



ELASTICITIES

Chapter 4

ELASTICITY

- Elasticity is the measure of responsiveness
- It measures how much something changes when there is a change in one for the factors that determines it
- We look at elasticity in terms of demand and supply



ELASTICITY OF DEMAND

- Elasticity of demand is a measure of how much the demand for a product changes when there is a change in one of the factors that determine demand
- There are 3 elasticities to consider:
 - PED= Price elasticity of demand
 - XED= Cross elasticity of demand
 - YED= Income elasticity of demand

PRICE ELASTICITY OF DEMAND

- PED (Price elasticity of demand) is a measure of how much the quantity demanded of a product changes when there is a change in price of the product.
- Equation:
 - $$\text{PED} = \frac{\text{Percentage change in quantity demanded of a product}}{\text{Percentage change in price of a product}}$$

PRICE ELASTICITY OF DEMAND

- EXAMPLE: A publishing firm discovers that when they lower the price of one of their monthly magazines from \$5 to \$4.50, the number of magazines that are bought each month rises from 200,000 to 230,000. Calculate the price elasticity of demand for this magazine

- $$\text{PED} = \frac{(200,000-230,000) / 200,000 = -.15 \text{ or } -15\%}{(\$5.00-\$4.50) / \$5.00 = .10 \text{ or } 10\%} = -1.5$$

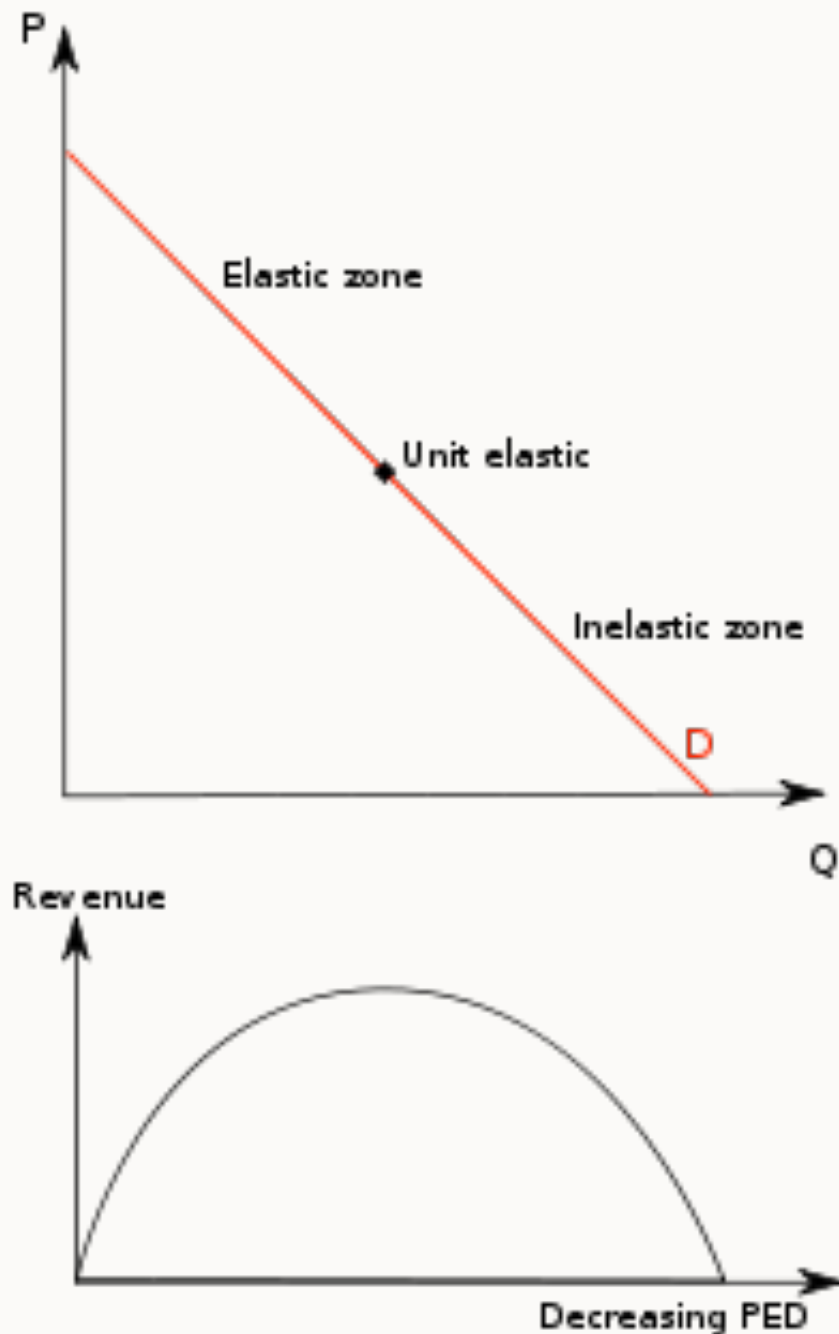
PRICE ELASTICITY OF DEMAND

- The negative value indicates that there is an inverse relationship between price and the quantity demanded.
- Economists usually ignore the negative value (to simplify things) and give the answer as a positive figure.
- For this example, the PED for the monthly magazine is 1.5



$$\text{PED} = \frac{(200,000 - 230,000) / 200,000 = -.15 \text{ or } -15\%}{(\$5.00 - \$4.50) / \$5.00 = .10 \text{ or } 10\%} = 1.5$$

THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND

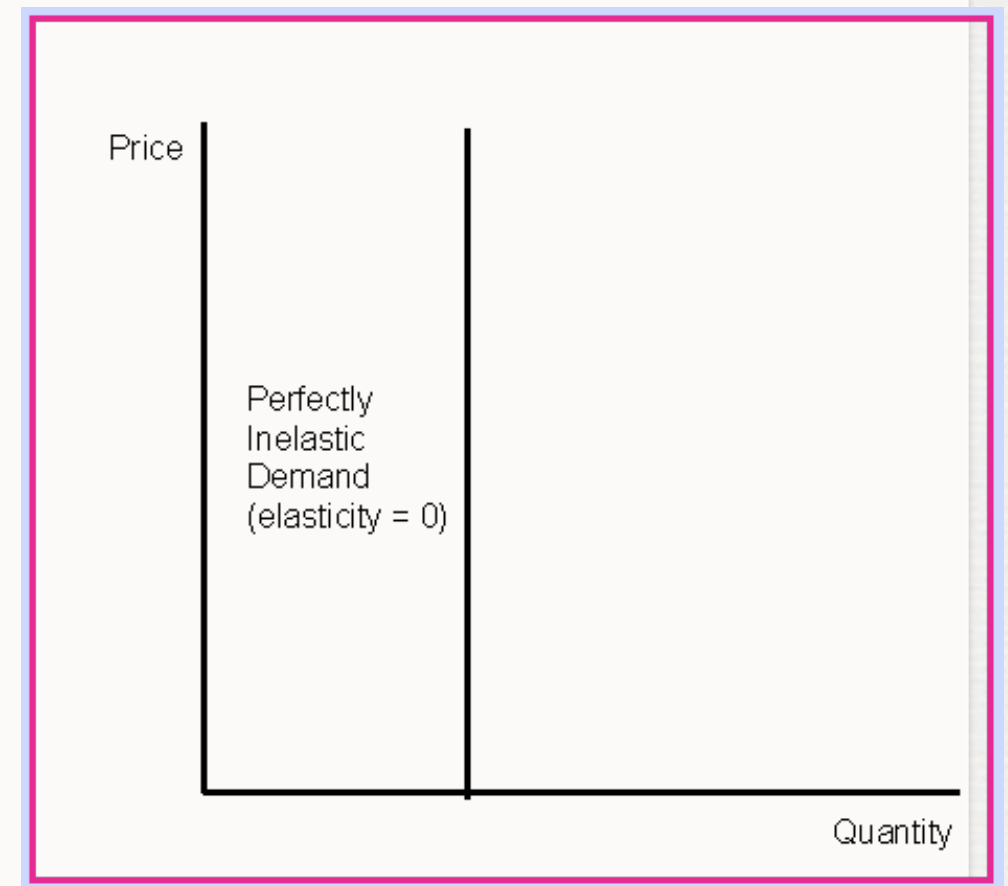


- The possible range of values for price elasticity of demand usually goes from 0 to infinity.
- The two extremes are theoretical and the real values lie in between

THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND

- If the PED is equal to 0, then a change in the price of a product will have no effect on the quantity demanded at all.
- The percentage change in the quantity demanded would therefore be 0 so would the value on the top of the PED equation.
- Since 0 divided by anything is 0, no matter what the percentage change in price, the PED value would be 0.

