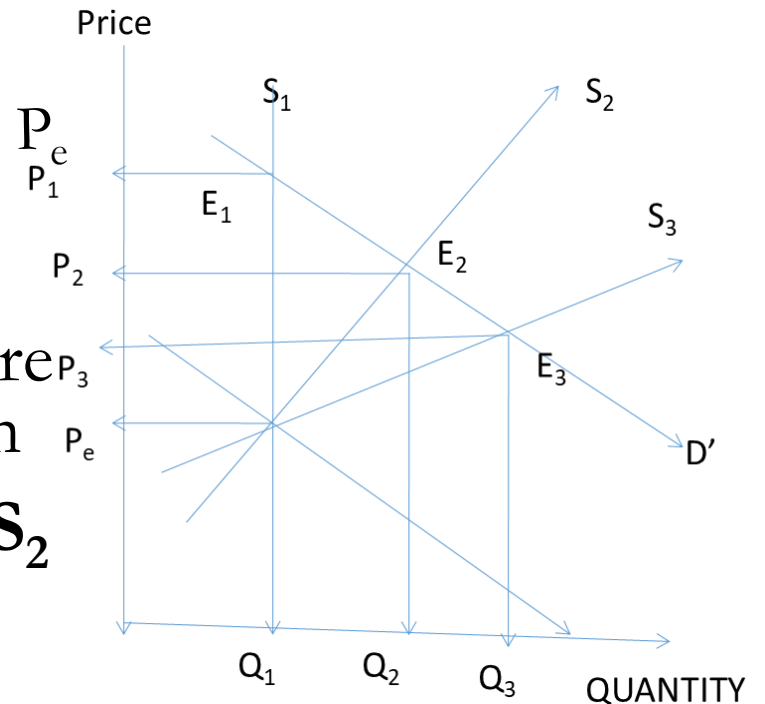
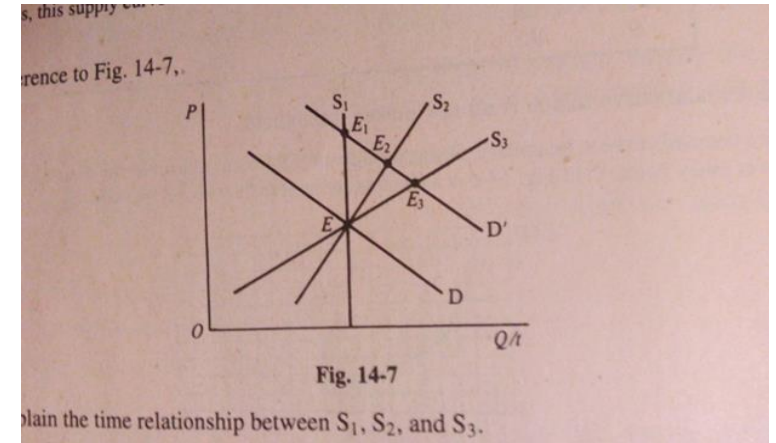
- $S_3$  is the supply curve over a longer time period say a year or more.
- The **longer period is referred to as long run**
- In the long run, the quantity response for a given increase in price is even greater
- That is the supply curve is more elastic because over a period of one or more years output would increase.





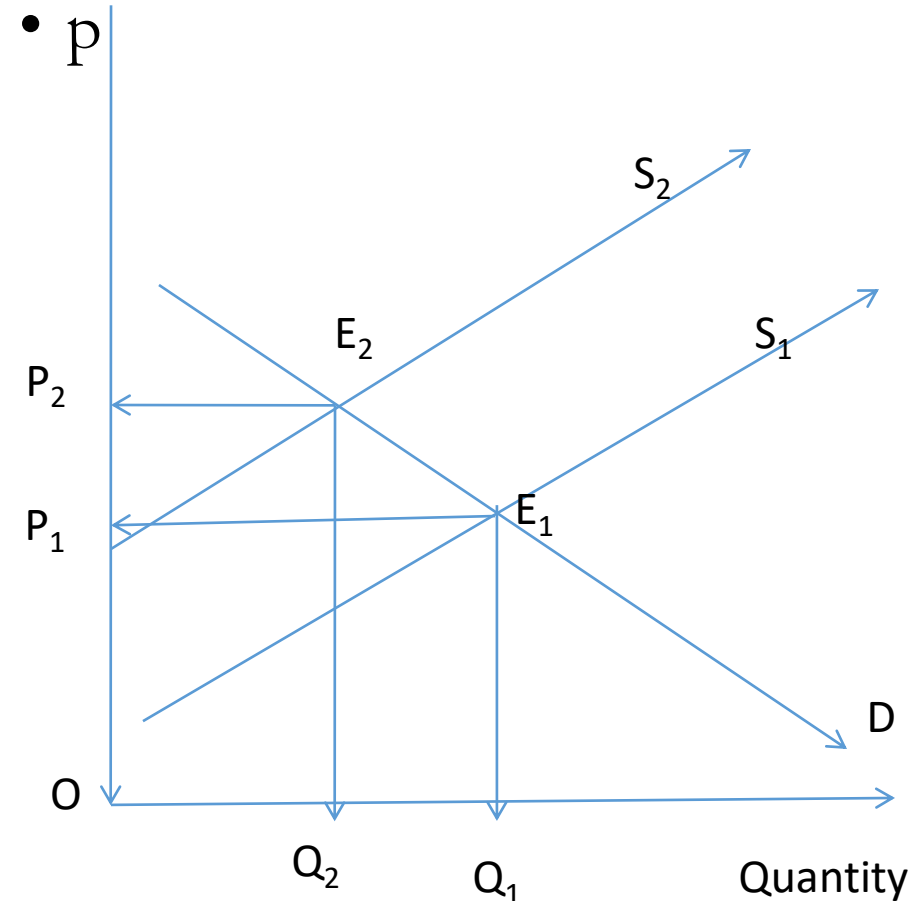
# Application Of Elasticity

- With  $D$  and  $S_1$  or  $S_2$  or  $S_3$ ,
  - the equilibrium price and quantity is given by point  $E$ .
- If  $D$  shifts up to  $D'$  (increase in demand)
  - only  $P$  rises in the market period (point  $E_1$  on  $S_1$ ), no change in quantity.
- In the short run, equilibrium is at  $E_2$ . Price rose to  $P_2$  from  $P_e$  and  $Q_1$  rose to  $Q_2$
- In the long run, equilibrium is at  $E_3$  Price rose to  $P_3$  from  $P_e$  and  $Q_1$  rose to  $Q_3$
- In the short run and the long run, both price and quantity increase, but equilibrium output rises more and price less in the long run than in the short run
- **Compare  $E_3$  on  $S_3$  in the long run with  $E_2$  on  $S_2$  in the short run.**



