Chapter 5

Elasticity: Measuring Responsiveness

1. Price Elasticity of Demand

2. How Businesses Use Demand Elasticity

3. Other Demand Elasticities

4. Price Elasticity of Supply

Measure the responsiveness of the quantity demanded to price changes, using the price elasticity of demand

1. Price Elasticity of Demand

2. How Businesses Use Demand Elasticity

3. Other Demand Elasticities

4. Price Elasticity of Supply

What we know so far...

Law of demand tells us that when **prices fall**, the **quantity demanded** will **rise**.

But, **by how much?**

➢ If cutting prices only leads to **a few** new sales, then it was a bad strategy.

➢ If cutting prices leads to **a lot more** sales, then it was a good strategy.

How responsive are buyers to prices?
Will buyers respond **a lot** or **a little** to changing prices?

Key Definition (1 of 5)

Price elasticity of demand: A measure of **how responsive buyers** are **to price** changes. It measures the percent change in quantity demanded that follows from a 1% price change.

Price elasticity of demand =

$$\frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

Scenario: If cutting the price of t-shirts **15%** leads to a rise in quantity demanded by **25%**, then the **price elasticity of demand for t-shirts is...**

$$\frac{\%\Delta Q}{\%\Delta P} = \frac{+25\%}{-15\%} = -1.67$$

$$|-1.67| = 1.67$$

The price elasticity of demand is a **negative number** (of course!).

➢ The negative sign gives no additional information.

➢ To **focus on the magnitude**, economists take the **absolute value**.

Elastic versus Inelastic Price Elasticity of Demand

Elastic: When the absolute value of the **percent change in quantity** is **larger** than the absolute value of the **percent change in price.**

➢ The absolute value of the price elasticity is **greater than 1.**

$$|\%\Delta Q| > |\%\Delta P| \text{ implies } \frac{|\%\Delta Q|}{|\%\Delta P|} > 1$$

$$|35\%| > |-20\%| \text{ implies } \frac{|+35\%|}{|-20\%|} = 1.75$$

$$|-8\%| > |3\%| \text{ implies } \frac{|-8\%|}{|+3\%|} = 2.67$$

The buyer **is responsive** to changes in price.

Inelastic: When the absolute value of the **percent change in quantity** is **smaller** than the absolute value of the **percent change in price.**

➢ The absolute value of the price elasticity is **less than 1.**

$$|\%\Delta Q| < |\%\Delta P| \text{ implies } \frac{|\%\Delta Q|}{|\%\Delta P|} < 1$$

$$|14\%| < |-18\%| \text{ implies } \frac{|+14\%|}{|-18\%|} = 0.78$$

$$|-3\%| < |10\%| \text{ implies } \frac{|-3\%|}{|+10\%|} = 0.3$$

The buyer is **not responsive** to changes in price.

Story Time: Elastic versus Inelastic (2 of 2)

Sara and Morgan are sisters and are planning to **return to Minnesota** for an upcoming holiday weekend with the family. **Sara lives in Wisconsin** (426 miles away from Minnesota), while **Morgan lives in Georgia** (1,442 miles away from Minnesota).

Sara could drive, take the bus, or fly back to Minnesota — any of which would take approximately half a day of travel time.

Morgan has fewer options. Driving or taking the bus would take 2–3 days one direction, and given that she does not have many vacation days, flying is the only feasible option.

Question 1: If the price of plane tickets goes up**, who will be relatively more responsive** to that price change, Sara or Morgan?

Answer: Sara, since she has more transportation options.

Question 2: Categorize Sara's and Morgan's demand for plane tickets as either elastic or inelastic.

Answer: Sara's demand is elastic, while Morgan's demand is inelastic.

Visualizing Relative Elasticit

The **same change in price** can cause a **different change in quantity**, depending on the elasticity.

Example: If the price of gas falls from $3 to $2, it will cause the quantity demanded to rise. By how much depends on whether buyers have...

➢ **Elastic demand:** Buyers are very responsive to price, so the **quantity demanded rises by a lot**.

