

Elasticities of Demand and Supply:

Today add elasticity and slope, cross elasticities

What Determines Elasticity?

Influences on the price elasticity of demand fall into two categories:

- Availability of substitutes
- Proportion of income spent

Availability of substitutes

The demand for a good is **elastic** if a substitute for it is **easy** to find.



The demand for a good is **inelastic** if a substitute for it is **hard** to find.



When are Substitutes Available?

Luxury Versus Necessity

- A necessity has poor substitutes, so the demand for a necessity is inelastic. Food is a *necessity*.
- A luxury has many substitutes, so the demand for a luxury is elastic. Exotic vacations are *luxuries*.

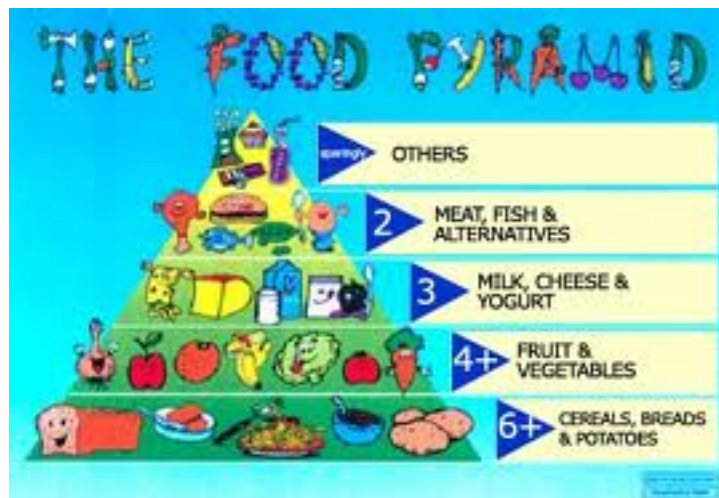
Elasticity by narrowness of definition of good



The demand for a narrowly defined good is elastic.

The demand for a broadly defined good is inelastic.

Not many substitutes for food but many for bread and even more for sourdough bread.



What Determines Elasticity?

Time Elapsed Since Price Changed

The **longer** the time elapsed since the price change, the more **elastic** is the demand for the good.

2 Proportion of Income Spent

A price rise, like a decrease in income, means that people cannot afford to buy the same quantities.

The greater the proportion of income spent on a good, the more elastic is the demand for the good.

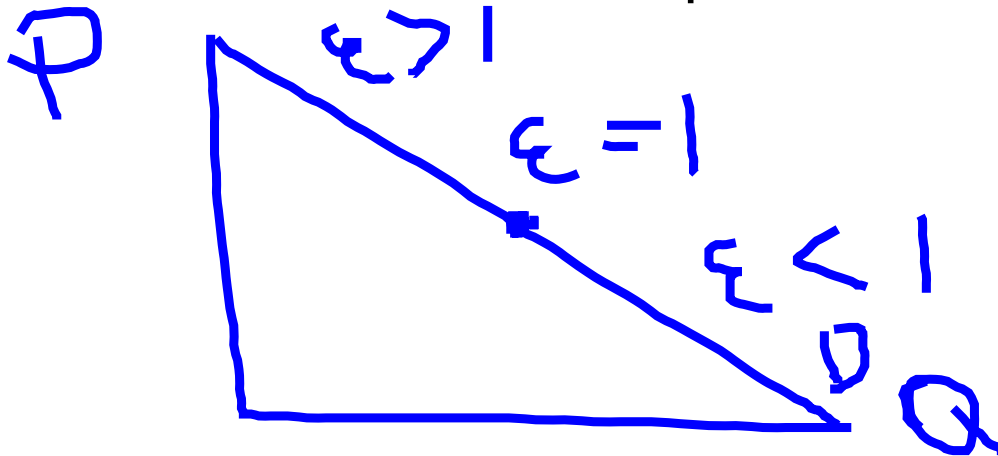
Tricky Bit Warning: Elasticity is NOT Slope

- Elasticity is measured by percentage changes **UNIT FREE**
- Slope is NOT
- Elasticity changes along a straight line D curve
- Slope does NOT

Where is Demand Elastic?