# Application of Elasticity: Bad Agricultural Harvest

- Why do farmers' income often rise when harvests are bad, and farmers' income often fail when harvests are good?
- A bad harvest is reflected by a decrease in supply
- That is an upward shift in the market supply curve of the good  $S_1$  to  $S_2$
- Given that the market demand remains constant, the decrease in supply causes the equilibrium to shift from  $E_1$  to  $E_2$  with
- Price rising to  $P_2$  from  $P_1$  and
- $Q_1$  falling to  $Q_2$



## Application of Elasticity: Bad Agricultural Harvest

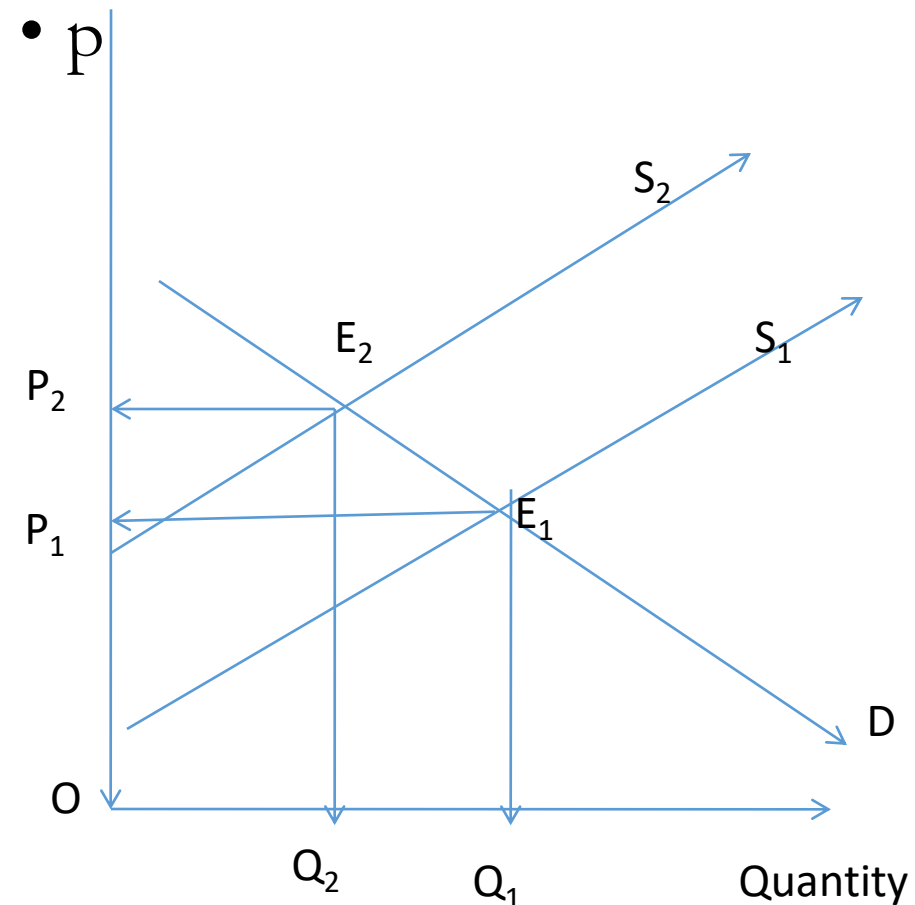
- Since the demand for agricultural commodities is usually price inelastic,

**The total receipts of farmers as a group increase,**

**This means that area**

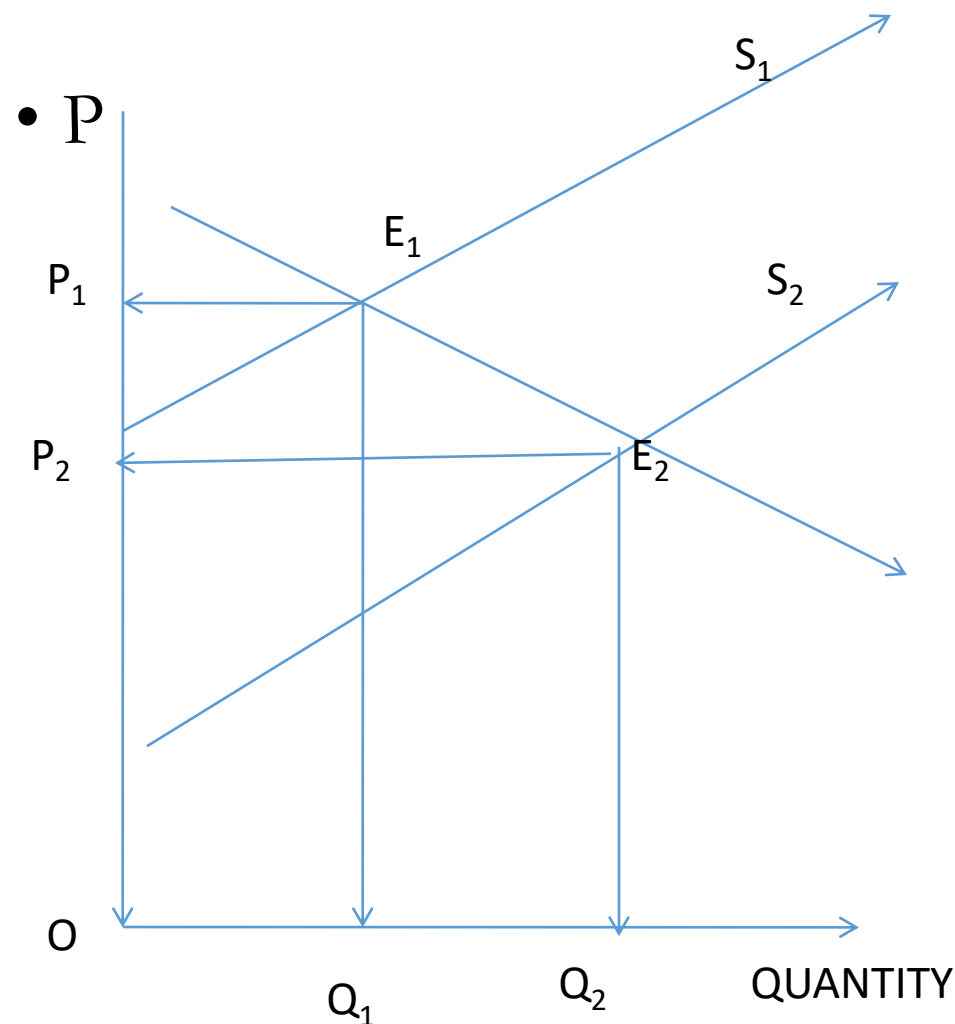
$$OQ_2E_2P_2 > OQ_1E_1P_1$$

- When the demand for an agricultural commodity is price inelastic, the same result can be achieved by reducing the amount of land under the cultivation of the commodity.