➢ **Inelastic demand:** Buyers are not very responsive to price, so the **quantity demanded rises only a little.**

Price of gas ($ per gallon)

Inelastic demand curve

Elastic demand curve

$3

$2

Quantity of gas

3   3.15   6
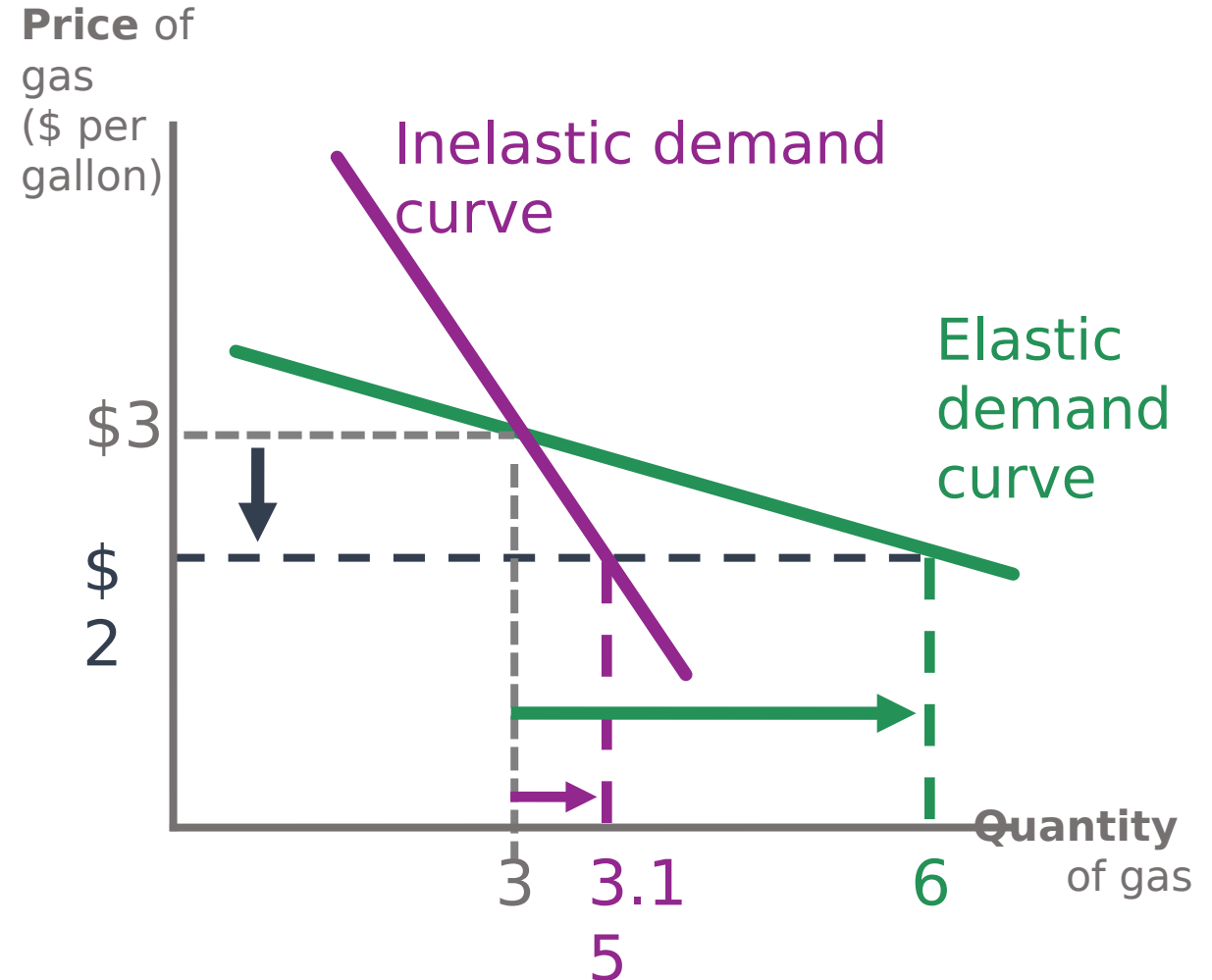
A note on visualizing relative elasticities

Elastic demand curves are relatively **flat**, while **inelastic** demand curves are relatively **steep**.