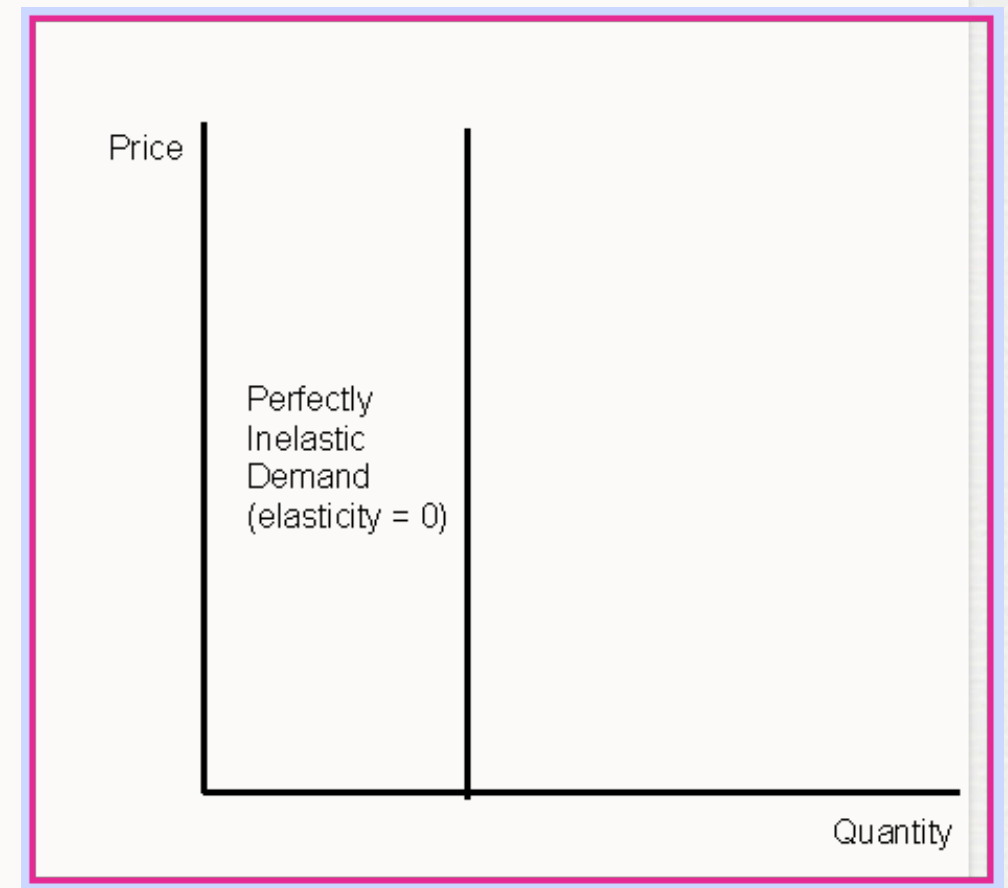
$$\frac{(0-0)/0 = 0\% \text{ change}}{(P_1-P_2)/P_1 = P\% \text{ change}} = 0$$



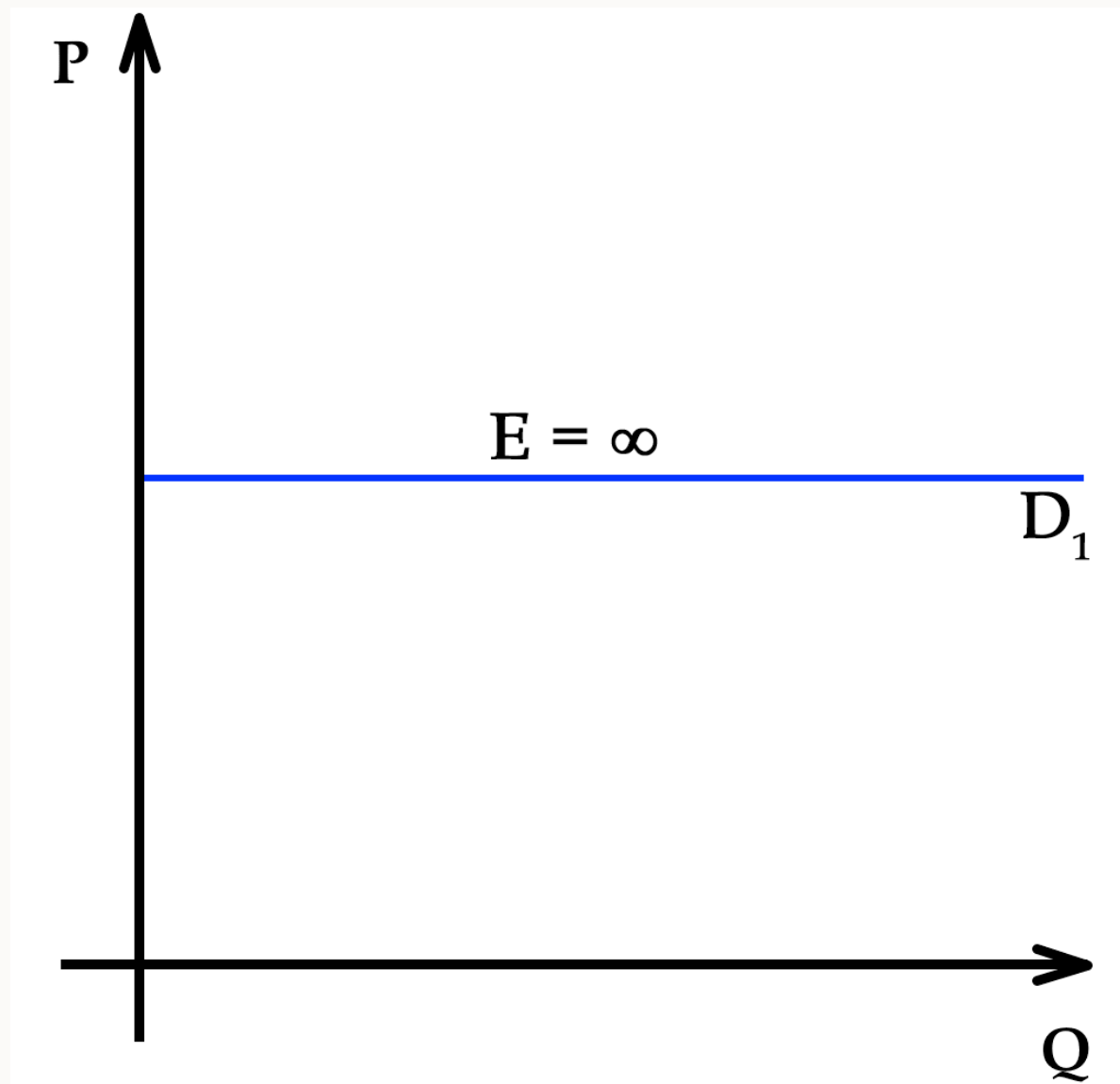
THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND

- A demand curve with a PED value of 0 is shown to the right and is said to be perfectly inelastic.
- No matter the change in price, the quantity demanded does not change

$$\frac{(0-0)/0 = 0\% \text{ change}}{(P_1-P_2)/P_1 = P\% \text{ change}} = 0$$

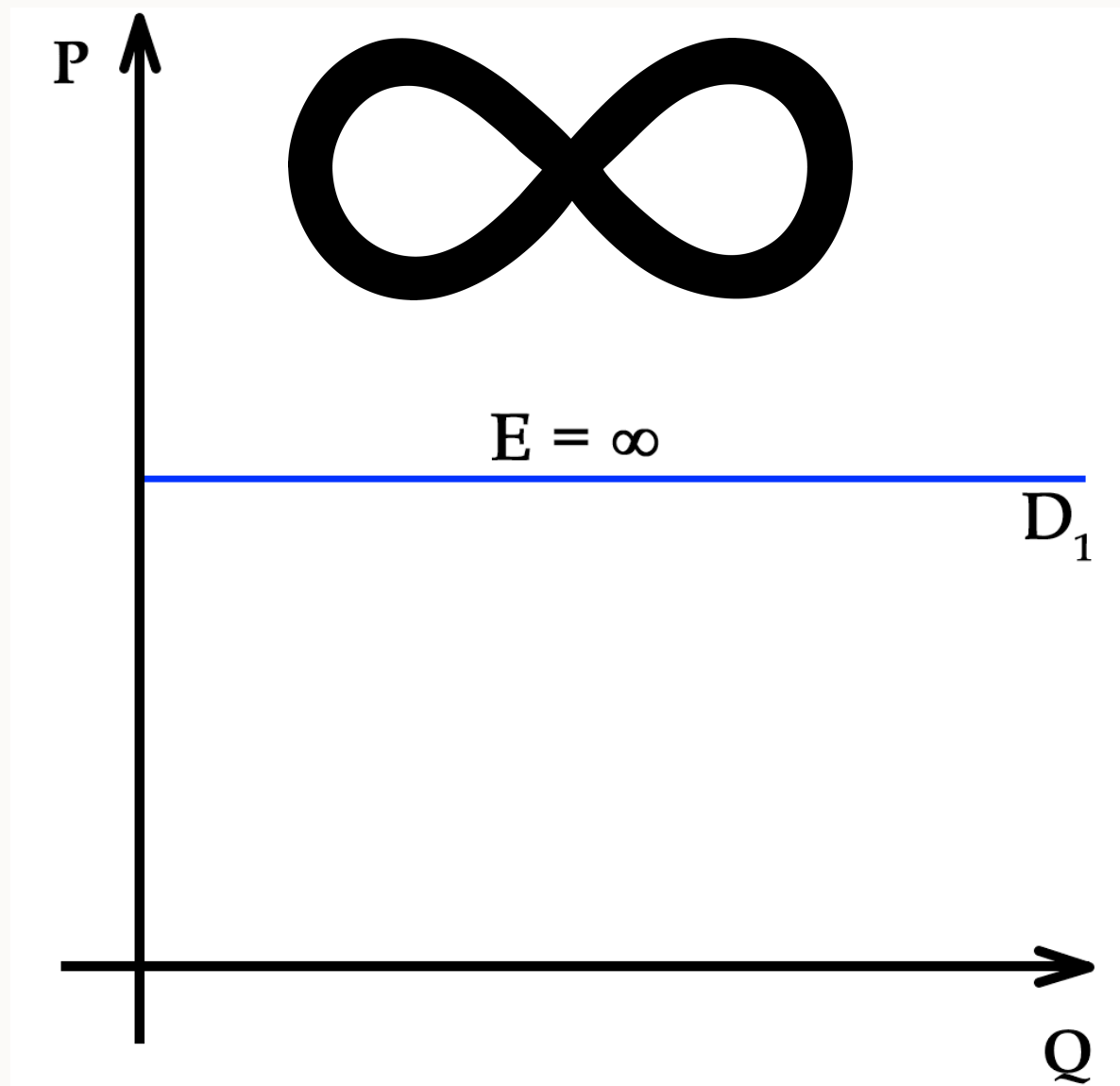


THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND



- A PED value of infinity is best explained by using a diagram and the situation is shown to the left
- Demand is said to be perfectly elastic, at the given price, the demand curve goes on forever and ever
- However, if the price is raised even by a small amount, demand will fall to 0, and infinite change.

THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND



Khan Academy

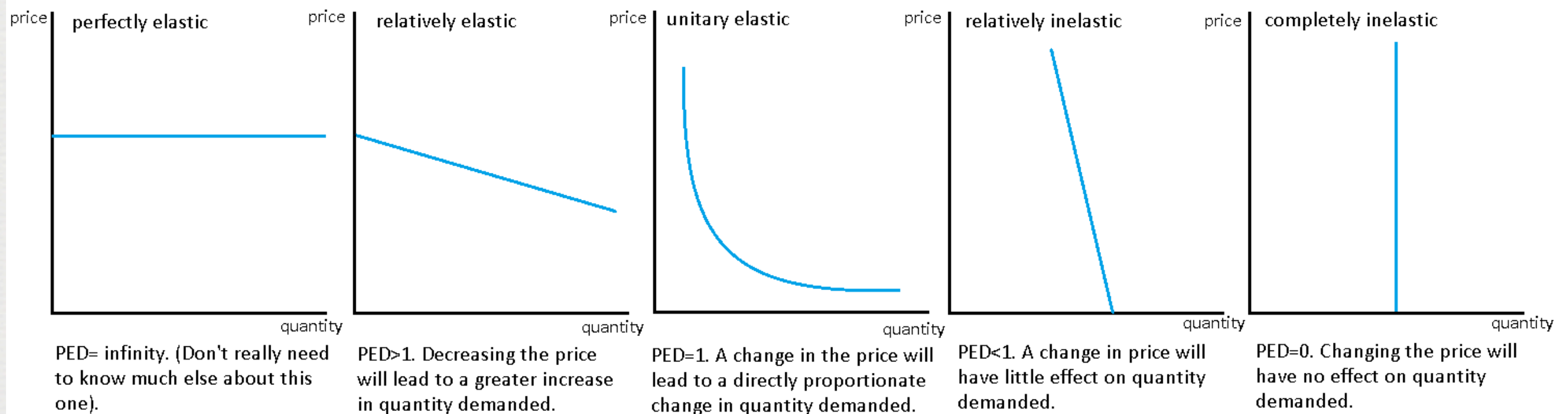
$$\frac{\infty}{(P_1 - P_2) / P_1 = P\% \text{ change}} = \infty$$

- Since infinity divided by anything is infinity, no matter what the percentage change in price, the PED value will be infinity.