Along a linear demand curve, demand is:

- Unit elastic *at* the midpoint of the curve.
- Elastic *above* the midpoint of the curve.
- Inelastic *below* the midpoint of the curve.

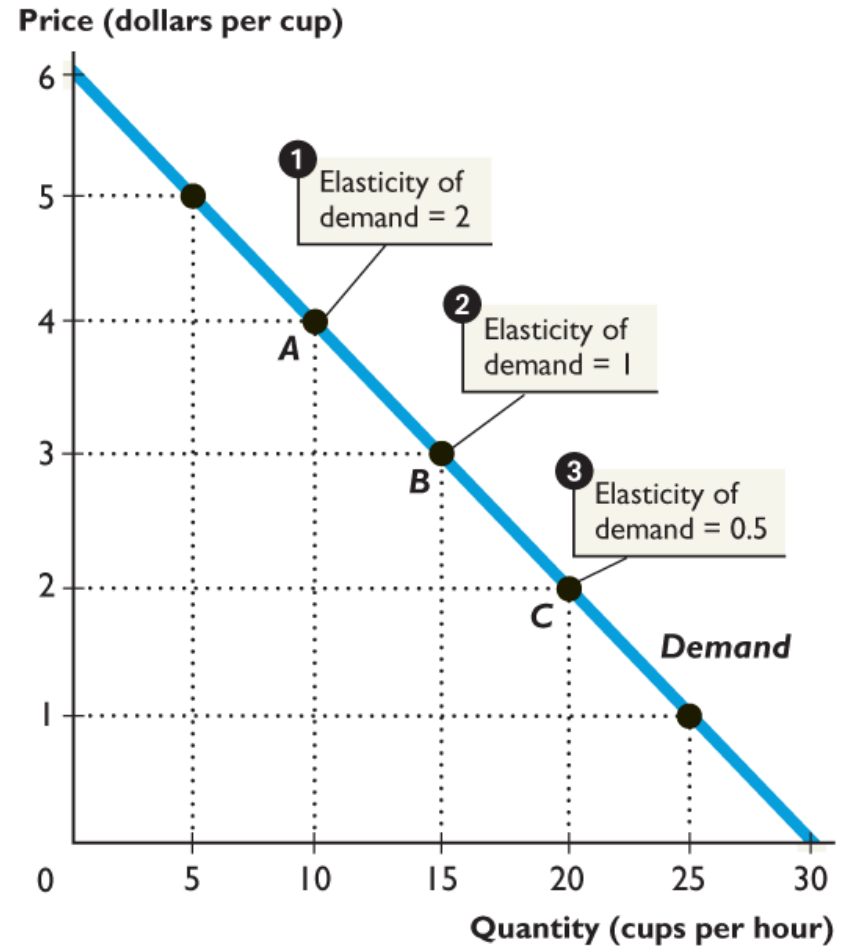


How Elasticity Changes along a Demand Curve



$$\epsilon = \frac{\% \Delta Q_D}{\% \Delta P}$$

1. At any price above the midpoint, demand is elastic.
2. At the midpoint, demand is unit elastic.
3. At any price below the midpoint, demand is inelastic.