Elasticity is **not the same** thing as slope.

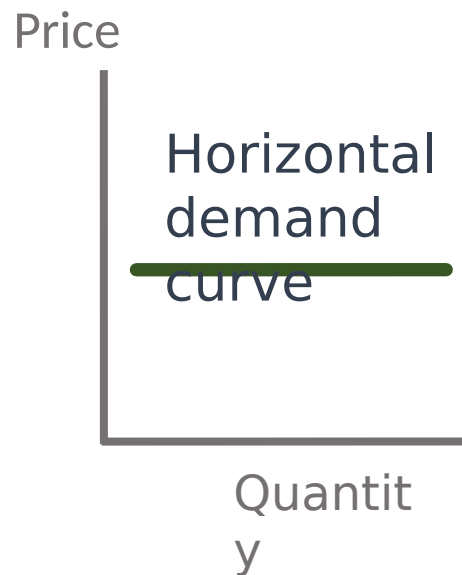$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in price}}{\text{change in quantity}}$$

$$\text{Elasticity} = \frac{\textit{percentage} \text{ change in quantity}}{\textit{percentage} \text{ change in price}}$$

The **slope will be the same** all along a linear demand curve, but **elasticity will change** at different points along the same demand curve.

Exceptions: There are two extreme cases for which the elasticity does *not* change:

➤ A completely **horizontal** demand curve means the price elasticity of demand is **infinite.**

  ➤ **Perfectly elastic:** When any change in price leads to an **infinitely large change** in quantity.

➤ A completely **vertical** demand curve means the price elasticity of demand is **zero** — no matter what the change in price, the total quantity demanded is unchanged.

Elastic and Inelastic Demand

Price

Quantity

Horizontal demand curve

| % change in quantity | is **infinite** for any | % change in price |

The quantity demanded is **infinitely responsive** to a change in price:

| *price E of D* | = ∞

Price

Quantity

Relatively flat demand curve

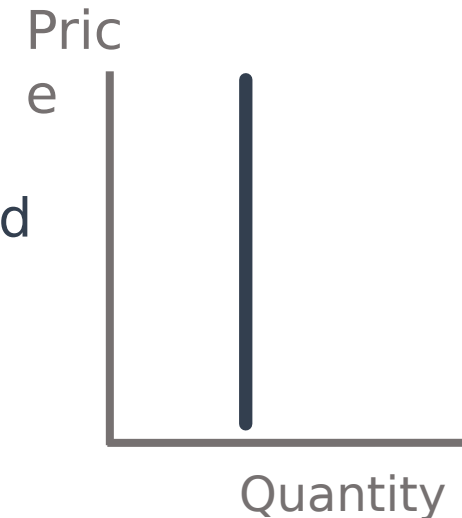| % change in quantity | is **larger** than |% change in price |

The quantity demanded is **relatively responsive** to a change in price:

Price

Quantity

Relatively steep demand curve

| % change in quantity | is **smaller** than | % change in price |

The quantity demanded is **relatively unresponsive** to a

Price

Quantity

| % change in quantity | is **zero** for any | % change in price |

The quantity demanded is **unchanged** for

Perfectly Elastic   **Elastic**   **Inelastic**   **Perfectly Inelastic**

Elasticity is all about **substitutability**!

1. More competing products means greater elasticity.
2. Specific brands tend to have more elastic demand than categories of goods.
3. Necessities have less elastic demand.
4. Consumer search makes demand more elastic.
5. Demand gets more elastic over time.

The **more competing products** there are, the more likely you'll be able to find a **close substitute**.

➢ Result: You will be **more price sensitive** (have more elastic demand).

Grocery Store Example: If the price of one pasta brand doubles, you might buy a different pasta brand instead.

Airline Example: Demand is more elastic for shorter flights, for which driving is a reasonable substitute.

Elasticity is all about **substitutability**!