THE RANGE OF VALUES OF PRICE ELASTICITY OF DEMAND

- Remember, perfectly inelastic and perfectly elastic values are theoretical.
- Normal products have values of PED between 0 and infinity.
- PED is split into three categories:
 - Inelastic Demand
 - Elastic Demand

Elasticities of Demand

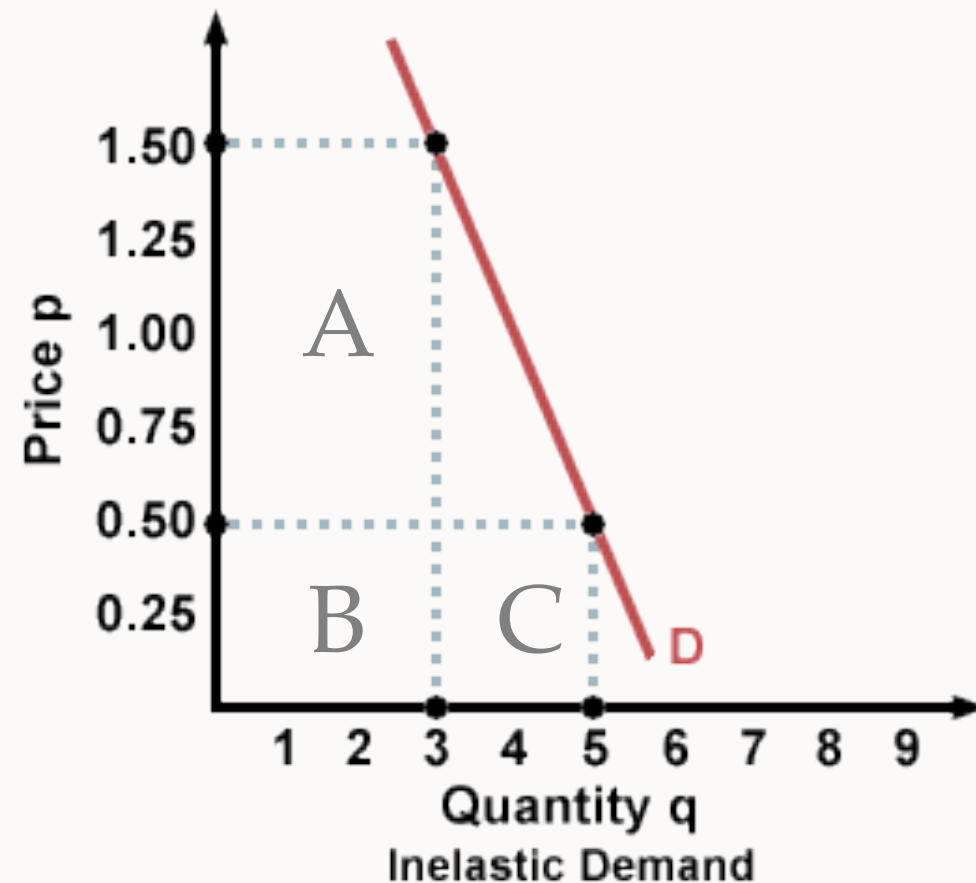


INELASTIC DEMAND

- The value of the PED is less than one and greater than zero.
- $>0 \text{ PED} < 1$
- If a product has an inelastic demand, then a change in price of the product leads to a proportionally smaller change in the quantity demanded of it
- If the price is raised, the quantity demanded will not fall by much in comparison and to the total revenue gained will increase

INELASTIC DEMAND

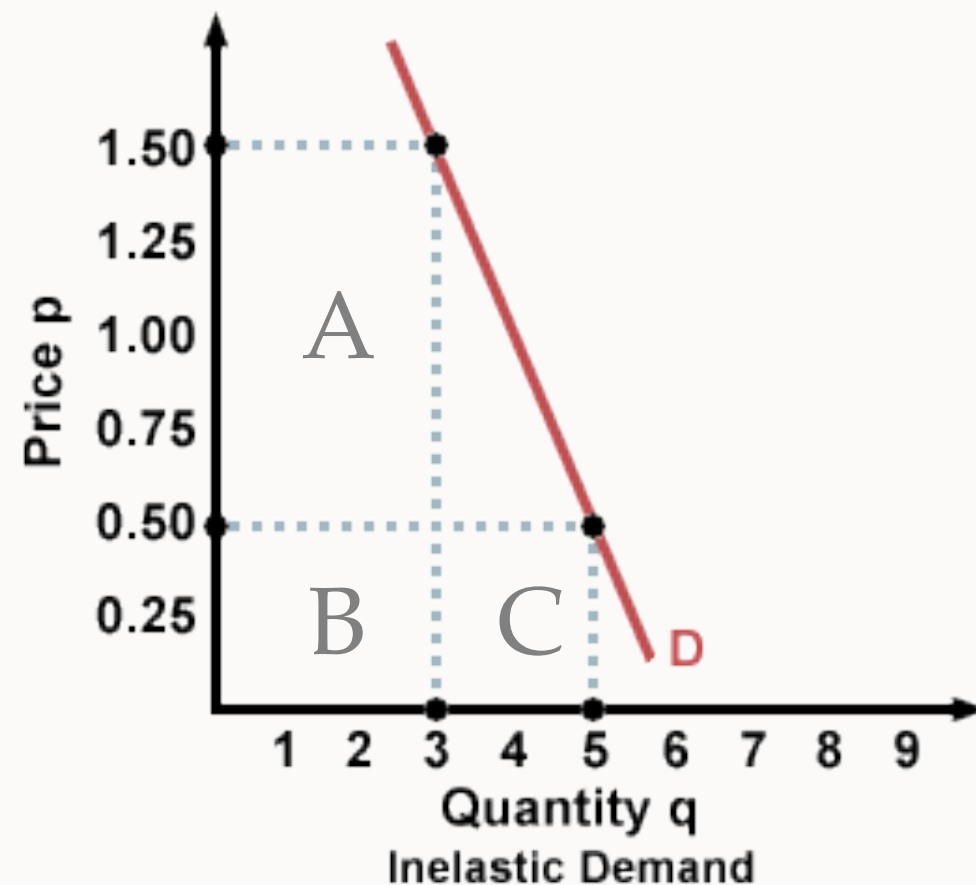
- As we can see, the PED is .2, less than one, so the demand for this product is **inelastic**.
- $5 \times \$0.50 = \2.50
- $3 \times \$1.50 = \4.50
- Firms revenue rises by \$2



$$\frac{(5-3)/5 = .4}{(.50-1.50)/.50 = -2} = -.2$$

INELASTIC DEMAND

- Before the price rise, the firm was getting revenue equal to “revenue box b” + “revenue box c”.
- After the price increase, the firm loses “revenue box c”, because quantity demanded falls to 3, but gains “revenue box a” because the remaining products are sold at \$1.50
- Thus if a firm has an inelastic demand for a product and wishes to increase total revenue, it should raise the price of the product.