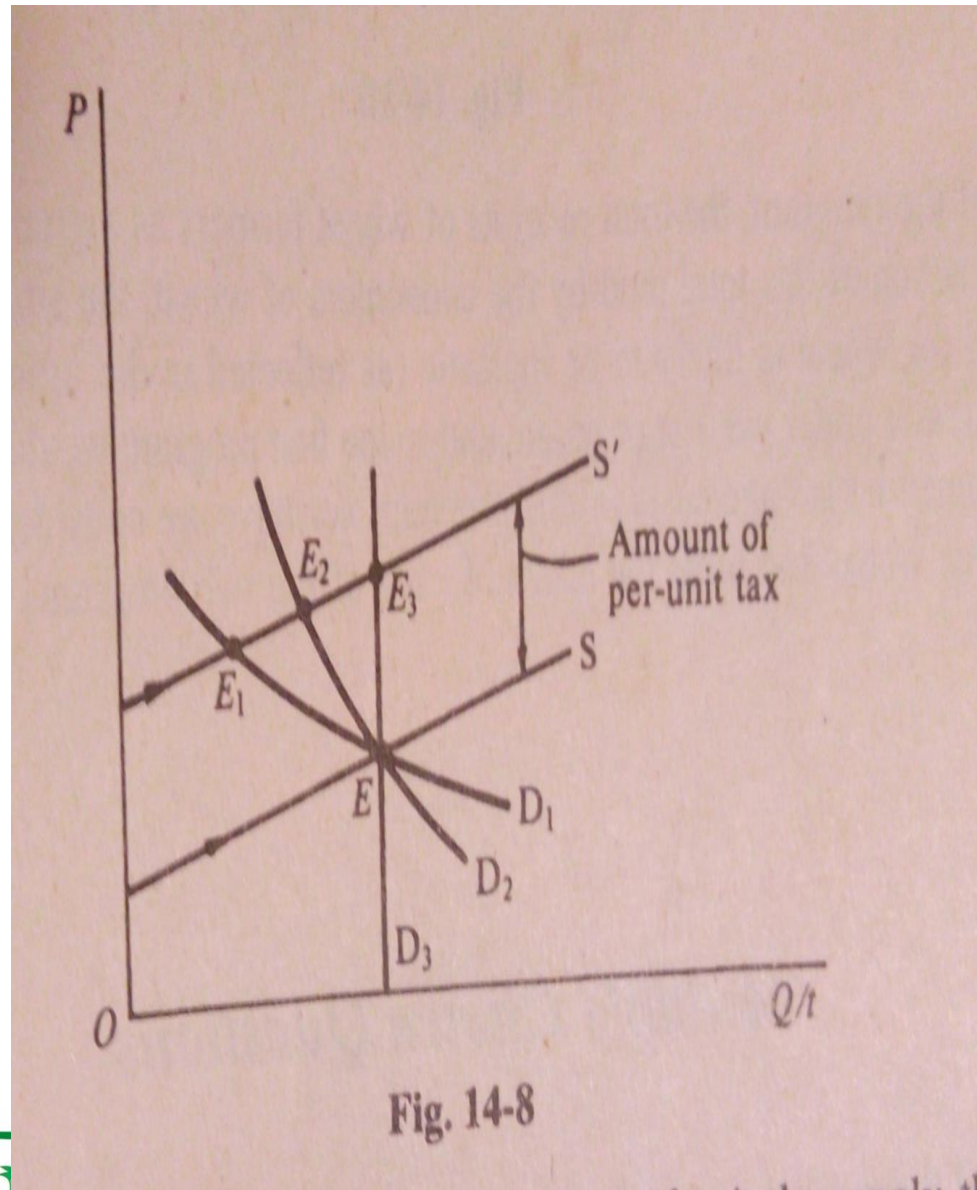


# Application of Elasticity: Good Agricultural Harvest

- When harvests are good, the supply increases.
- Supply curve shifts rightwards,  $S_1$  to  $S_2$ ,
- The commodity price falls from  $P_1$  to  $P_2$ .
- The farmers' income which is the product of price and quantity thus usually falls with good harvest which shift  $S_1$  to  $S_2$
- Initial Area(income),  $OQ_1E_1P_1 > OP_2E_2Q_2$ , the new revenue.



# Application of Elasticity: The case of Tax Incidence



- In the Fig, market demand  $D_1$  is more elastic than the alternatives  $D_2$  and  $D_3$ , while the supply curve  $S'$  is parallel and above  $S$  by the amount of per unit tax collected by the government from the producers
- The supply curves shifts up by the amount of per unit tax in order to leave producers with the same net per unit price for each quantity sold that they received before the imposition of the tax



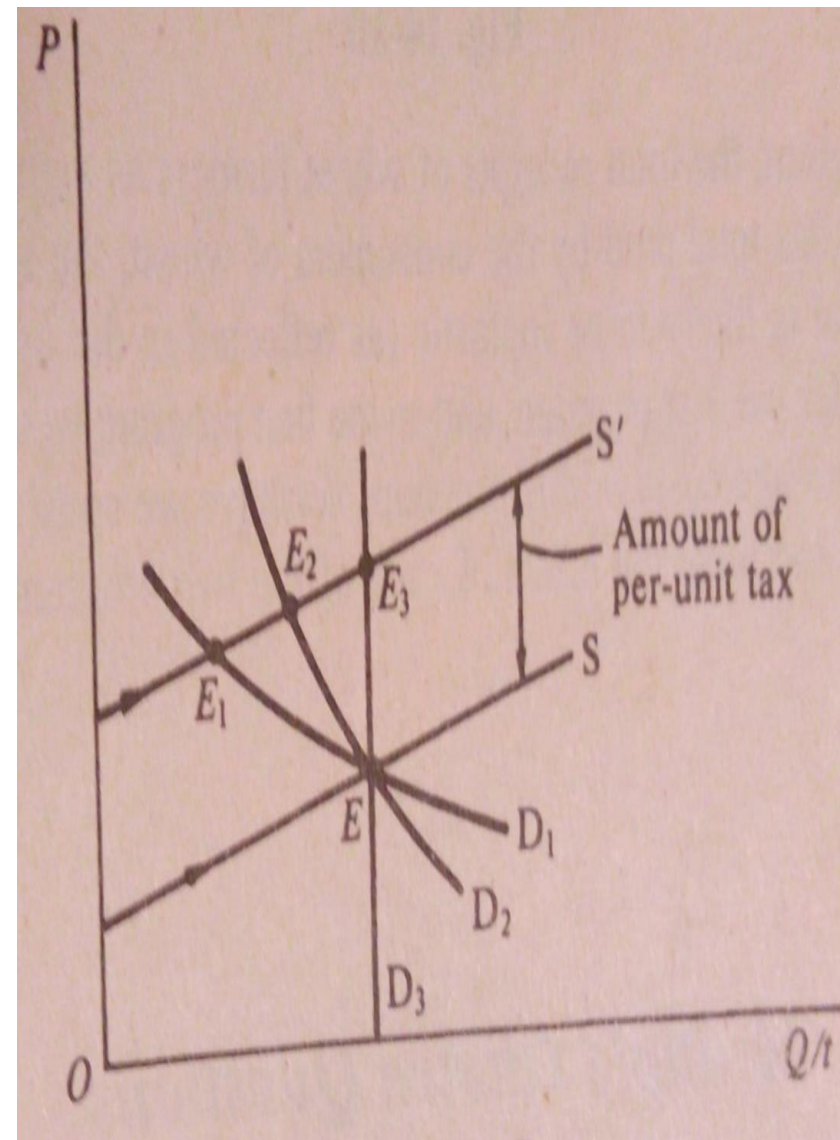
# Application of Elasticity: The case of Tax Incidence

- The figure shows that the **more inelastic the demand** curve for a commodity,
- the greater the burden or incidence of tax on the **consumers** for a per unit tax collected from producers.