1. More competing products means greater elasticity.

2. Specific brands tend to have more elastic demand than categories of goods.

3. Necessities have less elastic demand.

4. Consumer search makes demand more elastic.

5. Demand gets more elastic over time.

Cereal Example: There are **many substitutes** for Honey Nut Cheerios

➢ so if the **price goes up**

  ➢ buyers simply **switch** to a different breakfast cereal

    ➢ Result: Demand for Honey Nut Cheerios is quite **elastic**.

However, consumers are **less responsive** to price changes in the **overall category** of breakfast cereals.

➢ **fewer alternatives** to cereal overall, than there are for a specific type of cereal.

Elasticity is all about **substitutability**!

1. More competing products means greater elasticity.

2. Specific brands tend to have more elastic demand than categories of goods.

3. Necessities have less elastic demand.

4. Consumer search makes demand more elastic.

5. Demand gets more elastic

Things that you can't do without are things that you will keep buying even as the price rises.

Prescription drugs are necessity — it is not a good option to forgo buying something your doctor prescribes, and there are likely no close substitute as.

When consumers are **willing to search** for a low-cost alternative, demand for that product is **more elastic**.

➢ More likely to find an acceptable, lower-priced substitute!

Take-away: Those who are most willing to search will be more responsive to price changes (more elastic).

Elasticity is all about **substitutability**!

1. More competing products means greater elasticity.
2. Specific brands tend to have more elastic demand than categories of goods.
3. Necessities have less elastic demand.
4. Consumer search makes demand more elastic.
5. Demand gets more elastic over time.

Demand is **more elastic in the long run** than in the short run.

Travel Example: You are planning a trip to Hawaii sometime for the upcoming year. You have **plenty of time** to watch plane ticket prices and get the best deal.

➤ Your timetable allows you to be price sensitive — **your demand is elastic.**

If, however, you need to get across country **within the next 48 hours** for a family or work-related emergency, then you will buy a ticket regardless of the price.

➤ Your timetable does not allow you to

Elasticity will differ by person, product, and price

Your preferences across alternatives determine your elasticity of demand.

Coke & Pepsi: Some people are die-hard Coco-Cola drinkers, and would never switch to Pepsi, even if the price of Coke rose dramatically (inelastic demand for Coke).

Your elasticity also depends where you are on your demand curve.

Shopping Example: If clothing is expensive, you are likely to respond to a 15% discount (elastic), but if the clothing is already cheap, the 15% discount will elicit less of a response from you (inelastic).

xiaorui/Shutterstock

Calculating the Price Elasticity of Demand

Annoying aspect of "% change":

When quantity goes from **100** to **150**, it's a **50% increase**.

But, when quantity goes from **150** to **100**, it's a **33% decrease**.

The percentage change **depends on the starting point**!

To get a **consistent measure of elasticity** between two points, we will use the **midpoint formula** when calculating the price elasticity of demand $= \dfrac{|\%\Delta Q|}{|\%\Delta P|}$

Price elasticity of demand calculation recipe:

1. What was the percentage change in price (as calculated by the midpoint formula)?

2. How much did the quantity demanded change as a percent, in response (as calculated by the midpoint formula)?

3. Calculate the elasticity (using values from steps 1 and 2).

Midpoint formula: Divide the difference between two points by the average of the two points

$$\frac{X_2 - X_1}{(X_2 + X_1)/2} \times 100$$

Bakery Scenario: The price of fudge brownies at your local bakery rose from **$1.50 to $2.25**. As a result, the quantity of brownies purchased drop from **72 to 60** brownies per day.

Calculate the absolute value of the price elasticity of demand for brownies.