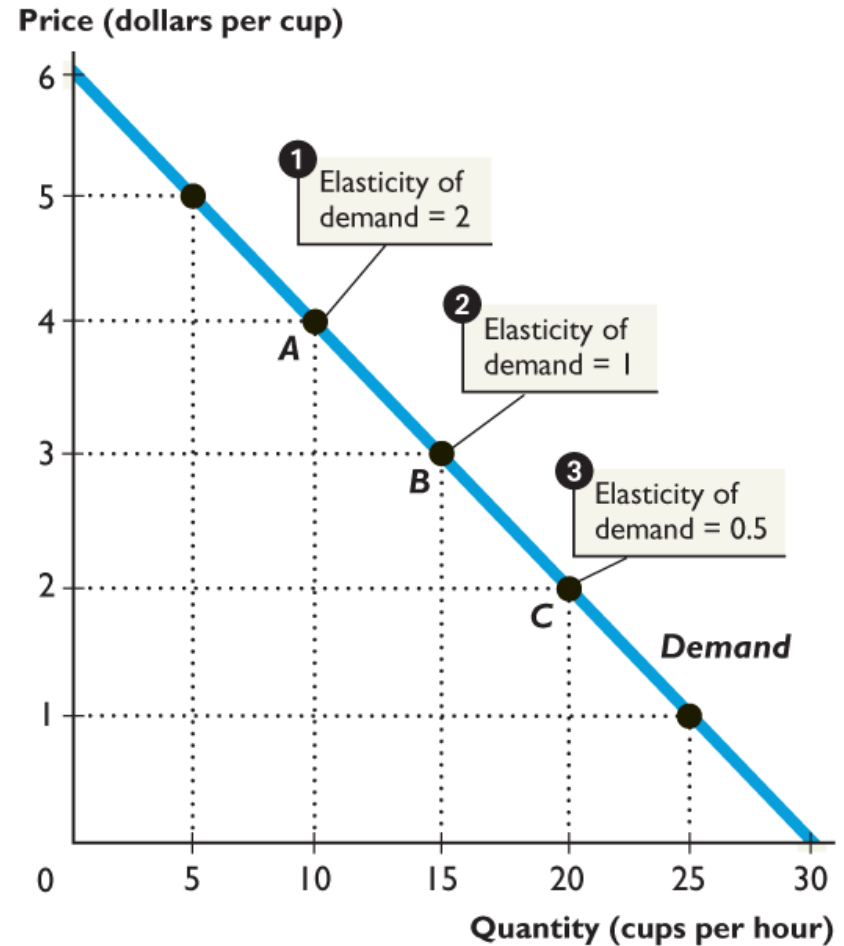
Elasticity along the Demand Curve



Why does this happen?

Remember the definition of elasticity

1. At A, q is low so % change in q is high
2. At A, p is high, so % change in p is low
3. So % change in q divided by % change in p is 'high' divided by 'low': here >1