- **Explanation:**

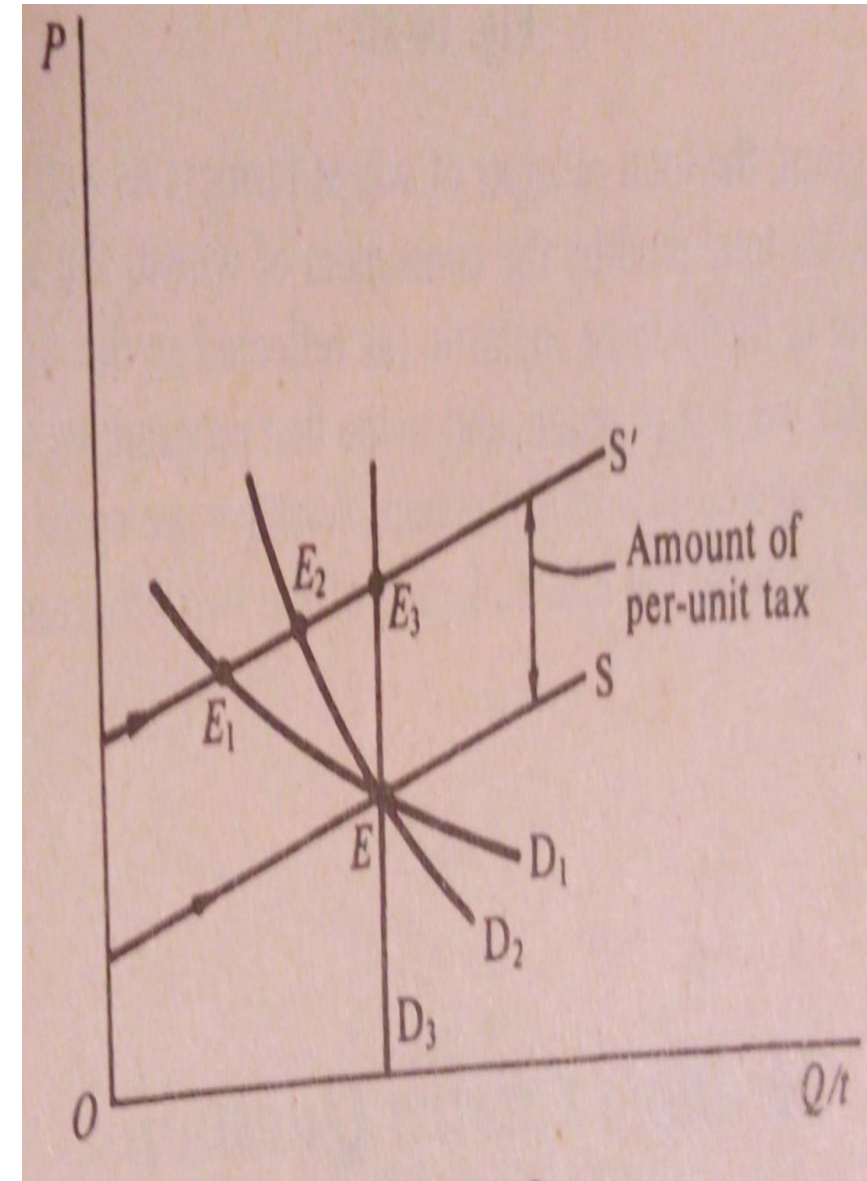
- Tax shifts supply curve from  $S$  to  $S'$  by amount of per unit tax collected by government from producers. Demand curves  $D_1, D_2$  and  $D_3$  show different elasticities of demand.

- $D_1$  being most elastic demand,
- $D_3$  is the most inelastic
- $D_2$  has elasticity between  $D_3$  and  $D_1$



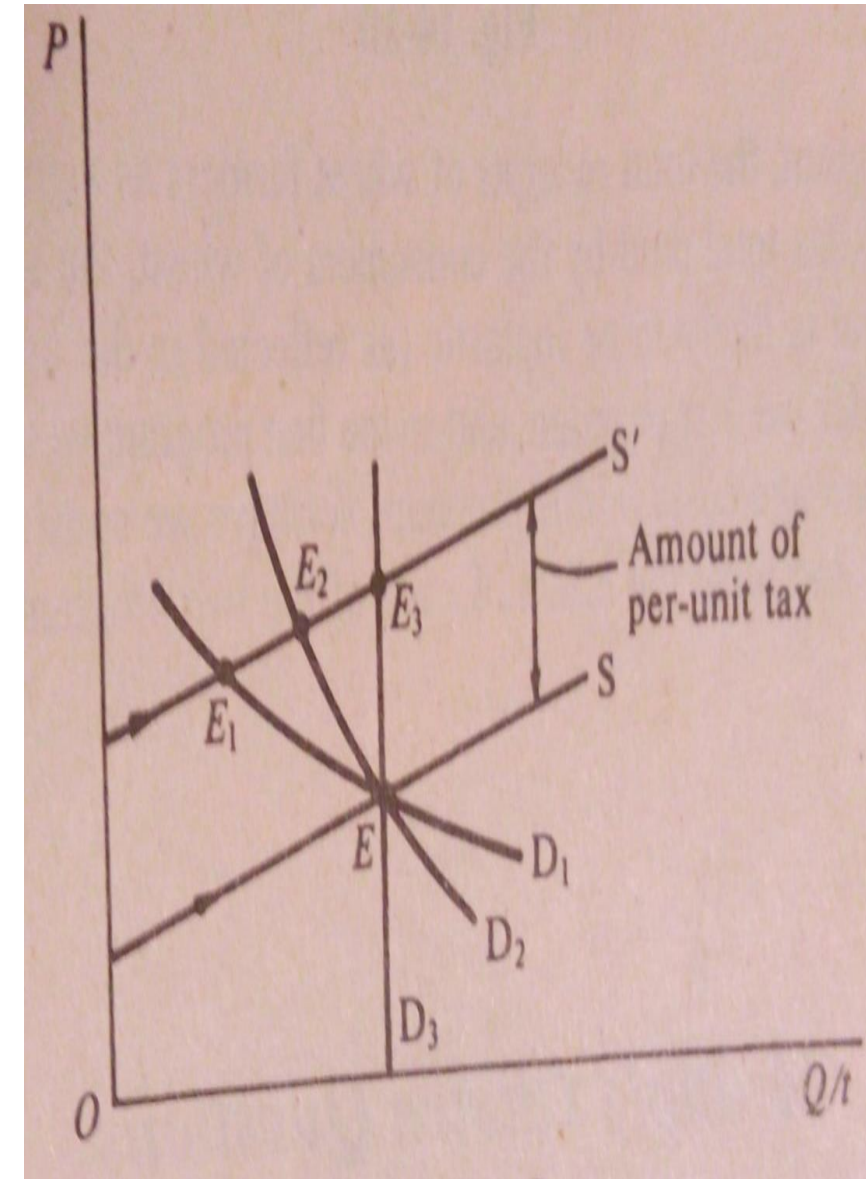
# Application of Elasticity: The case of Tax Incidence