Recall the Midpoint Formula:
Divide the difference between two points by the average of the two points

$$\frac{X_2 - X_1}{(X_2 + X_1)/2} \times 100$$

1. What was the percentage change in price (as calculated by the midpoint formula)?

$$\frac{P_2 - P_1}{(P_2 + P_1)/2} = \frac{2.25 - 1.50}{(2.25 + 1.50)/2} \times 100 = 40\%$$

2. How much did the quantity demanded change as a percent, in response (as calculated by the midpoint formula)?

$$\frac{Q_2 - Q_1}{(Q_2 + Q_1)/2} = \frac{60 - 72}{(60 + 72)/2} \times 100 = -18.18\%$$

3. Calculate the elasticity.

$$\frac{|-18.18\%|}{|+40\%|} = 0.4545, \text{ approximately } 0.46$$

Key take-aways: Price elasticity of demand

Price elasticity of demand ☾ how **buyers respond** to a **change in price**.

Elastic demand

➢ Buyers are **very responsive** to changes in price.

➢ Visually, elastic demand curves are relatively **flat.**
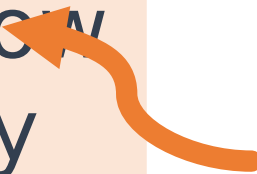
➢ Substitutes available.

Inelastic demand

➢ Buyers are **not responsive** to changes in price.

➢ Visually, inelastic demand curves are relatively **steep.**

➢ Substitutes are not available.

Elasticity calculations

➢ Use the **midpoint formul**a when calculating percentage changes.

Understanding how demand elasticity shapes your total revenue and your business strategy

1. Price Elasticity of Demand

2. How Businesses Use Demand Elasticity

3. Other Demand Elasticities

4. Price Elasticity of Supply

Insights from price elasticity of demand

Use price elasticity of demand to **forecast** the likely **consequences** of a given **price change.**

Rearrange the formula:

➢ Percentage change in quantity demanded = Price elasticity of demand × percentage change in price

➢ **Shorthand equivalent:** %ΔQ = Price elasticity of demand × %ΔP

Scenario: The **price elasticity of demand** for strawberries is -**0.8**. If the **price** of strawberries were to **rise by 15%,** by how much will the quantity of strawberries demanded fall?

%ΔQ = Price elasticity of demand × %ΔP

%ΔQ = -0.8 × 15%

%ΔQ = -12%

The quantity of strawberries demanded will fall by 12%.

So far…

➤ Understand price elasticity of demand

➤ Forecast the consequences of a given price change using price elasticity of demand

Up next…

➤ How does price elasticity of demand affect revenue?

Total revenue: The total amount you receive from buyers, which is calculated as price × quantity.

Diving into the Definition

Bakery Scenario: If you sell **60 brownies** at a **price of $2.25**, how much revenue do you have?

➤ You collect $2.25 for each of the 60 brownies you sell.