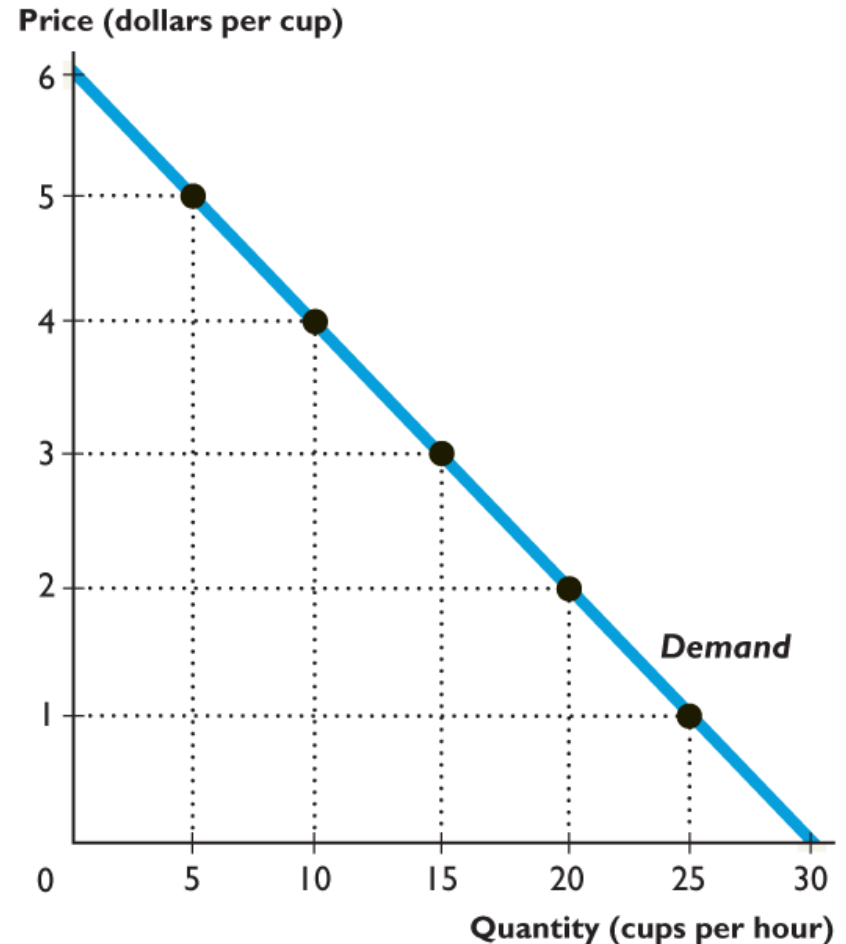
Elasticity along the Demand Curve



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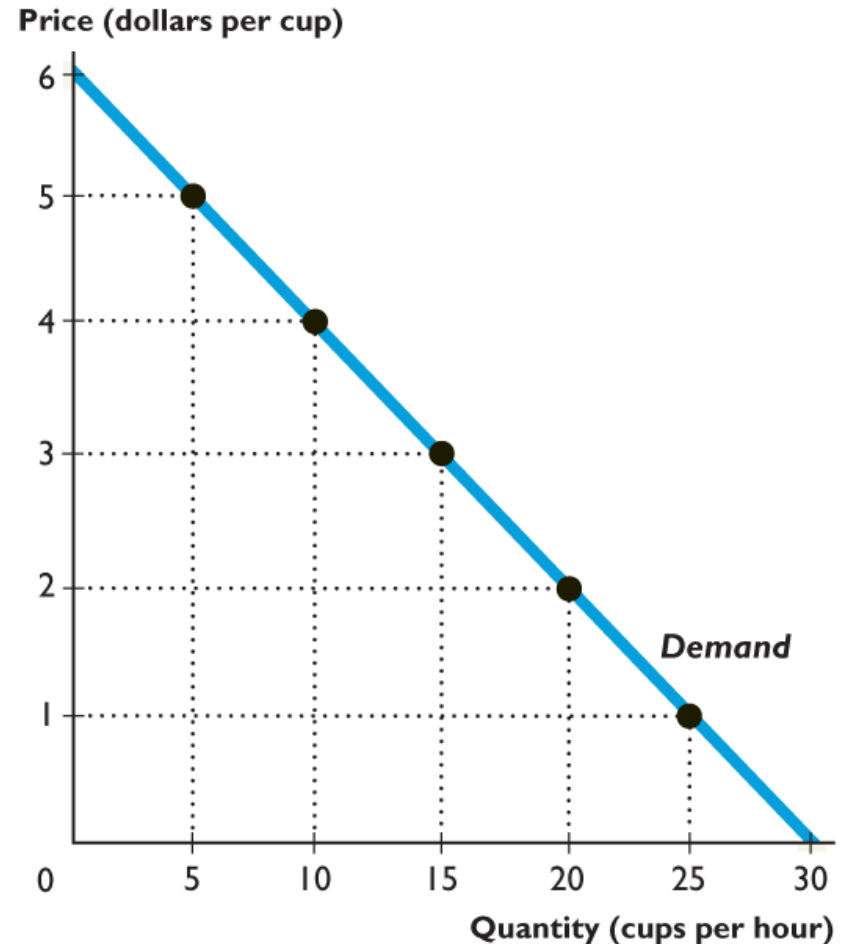
Elasticity along the Demand Curve



Why does this happen?

Remember the definition of elasticity

1. At B, q is high so % change in q is low
2. At B, p is low, so % change in p is high
3. So % change in q divided by % change in p is 'low' divided by 'high': here < 1



Elasticity along the demand curve



Elasticity and Total Revenue (TR)

■ TR affected by elasticity

Definition: TR is amount spent on a good and received by its sellers;

Price of the good multiplied by the quantity of the good sold (from now on $p \times q$).



Elasticity and TR

If demand is elastic:

10% ↑ P

- A given percentage rise in price brings a *larger* percentage decrease in the quantity demanded.
- Total revenue *decreases*.

20% ↓ Q_D

If demand is inelastic:

10% ↑ P

- A given percentage rise in price brings a *smaller* percentage decrease in the quantity demanded.
- Total revenue *increases*.