- With either  $D_1$ ,  $D_2$  or  $D_3$  and  $S$  (in the absence of the per unit tax),
- We have equilibrium at point  $E$ .
- When government imposes the per unit tax on producers, (i.e. with supply  $S'$ ),
- The equilibrium point rises to  $E_1$  with  $D_1$  (the most elastic demand),
- The equilibrium point rises to  $E_2$  with  $D_2$ , and
- The equilibrium point rises to  $E_3$  with  $D_3$  (i.e. by full amount of the vertical shift in  $S'$  or per unit tax) by the inelastic demand curve.



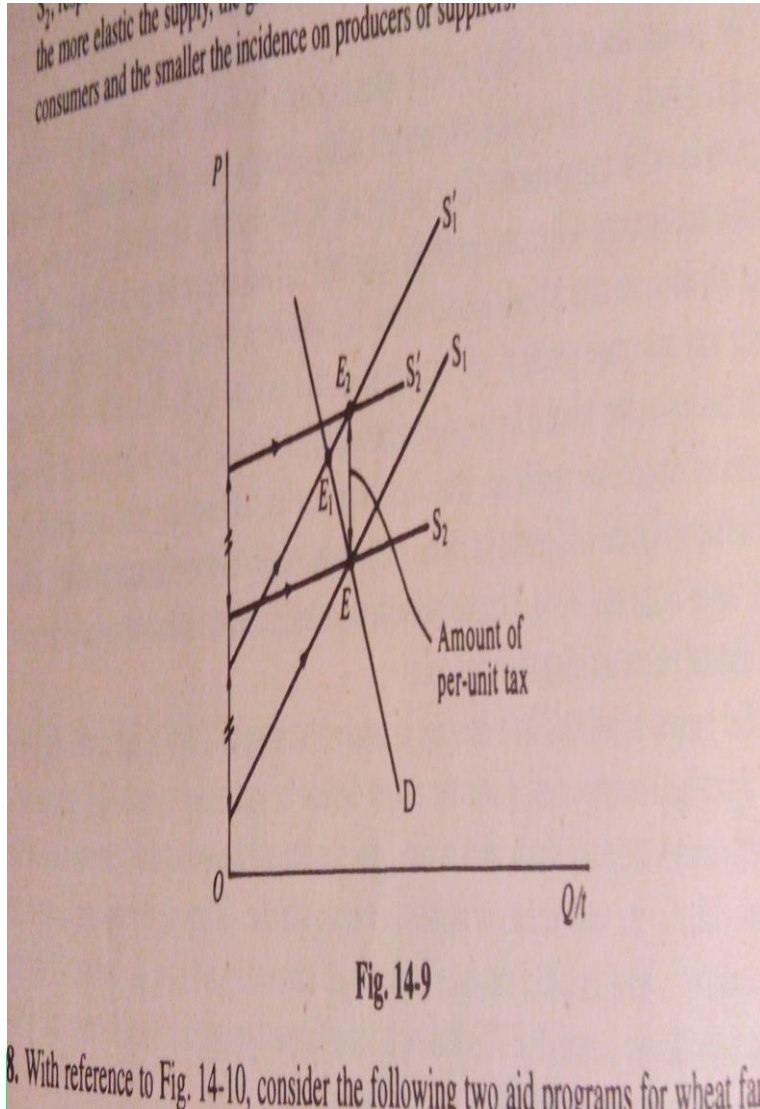
# Application of Demand Elasticity: The case of Tax Incidence

- Thus, the more inelastic the market demand curve for a commodity, the more the equilibrium price will rise for a given per unit tax collected from producers.
- In other words, the more inelastic the demand, the more producers are able to shift the burden or incidence of tax to consumers in the form of higher prices





# The Case of More Elastic Supply Curves $S'_2$ , Equilibrium at $E_2$ Compared with $S'_1$ Equilibrium at $E_1$



The figure shows that for a given demand  $D$ , the more elastic the supply curve, the greater the incidence of the tax on consumers

$S_2$  is more elastic than  $S_1$  and equilibrium is at  $E$  without tax.

When a given per unit tax is collected from producers, both  $S_1$  and  $S_2$  shift up vertically by the amount of the per unit tax to  $S'_1$  and  $S'_2$

With  $S'_1$ , the new equilibrium point  $E_1$  is lower than  $E_2$  with  $S'_2$ . Thus, for a given market demand:

**the more elastic the supply,**

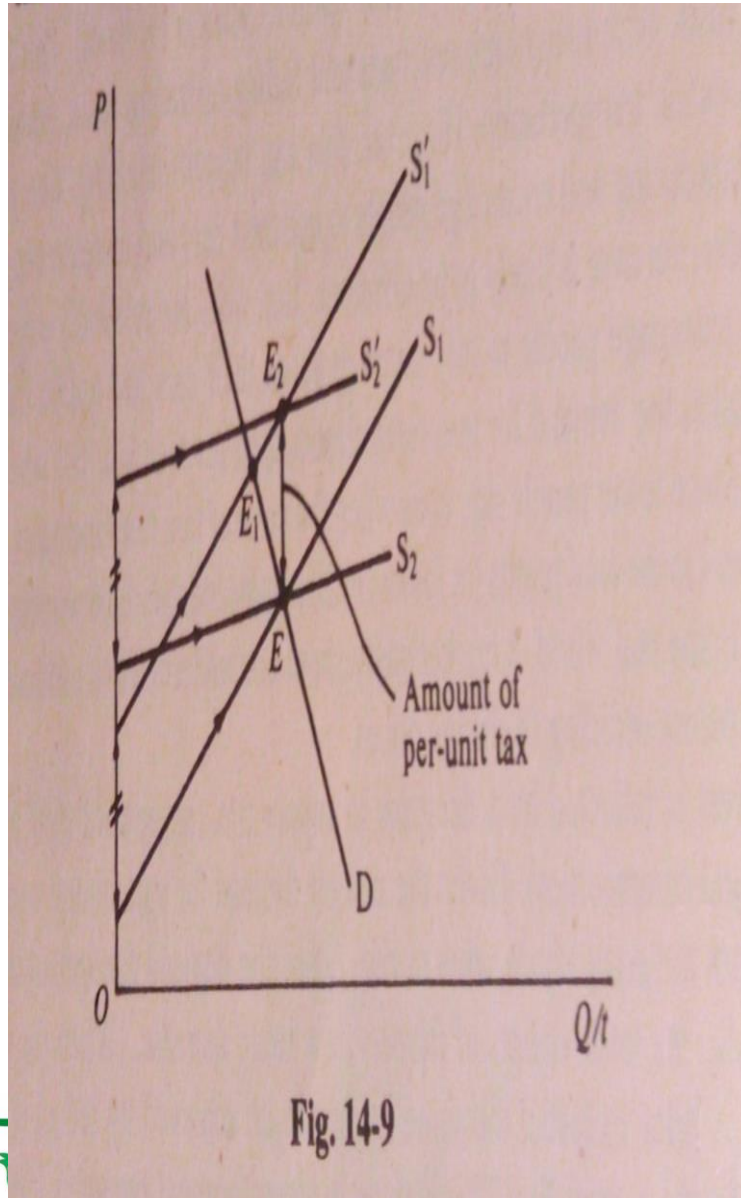
- **the greater the incidence of the tax on consumers and the smaller the incidence on producers or suppliers**

# Applications of Elasticity

- The concept of elasticity has many applications
- It tells whether the price of taxi ride should increase or decrease in order to increase total revenue
- It explains why farmers income often rises in times of bad harvest
- It shows that the more inelastic the demand for a good, the greater the burden (incidence) on consumers of a per unit tax collected from producers
- On the other hand, for a given demand,
  - the more elastic the supply, the greater the incidence of the tax on consumers
- Elasticity can also help the government determine the relative cost of various alternative farm-aid programs

- With either  $D_1, D_2$  or  $D_3$  and  $S$  in the absence of per unit tax, we have equilibrium at point  $E$ .
- When the government imposes the per unit tax on producers, that is with  $S'$ , the equilibrium point rises to  $E_1$  with  $D_1$  (the more elastic demand) to  $E_2$  with  $D_2$  and to  $E_3$  (ie by the full amount of the vertical shift in  $S'$  or the per unit tax with  $D_3$ ).
- Thus the more inelastic the market demand curve for a commodity, the more the equilibrium price will rise for a given per unit tax collected from producers.
- In other words the more inelastic the demand, the more producers are able to shift the burden or incidence of the tax to consumers in the form of higher prices

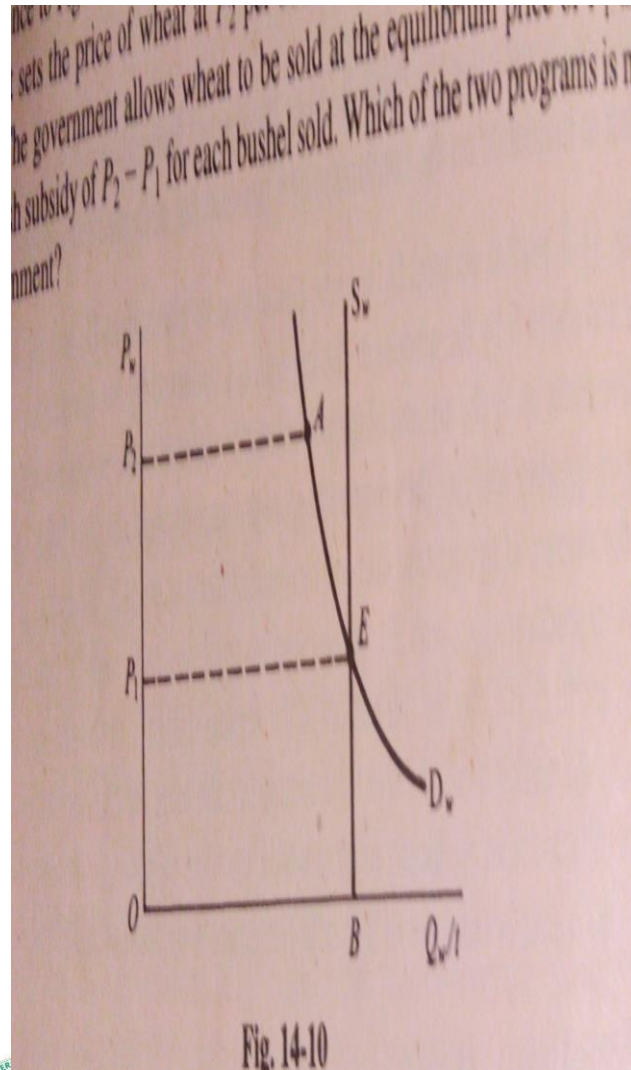
# Application of Supply Elasticity



- In the figure  $S_2$  is more elastic than  $S_1$  and equilibrium is at  $E$  without the tax
- Whether a given per unit tax is collected from producers, both  $S_1$  and  $S_2$  shift up vertically by the amount of per unit tax to  $S_1'$  and  $S_2'$  respectively.
- With  $S_1'$ , the new equilibrium point  $E_1$  is lower than  $E_2$  with  $S_2'$
- Thus for a given demand, the more elastic the supply, the greater the incidence of tax on, ie the greater the increase in price for consumers and the smaller the incidence on the producers or suppliers



# Aid Program on Wheat



- With reference to the figure, consider the 2 aid programs for wheat.
- 1. The government sets the price of wheat at  $P_2$  per bushel and purchased the resulting surplus of wheat at  $P_2$ .
- 2. The government allows wheat to be sold at the equilibrium price  $P_1$  and grants each farmer a cash subsidy of  $(P_2 - P_1)$  for each bushel sold
- Which of the 2 aid programs is more expensive to the government?

# Aid Program Evaluation

- Regardless of the programs the total receipt of wheat farmers as a group is the same,  $OP_2 \times OB$
- The greater the fraction of this total, paid by the consumers of wheat, the smaller the cost to the government
- Since the demand for wheat is likely to be inelastic, consumers expenditures on wheat would be greater under the first program, and thus the first program will cost the government less (ie set price at  $P_2$  and purchase the surplus)
- Note, we have assumed no storage cost in the problem nor have we considered what the government would do with the surplus wheat and what the effect of each of the 2 programs would be on the welfare of the consumers

# Assignment

- Given the diagram in the slide in which government has 2 programs for wheat production,
- 1. The government set wheat price at  $P_2$ / tonne and purchases the resulting surplus at  $P_2$
- 2. The government allows wheat to be sold at the equilibrium price  $P_1$  and grants each farmer a cash subsidy of  $(P_2 - P_1)$  for each tonne of wheat sold.
- Which of the two programs is more expensive to government?