Price

$2.25

Price

Total revenue
= P × Q
= $2.25 × 60
= $135

Demand

60
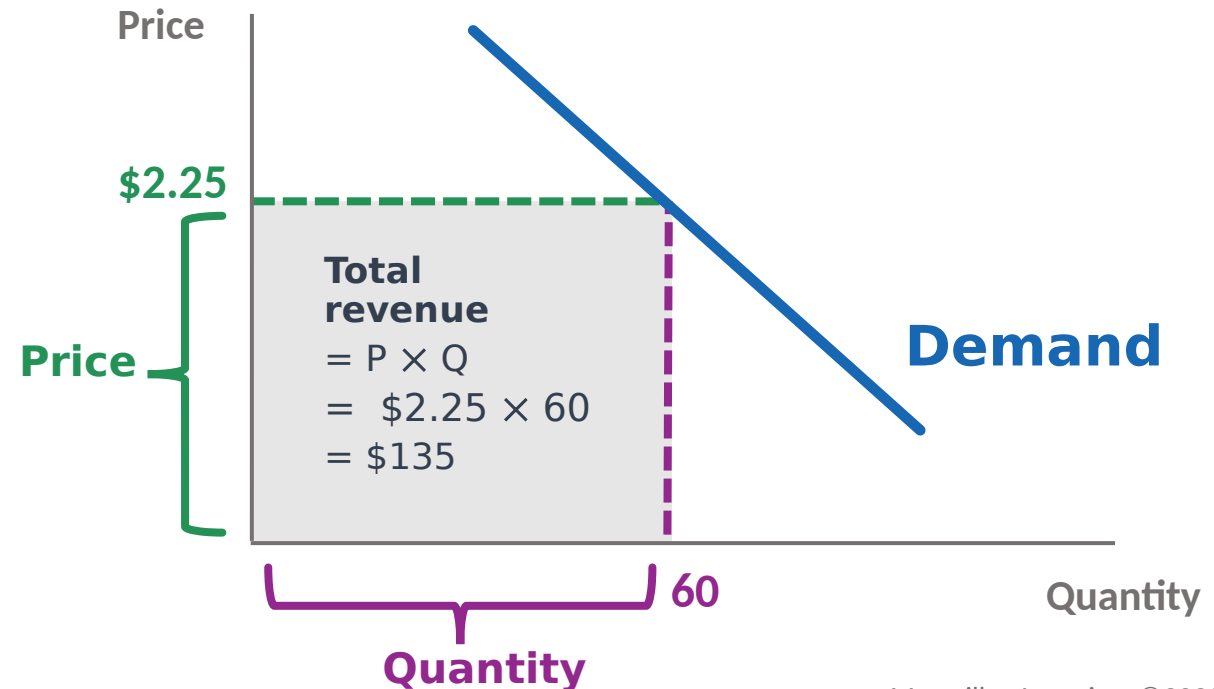
Quantity

Quantity

Elasticity and Revenue

Recall: A **change in price** leads to a **change in quantity** demanded in the *opposite* direction.

➢ **Impact** of a price change **on total revenue** depends on **which change was relatively bigger**: price or quantity.

The **price elasticity of demand** (elastic versus inelastic) tells us whether the percentage change in price is **smaller or larger** than the percentage change in quantity.

A **decrease** **in price** will only cause **revenue to rise** if…

➢ % change in price is **smaller than** % change in quantity.

Elastic demand:

The quantity demanded is relatively **responsive to a change in price**, so when the **price falls**, the quantity demanded rises a lot in response to the price cut (i.e., extra sales make up for the price cut).