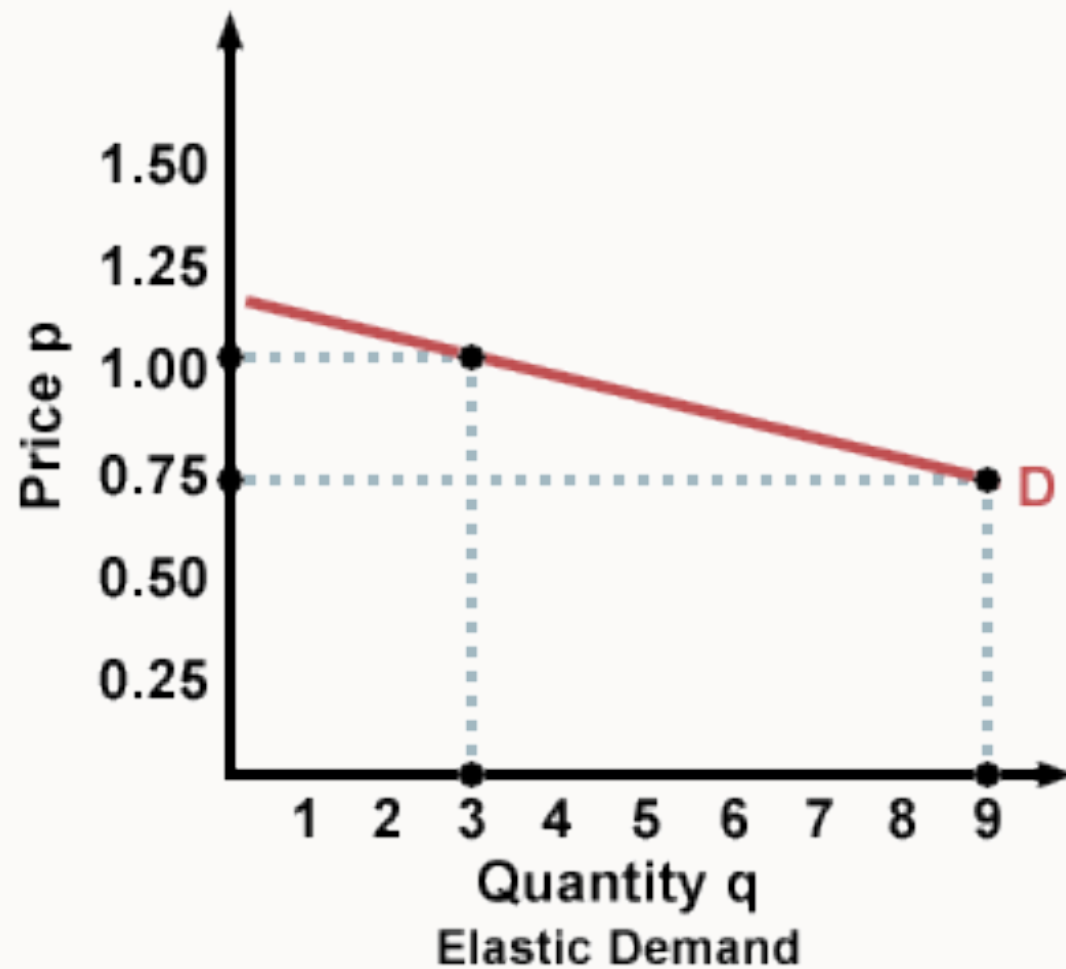


$$\frac{(5-3)/5 = .4}{(.50-1.50)/.50 = -2} = -.2$$

ELASTIC DEMAND

- The value of PED is greater than one and less than infinity.
- $>1 \text{ PED} < \infty$
- If a product has an elastic demand, then a change in the price of the product leads to a greater than proportionate change in the quantity demanded
- If the price is raised, the quantity demanded will fall by more in comparison and so the revenue gained by the firm will fall.

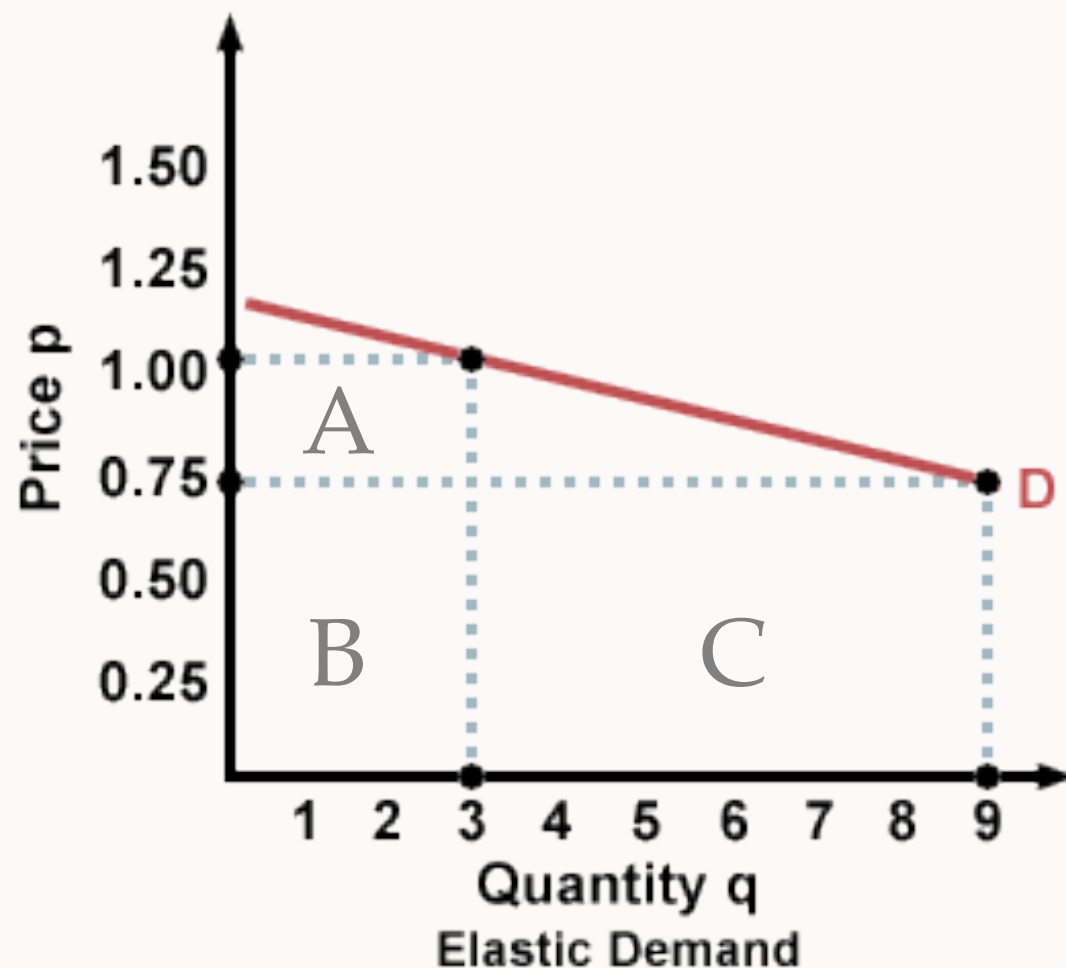
ELASTIC DEMAND



$$\frac{(9-3)/9 = .667}{(.75-1.00)/.75 = -.33} = -2.021$$

- As we can see, the PED is 2.02, greater than 1, so the demand for the product is **elastic**.
- $9 \times \$0.75 = \6.75
- $3 \times \$1.00 = \3.00
- Firms revenue decreases by \$3.75

ELASTIC DEMAND



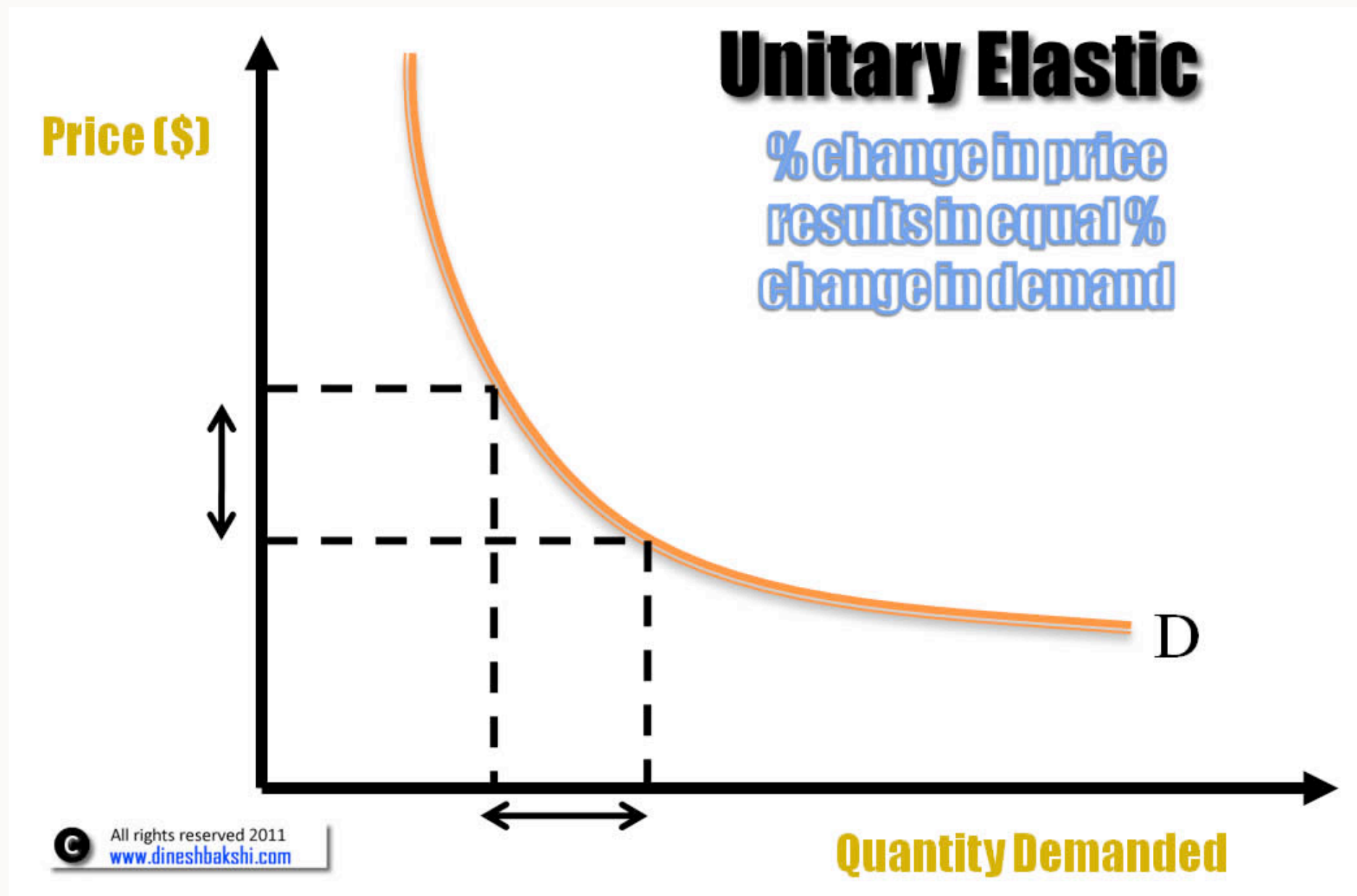
$$\frac{(9-3)/9 = .667}{(.75-1.00)/.75 = -.33} = -2.021$$