# Solution

- Regardless of the program, the total receipts of wheat farmers as a group are the same ie ( $OP_2 \times OB$ ).
- The greater the fraction of this total paid by the consumers of wheat, the smaller the cost to government
- Since demand for wheat is likely to be inelastic, consumers' expenditure on wheat would be greater under the first program (ie, where government set price at  $P_2$  and purchase the resulting surplus) and so the first program would cost the government less.
- **Note that we assumed no storage cost and have not considered what government will do with surplus and what the effect of each of the 2 programs would be on welfare.**



- You can use programs, projects and policies to achieve the goals of interest to you.

Government use these interventions to achieve its goals and objectives, which can be:

- welfare promotion
- Increased income to producers
- Increased output from producers, etc

# Objective Practice Questions

**The intersection of the demand and supply curves for a commodity determines**

- a) the equilibrium price
- b) the equilibrium quantity
- c) the price at which there is neither a surplus nor a shortage of the commodity
- d) all of the above
- e) none of a, b, and c

**The elasticity of demand is measured by:**

- a. the slope of the demand curve
- b. the inverse of the slope of the demand curve
- c. the percentage change in price for a given percentage change in quantity
- d. the percentage change in supply for a given percentage change in price
- e. the percentage change in quantity for a given percentage change in price

### **The demand curve for a commodity is more elastic**

- a. the greater the number of good substitutes available
- b. the greater the proportion of income spent on the commodity
- c. the longer the period of time considered
- d. all of the above
- e. none of a, b, and c

### **When harvests are bad:**

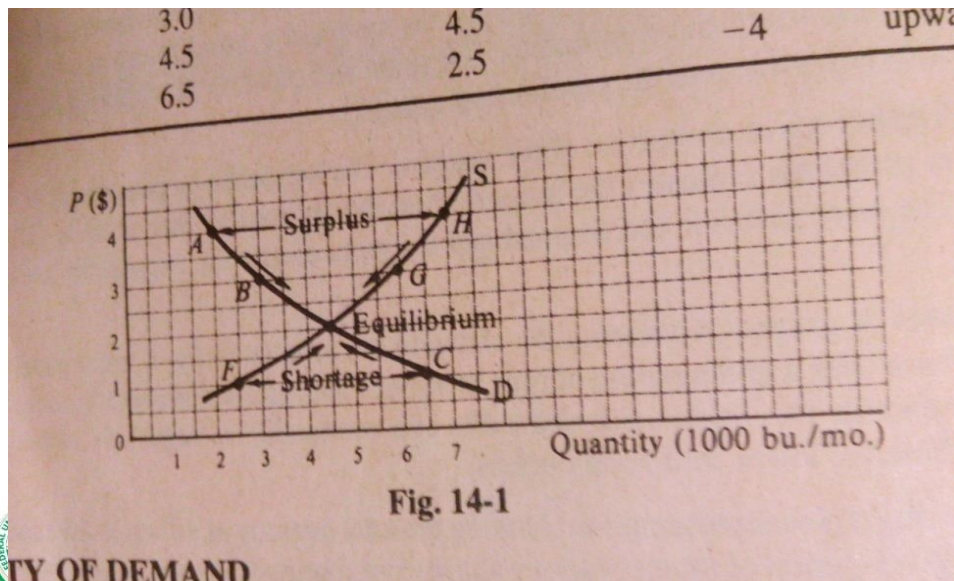
- a. the supply of farm produce decreases
- b. farm prices rise
- c. farmers incomes usually rise
- d. all of the above
- e. none of a, b and c

### **The burden on consumers of a per-unit tax collected from producers is greater:**

- a. the more elastic the demand curve
- b. the more inelastic the demand curve
- c. the more inelastic the supply curve
- d. all of the above

## Essay Practice Questions on elasticity application

- Draw a figure showing that the more inelastic the market demand curve for a commodity, the greater the burden or incidence on the consumers of a per unit tax collected from producers
- Draw a figure showing that for a given demand, the more elastic the supply, the greater the incidence of a tax on consumers
- Given the graph and schedule, find  $E_d$  between A and B; and between B and E. Find  $E_s$  between GE and between EF



Price	Qd		P	Qs
A. 4	2	H.	4	7
B. 3	3	G.	3	6
E. 2	4.5	E.	2	4.5
C. 1	6.5	F.	1	2.5

# Find:

- The elasticity between points E and C along the demand curve using the original quantity and price is:
- The elasticity between points E and C along the demand curve using the new quantity and price is:
- The average elasticity between points E and C along the demand curve .
- The average elasticity between points G and H along the supply curve



- Assume equilibrium price initially for petrol is  $P_0$  while equilibrium quantity is  $Q_0$ .
- Suppose government seeks to reduce consumption that is decrease the quantity demanded.
- An imposed tax of N0.50 on a litter sold would decrease market supply, that is:
- Shift the market supply curve to the left to  $S'$ , and raise the equilibrium price to  $P_1$ ;
- equilibrium quantity would fall from  $Q_0$  to  $Q_1$  litres .
- Give the graphical illustration of the phenomenon

Given The Individual Demand and Supply Schedule, What is the equilibrium price?

Price ₦	Quantity Demanded	Quantity Supplied
20.00	110	5
40.00	90	46
60.00	77	77
80.00	67	100
100.00	62	115
120.00	60	122