5% ↓ Q_D

Total Revenue Test



- If price and total revenue change in **opposite** directions, demand is **elastic**.

Example: p falls by 10%, q rises by 15%, TR rises.
Percentage increase in q more than makes up for p fall.

Total Revenue Test

- If a price change leaves total revenue **unchanged**, demand is **unit elastic**.

Example: p falls by 10%, q rises by 10%, TR stays the same.

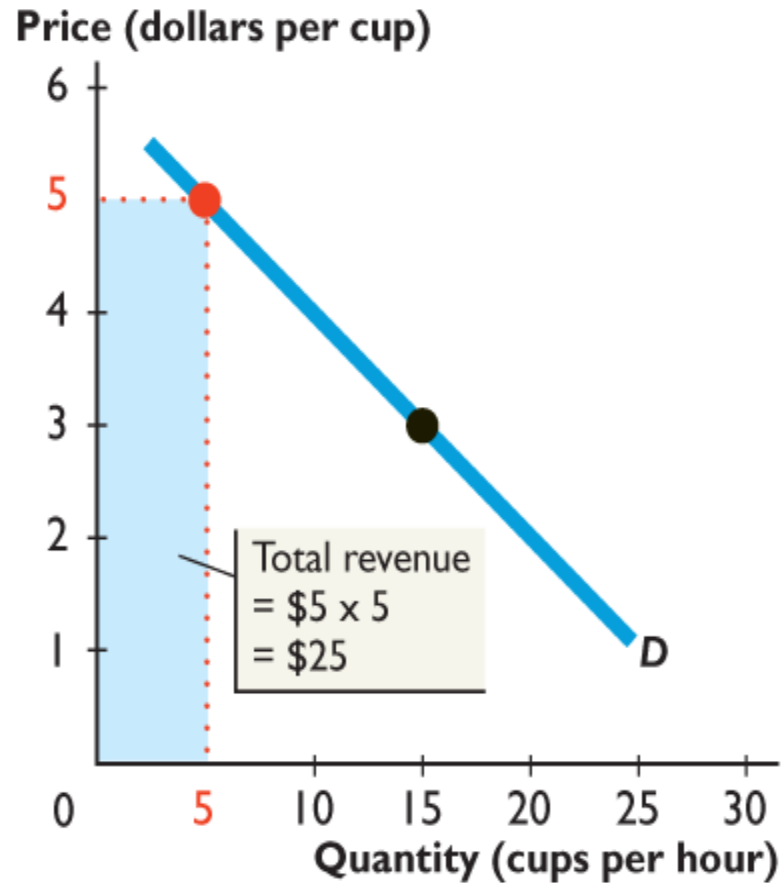
Percentage increase in q just enough to make up for p fall.

Total Revenue Test

- If price and total revenue change in the **same** direction, demand is **inelastic**.

Example: p falls by 10%, q rises by 5%, TR falls.

Percentage increase in q not enough to make up for p fall.



(a) Total revenue and elastic demand:
Starbucks latte



Elasticity and TR Graphically



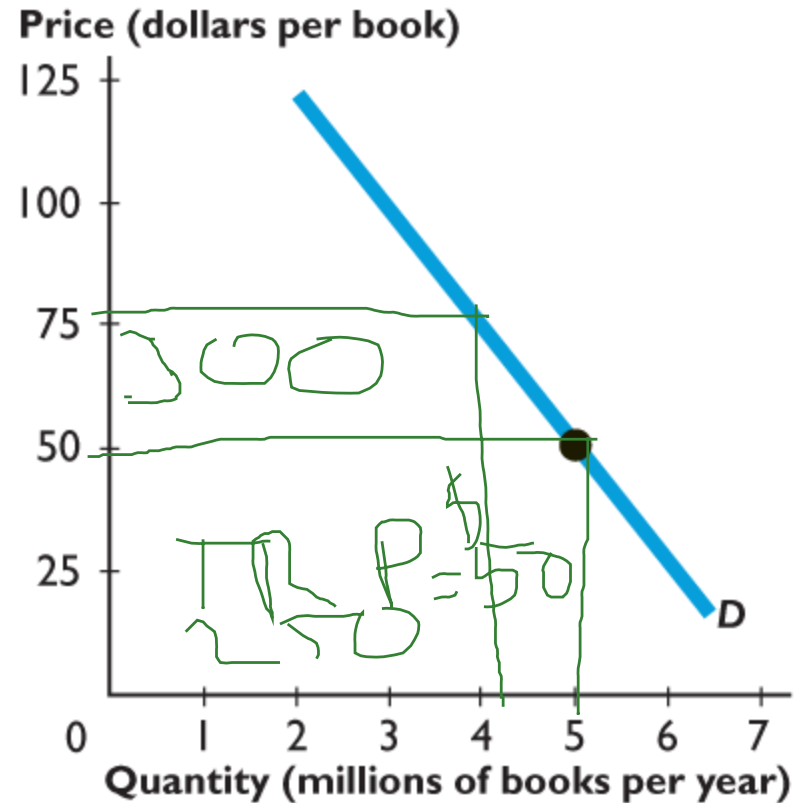
Case: total revenue and **inelastic** demand.