- Before the price rise, the firm was getting revenue equal to “revenue box b” + “revenue box c”.
- After the price increase, the firm loses “revenue box c”, because quantity demanded falls to 3, but gains “revenue box a” because the remaining products are sold at \$1.00
- Thus if a firm has an elastic demand for a product and wishes to increase total revenue, it should NOT raise the price of the product.

UNIT ELASTIC DEMAND

- The value of PED is equal to one.
- $PED = 1$
- If a product has unit elastic then a change in the price of the product leads to a proportionate, opposite, change in the quantity demanded of it.
- If the price is raised by a certain percentage, then the quantity demanded will fall by the same percentage, so PED is equal to 1 and the total revenue gained by the firm will not change

UNIT ELASTIC DEMAND



DETERMINANTS OF PRICE OF DEMAND

- Different products will have different values for PED.
- For example, the demand for a restaurant meal may have a PED value of 3 (elastic) whereas the demand for gasoline may have a PED value of .0.4 (inelastic).
- So what determines the elasticity of a product?

DETERMINANTS OF PRICE OF DEMAND

1. The number and closeness of substitutes

- Most important determinant of PED
- The more substitutes there are, the more elastic the demand for it
- The closer the substitutes available, the more elastic will be the demand



THE NUMBER AND CLOSENESS OF SUBSTITUTES

- Example: There are many different brands of butter of butter available on the market and so an increase in the price of one brand available will lead to a large number of customers changing their demand to another brand.



THE NUMBER AND CLOSENESS OF SUBSTITUTES

- Products with few substitutes such as oil, prescription drugs, milk, tobacco products and electricity will tend to have relatively inelastic demand.
- Demand does not fall much as price goes up.

Inelastic Demand



NECESSITY OF A PRODUCT AND HOW WIDELY THE PRODUCT IS DEFINED

2. How widely the product is defined

- Food is a necessary product in general= inelastic
- Define food more narrowly, like meat= elastic
- Many alternatives / substitutes in meat (chicken, beef, pork, lamb, tofu, fish)



NECESSITY OF A PRODUCT AND HOW WIDELY THE PRODUCT IS DEFINED

2. Necessity of a product

- Necessity will change from consumer to consumer since different people have different tastes and preferences.
- “Necessity” definition is subjective



THE TIME PERIOD CONSIDERED

3. The time period considered

- As the price of a product changes, it often takes time for consumers to change their buying and consumption habits
- PED tends to be more inelastic in the short term and then becomes more elastic the longer the time period is measured.



THE TIME PERIOD CONSIDERED



FROM: HOMEDEPOT.COM

3. The time period considered

Example: When heating oil prices rose sharply in Australia, the demand for oil that winter changed by a proportionally smaller amount than the change in price (inelastic).

Demand was relatively very inelastic since people really did not have much alternative products that they could switch to.

Over the next few years, the demand for heating oil fell as people started to change their heating systems to gas, coal or wood.

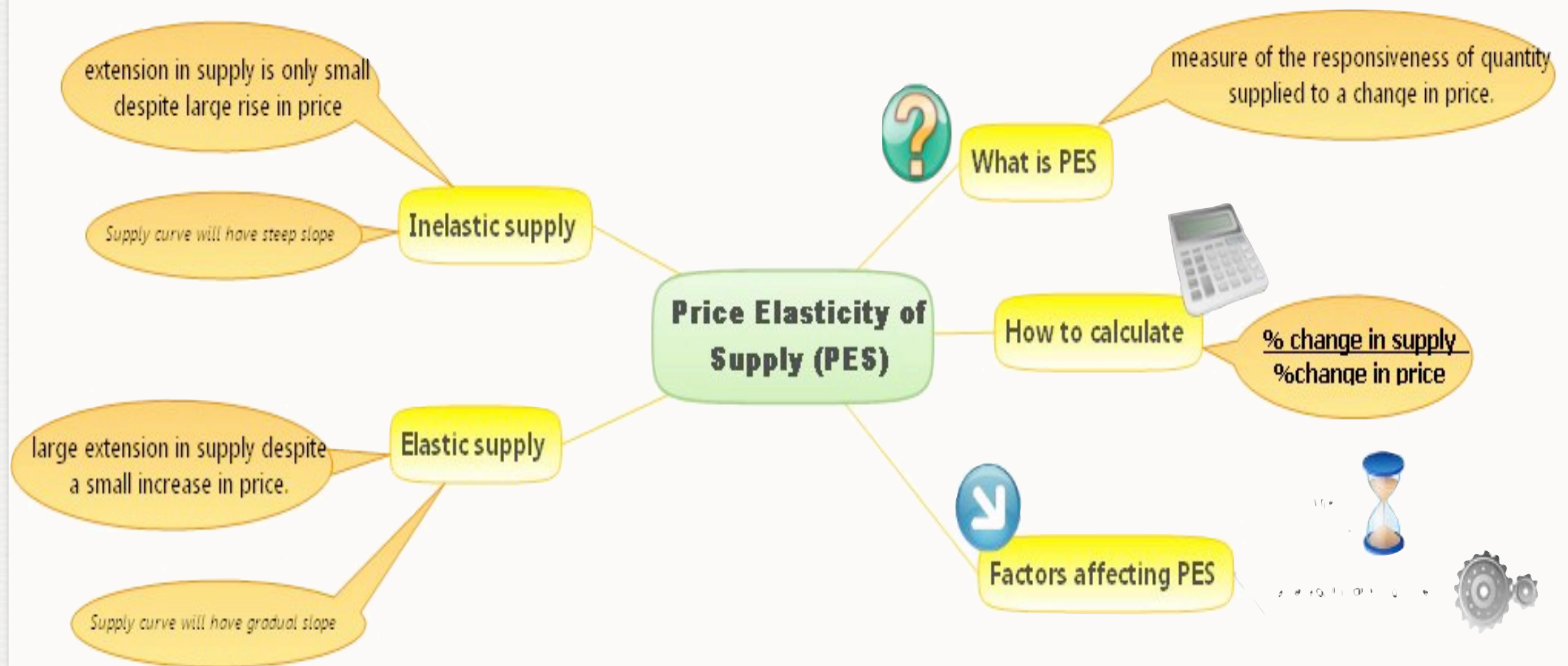
PED in the long run was more elastic.