**At  $P = 60.00$ ;  $Q_s = Q_d$**

Using the schedule below,

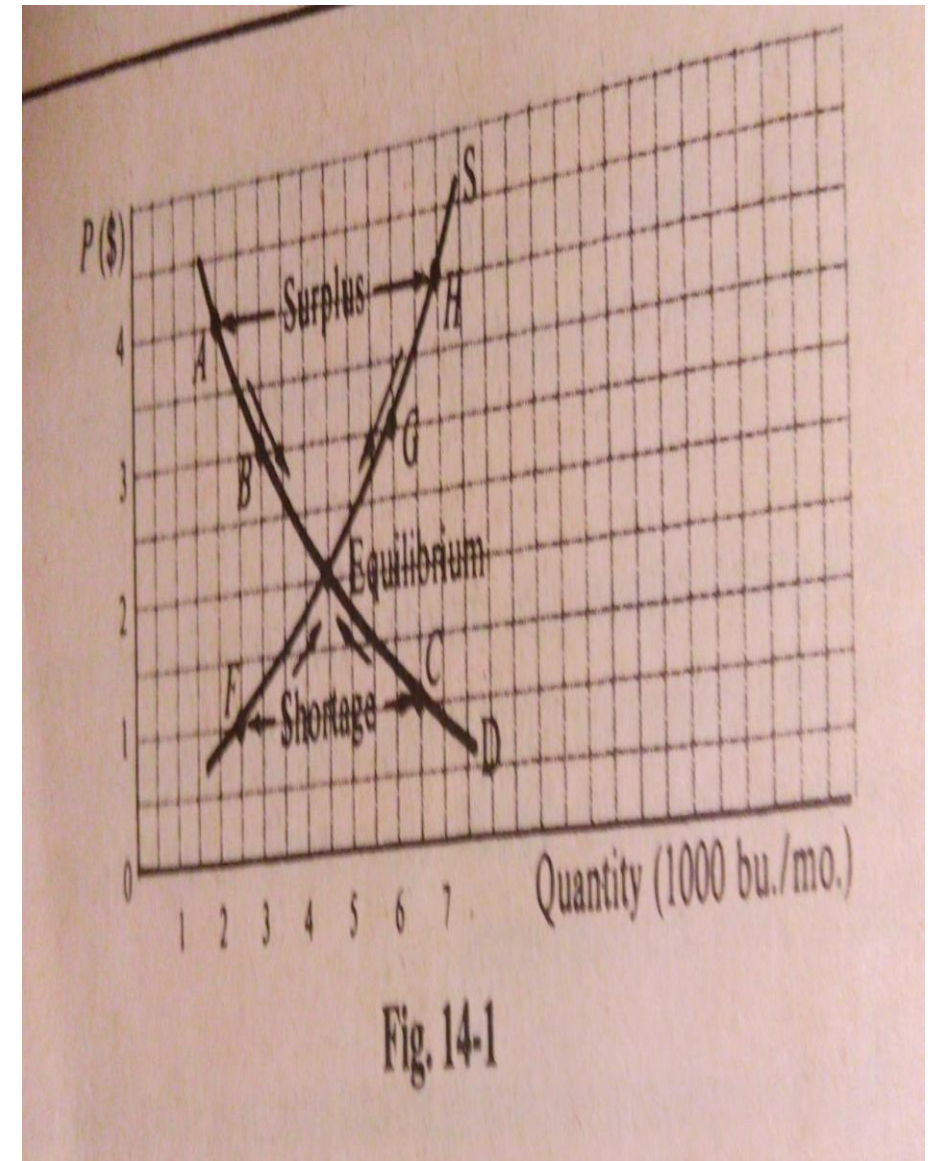
i) Draw the market demand curve for the good

ii) Draw the individual A's demand curve for the commodity.

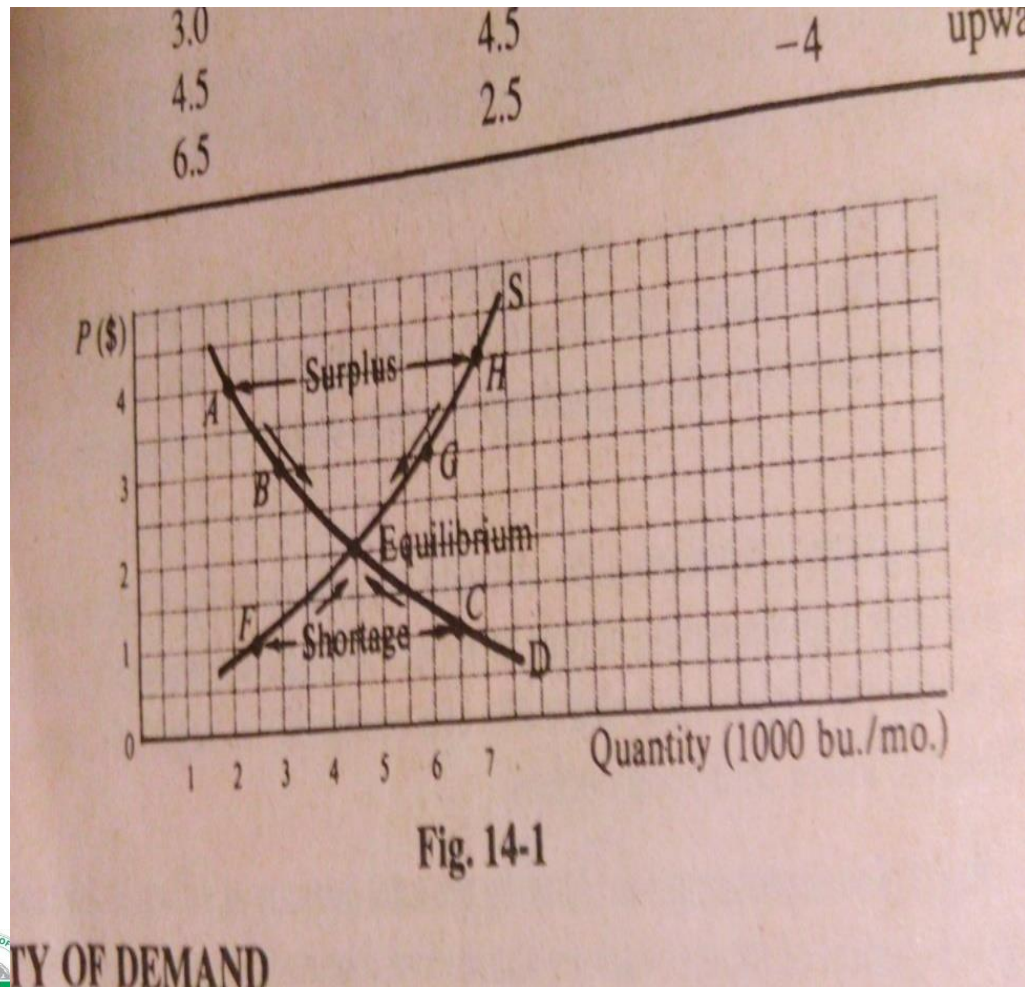
Price (Naira)	Quantity Demanded by A(Kg)	Quantity Demanded by B(Kg)	Quantity Demanded by C(Kg)	Market Quantity Demanded(Kg)
10	2	0	0	2
9	5	1	0	6
8	8	5	0	13
7	12	10	5	27
6	16	14	12	42
5	21	18	14	53
4	27	22	12	61
3	35	25	11	71
2	45	27	14	86
1	60	29	16	105

## Assignment a: Check for the nature of $E_d$ between B & E and E & C on the average in the schedule given.

Price	Quantity Demanded	Quantity Supplied	Surplus (+) or Shortage(-)	Pressure on price
4	2 A	7 H	+5	Downward
3	3 B	6 G	+3	Downward
2	4.5 E	4.5 E	0	Equilibrium
1	6.5 C	2.5 F	-4	upward



# Assignment b: Given the graph



- 1. Find  $E_s$  between E and G
- 2. Also find  $E_s$  between F and G
- 3. Define the following terms giving appropriate equations:
  - (i) Price elasticity of demand
  - (ii) Income elasticity of demand
  - (iii) Price Cross elasticity of demand