Compare revenue at $p = \$50$ to $p = \$75$

At $p = \$50$ TR = $\$300$

At $p = \$75$ TR = $\$250$

$P \uparrow$ + $TR \uparrow$



(b) Total revenue and inelastic demand: textbooks

How We Use Elasticity

Orange Prices and Total Revenue

Price elasticity of demand for agricultural products (oranges) is 0.4.

So if a frost cuts the supply of oranges (and demand doesn't change), a 1 percent decrease in the quantity harvested will lead to a 2.5 percent rise in the price.

Demand is inelastic and farmers' total revenue will increase.

Cases of Supply Elasticity

■ Note they are the same as for demand

Supply is **perfectly elastic** if an almost zero percentage change in price brings a very large percentage change in the quantity supplied.

Supply is **elastic** if the percentage change in the quantity supplied exceeds the percentage change in price.

Cases of Supply Elasticity

Supply is **unit elastic** if the % change in the quantity supplied = the percentage change in price.

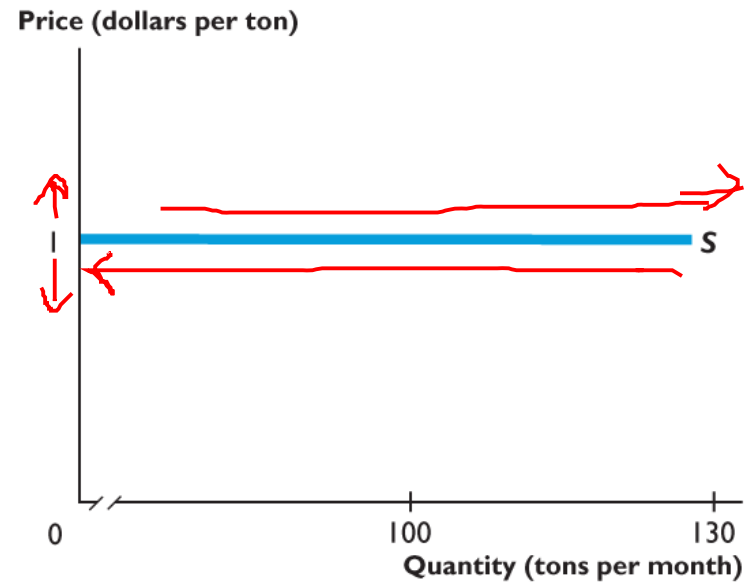
Supply is **inelastic** if the % change in the quantity supplied < the percentage change in price.

Supply is **perfectly inelastic** if the % change in the quantity supplied = 0 when the price changes.

Perfectly Elastic Supply



1. A small rise in the the price,
2. Increases the quantity supplied by a very large amount,
3. Supply is perfectly elastic.