ELASTICITY OF SUPPLY

- Price elasticity of supply is a measure of how much the supply of a product changes when there is a change in the price of a product.
- $$PES = \frac{\text{Percentage change in quantity supplied of a product}}{\text{Percentage change in price of a product}}$$

ELASTICITY OF SUPPLY

PRICE ELASTICITY OF SUPPLY



ELASTICITY OF SUPPLY

- Example: A publishing firm realizes that they can now sell their monthly magazine for \$5.50 instead of \$5.00. Because of this they can increase their supply from 200,000 to 230,000 magazines per month.
- Calculate the PES

$$\frac{\text{Percentage change in quantity supplied of a product}}{\text{Percentage change in price of a product}}$$

ELASTICITY OF SUPPLY

- Example: A publishing firm realizes that they can now sell their monthly magazine for \$5.50 instead of \$5.00. Because of this they can increase their supply from 200,000 to 230,000 magazines per month.
- Calculate the PES
- The value of PES will almost always be positive

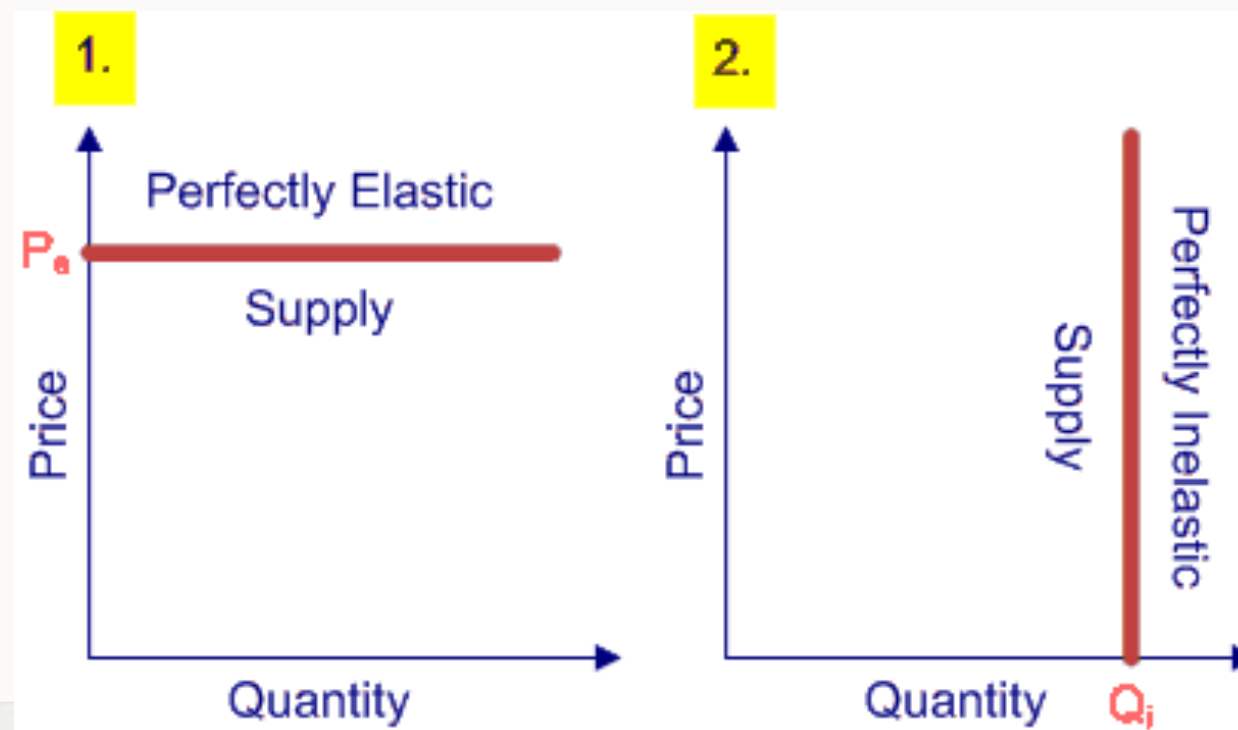
$$(200,000 - 230,000) / 200,000 = -0.15$$

$$(\$5.00 - \$5.50) / \$5.00 = -0.1$$

$$\text{PES} = 1.5$$

ELASTICITY OF SUPPLY

- Range of values for PES usually goes from 0 to infinity
$$\frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$
- Unlike PED, we will come across some extreme values for PES



ELASTICITY OF SUPPLY

- Inelastic Supply

- If PES is equal to 0, then a change in price of a product will have no effect on the quantity supplied at all.
- Thus the percentage change in quantity supplied would be 0 and so would the value on the top of the PES equation.



Percentage change in quantity supplied of a product

Percentage change in price of a product

ELASTICITY OF SUPPLY



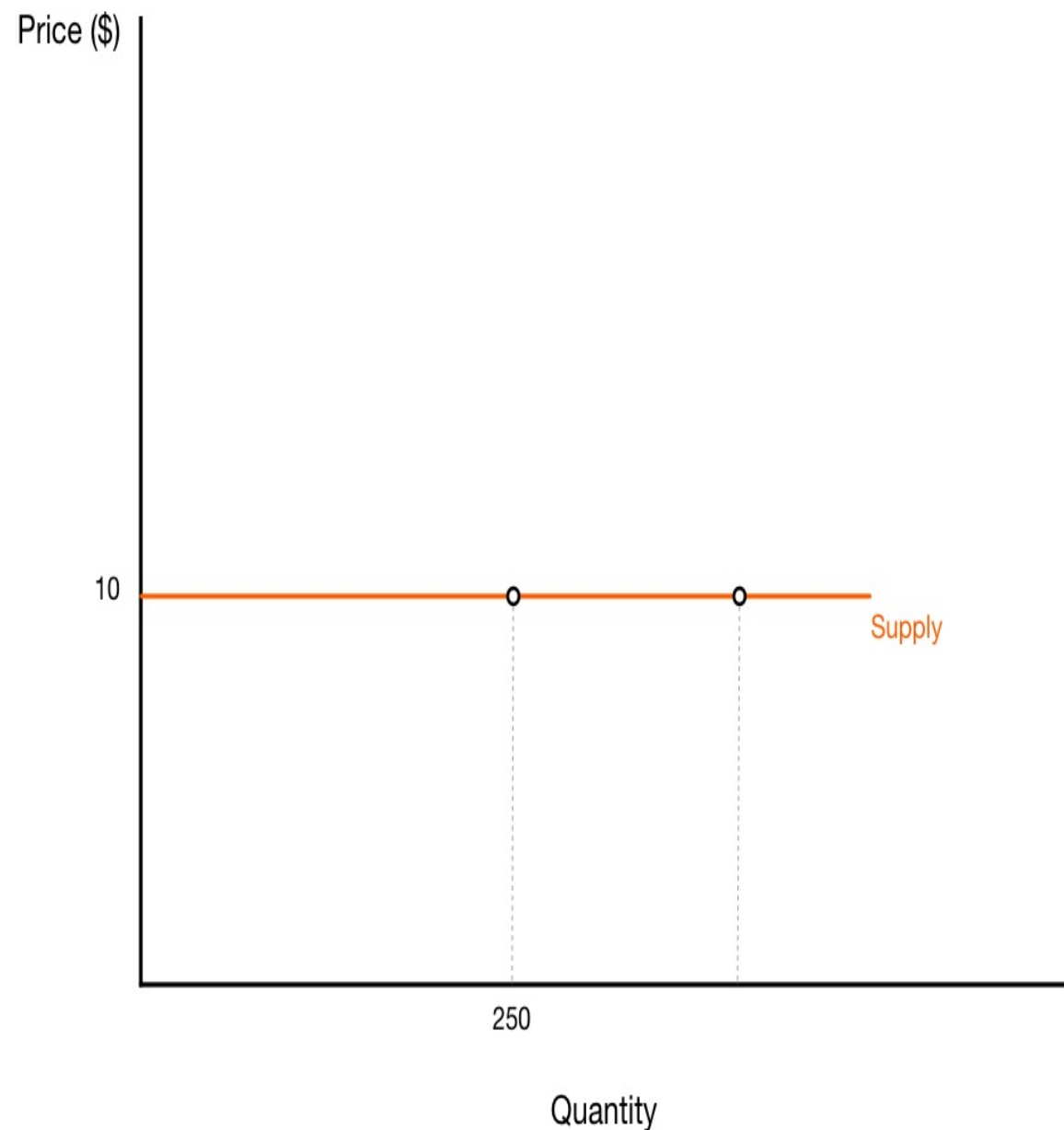
- **Perfectly Inelastic Supply Example:**
 - The best example is to imagine a situation where a very famous deceased painter has created three masterpieces and these need to be sold. Now, since the painter is dead, there are no forces of demand or price that can change the supplied quantity. No matter how much money a buyer is willing to pay, the supply for the paintings will be fixed at 3.

ELASTICITY OF SUPPLY

- **Perfectly Inelastic Supply Example:**
 - Another example is to consider a scenario where a farmer has to sell 100 tomatoes. These tomatoes need to be sold by the end of the day or else they will become rotten and the farmer will just have to throw them away. Thus, as the day goes by, the farmer will get more and more desperate to sell the tomatoes irrespective of what price they sell for. Hence the supply at the end of the day is the same, no matter what the price and the demand will be.



ELASTICITY OF SUPPLY



- Elastic Supply
 - If PES is equal to infinity, then a change in price of a product will have a significant effect on the quantity supplied.
 - If the supply curve goes on forever and so the quantity supplied will be infinite.
 - If the price falls below the original even by the smallest amount, the supply will fall to zero, an infinite change.

ELASTICITY OF SUPPLY

- **Perfectly Elastic Supply**

Example:

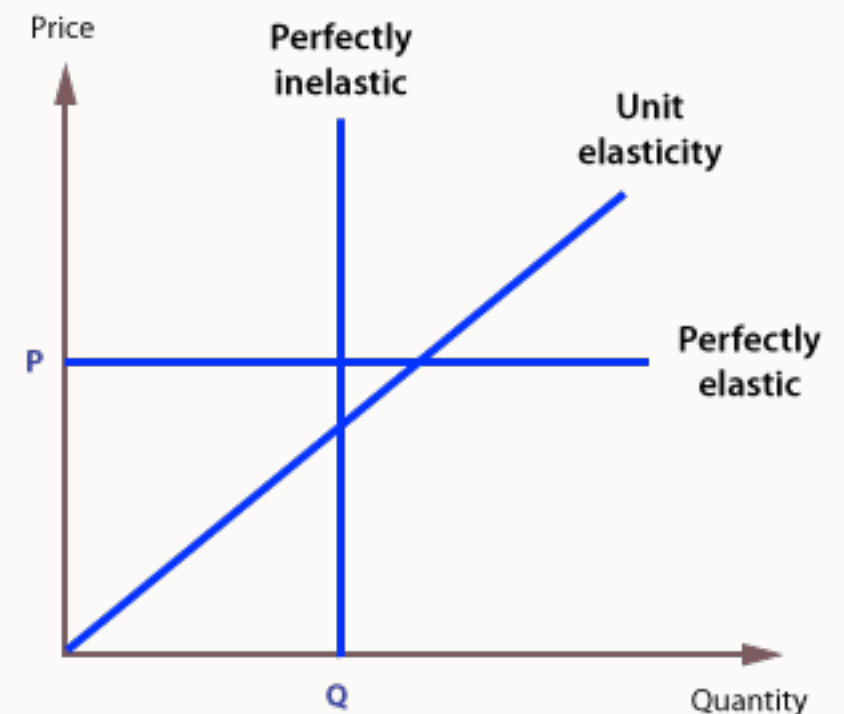
- In international trade, it is often assumed that the supply of commodities (ex: wheat) available to a country for import is infinite. The consumers in the country can have all they want as long as they are prepared to pay the current world market price. The the market in the country will have a “world supply” curve that is perfectly elastic at the current world market price.



- [Khan Academy](#)

ELASTICITY OF SUPPLY

- Range Values of PES:
 - Inelastic Supply- the value of PES is less than 1 and greater than 0. The change in price of the product leads to less than proportionate change in the quantity supplied, so the value of PES is > 0 and < 1 .
 - Elastic Supply- the value of PES is greater than 1 and less than infinity. A change in the price of the product leads to a greater than proportionate change in the quantity supplied and so the value of PES is > 1 and $< \infty$.
 - Unitary Elastic Supply- the value of PES is equal to 1. A change in the price of a product leads to a proportionate change in the quantity supplied and so the value of PES = 1.



DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- Different products will have different values for PES
 - Ex: supply of cans of soda might have a PES value of 2 (elastic, easily substituted for another product)
 - Ex: supply of electricity might have a PES value of .5 (inelastic, not many substitutes)

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
 - If total costs rise significantly as a producer attempts to increase supply then it is likely that the producer will not raise the supply of the product so it will be relatively inelastic. It would take large price rises to make increasing the supply worthwhile.

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
 - If total costs do not rise significantly then the producer will raise the quantity supplied and take advantage of the low increase in the costs to benefit from the higher prices, thus making more profits. Total costs will not rise significantly if the cost of factor inputs do not increase quickly as the firm uses more of them.

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
- Factors that assist in preventing a significant rise in costs:
 - Existence of unused capacity
 - Mobility of factors of production

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
 - Existence of unused capacity
 - If a firm has a lot of unused capacity (resources not being used) then it will be able to increase output easily without greater cost. In this case, the elasticity of supply for the product will be relatively high.

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
 - Existence of unused capacity
 - If the firm is producing at capacity then it is difficult to increase output without a significant increase in productive resources (expensive). It would be unlikely that the firm will increase supply and PES will be relatively inelastic.

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *1. How much costs rise as output is increased*
 - Mobility of the factors of production
 - If the factors of production (land, labor, capital and management) are easily moved from one productive use to another, then PES will be relatively elastic.
 - EX: firm moves from making 1 liter plastic bottles to 2 liter plastic bottles

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *2. Time period considered*
 - The amount of time over which PES is measured will affect its value.
 - The longer the time, period considered, the more elastic supply will be (can react to changes easier over time)
 - Immediate time period is inelastic because it is difficult to react quickly to changes of the factors of production and increase supply (inelastic PES)
 - In the long run, firms may be able to increase quantity supplied based on changes that they make in the factors of production (elastic PES)

DETERMINANTS OF PRICE ELASTICITY OF SUPPLY

- *3. Ability to store stock*
 - If a firm is able to store high levels of stock (product), then they will be able to react to price increase with swift supply increases and so PES for the product will be relatively elastic.
 - Ex: Businesses will store bathing suits until summertime

PRIMARY COMMODITIES

- Price elasticity of demand for commodities
 - Commodities are raw products or materials that are used to make other products (ex: cotton, coffee, wheat, timber)
 - Commodities tend to have an inelastic supply as they are necessities to the consumers who buy them and have few substitutes.

PRICE ELASTICITY OF SUPPLY FOR COMMODITIES

- Commodities tend to have an inelastic supply as a change in price cannot lead to a proportionally large increase in quantity supplied.
- Example: If there was an increase in demand for cocoa, producers would be unable to respond quickly to that demand increase (takes time to plant / grow / harvest or source more cocoa).