(a) Perfectly elastic supply

Elastic Supply

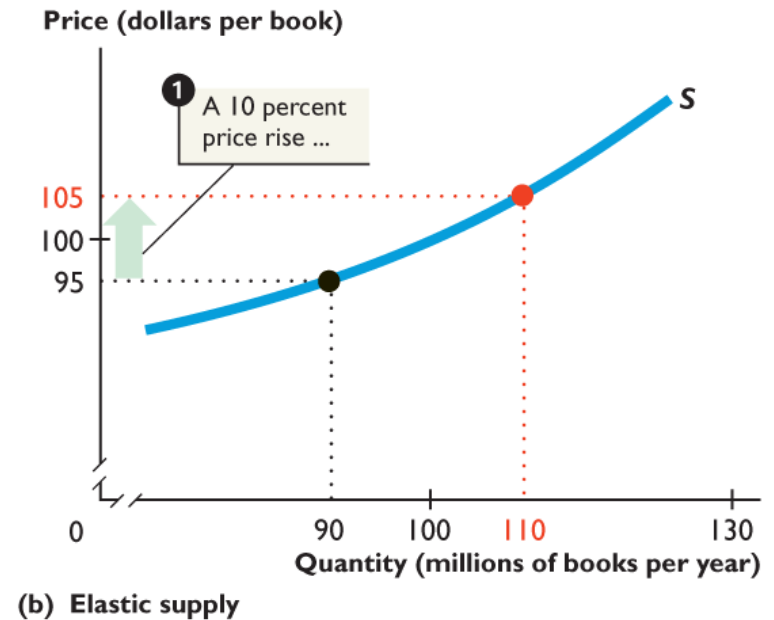


Price rises from 95 to 105

Quantity rises from 90 to 110

Elasticity = 2

The supply of books is elastic.



Influences on the Price Elasticity of Supply

The two main influences are:

- Storage possibilities
- Production possibilities

Storage Possibilities

The supply of a storable good is highly elastic.

The cost of storage is the main influence on the elasticity of supply of a storable good.



Production possibilities and elasticity

Goods that can be produced at a constant (or very gently rising) opportunity cost have an elastic supply.

Goods that can be produced in only a fixed quantity have a perfectly inelastic supply.

Which is elastic and which inelastic in supply?



Influences on the Elasticity of Supply

Time Elapsed Since Price Change

As time passes after a price change, producers find it easier to change their production plans, so supply becomes more elastic.

Computing the Price Elasticity of Supply

■ Equivalent definition to elasticity of demand

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in quantity price}}$$

- If the price elasticity of supply is greater than 1, supply is elastic.
- The cases for price elasticity = or < 1 also have the same interpretation as for demand elasticity.

More Types of Elasticity: Cross Elasticity

■ Cross Elasticity of Demand

Measure of the extent to which the quantity **demanded** of a good changes when the **price of a substitute or complement changes**, other things remaining the same

$$\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded of a good}}{\text{Percentage change in the price of one of its substitutes or complements}}$$

Cross Elasticity

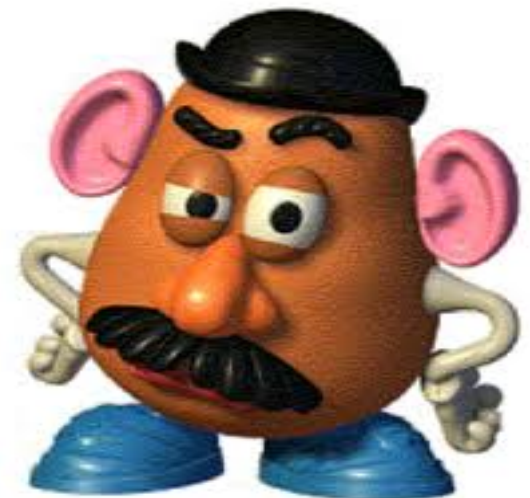
Suppose that when the price of a burger falls by 10 percent, the quantity of pizza demanded decreases by 5 percent.

$$\text{Cross elasticity of demand} = \frac{-5 \text{ percent}}{-10 \text{ percent}} = 0.5$$

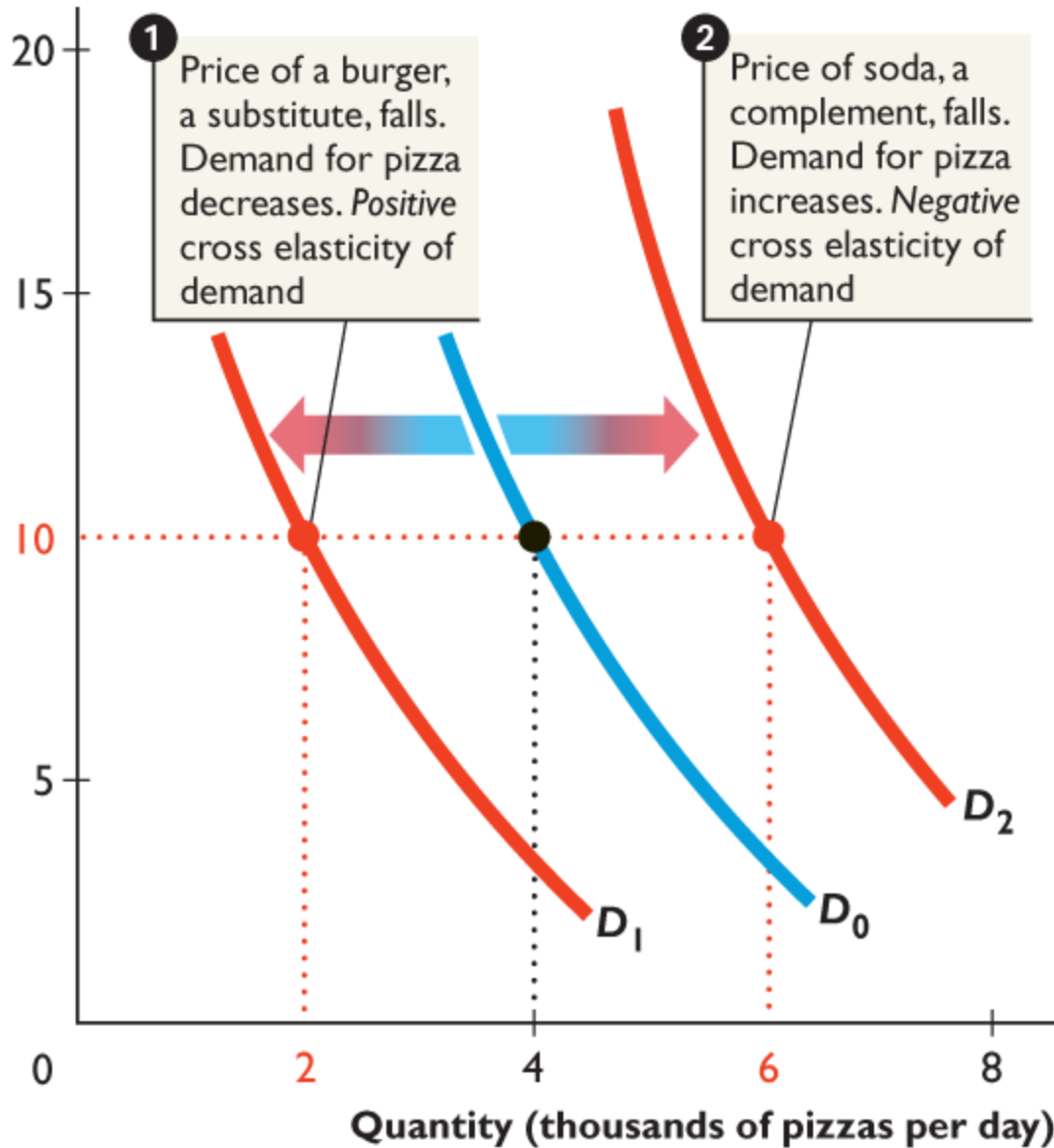
Cross Elasticity of Substitutes vs. Complements

The cross elasticity of demand for a substitute is positive.

- A *fall* in the price of a substitute of the good brings a *decrease* in the quantity demanded of the good.
- The quantity demanded of the good and the price of its substitute change in the *same* direction.
- Make sure you know how this works for complements too!



Price (dollars per pizza)



Income Elasticity of Demand

A measure of the extent to which the demand for a good changes when income changes, other things remaining the same.

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$