An **increase** **in price** will only cause **revenue to rise** if…

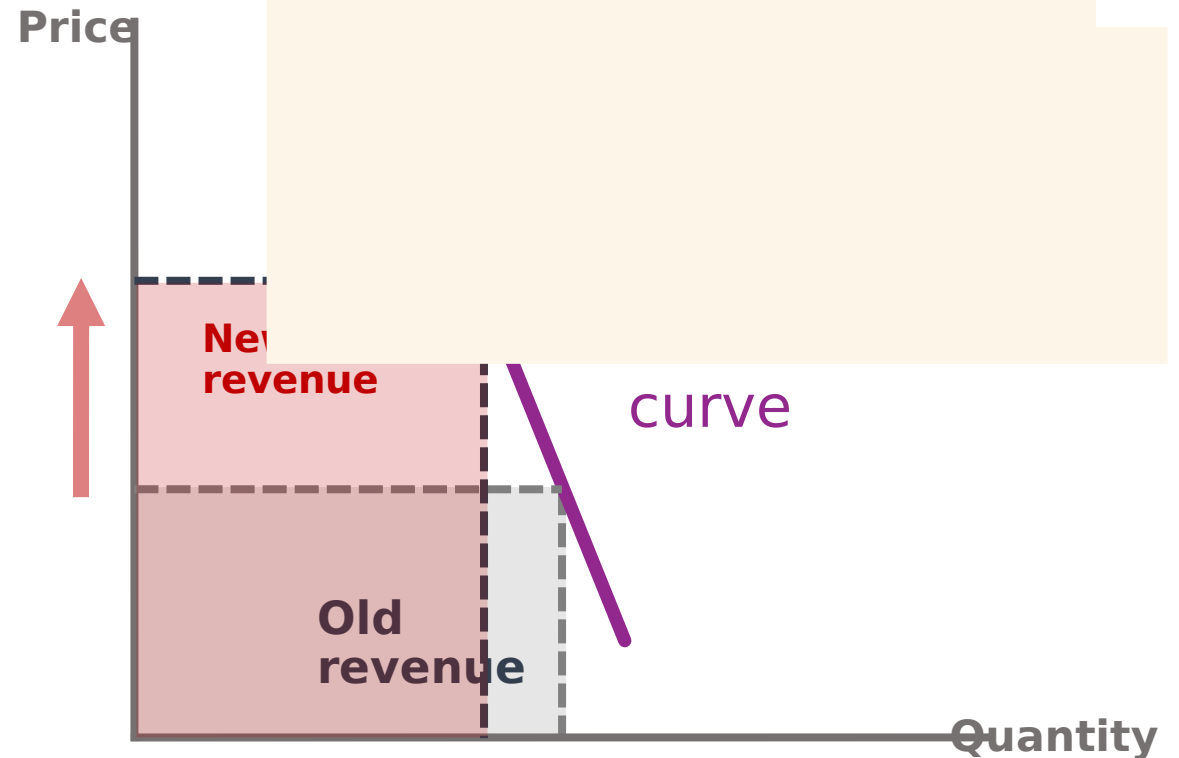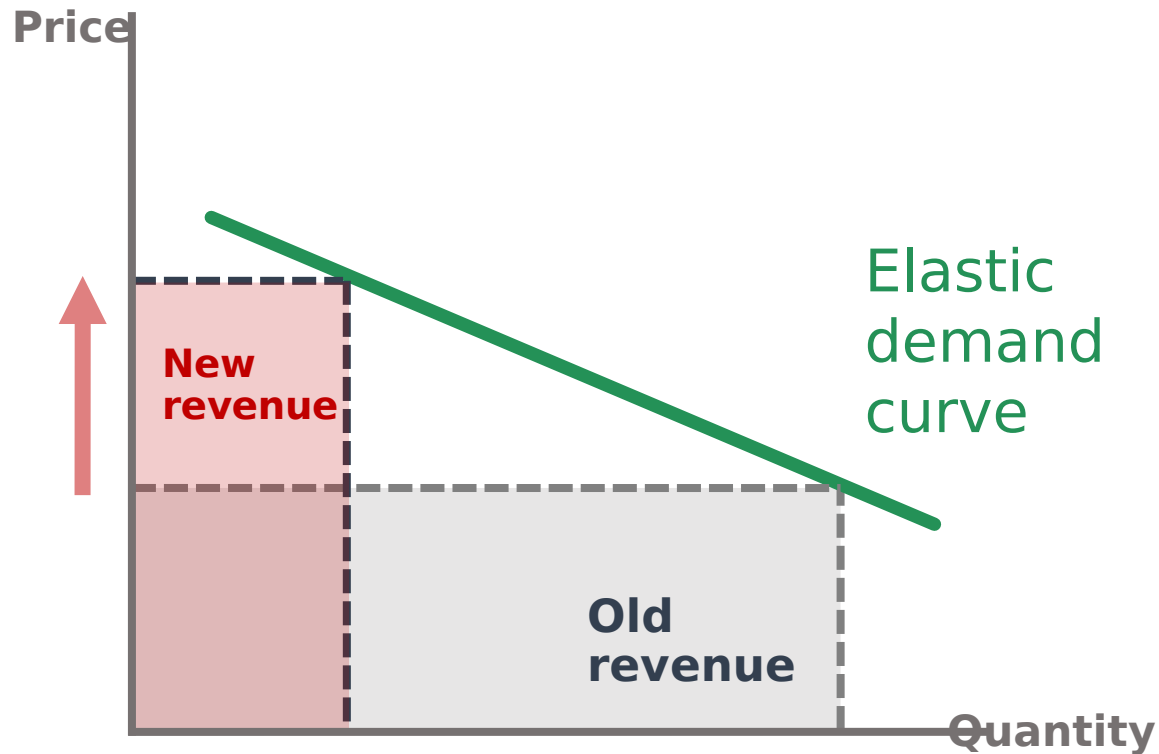➢ % change in price is **larger than** % change in quantity.

Inelastic demand:

The quantity demanded is relatively **unresponsive to a change in price**, so when the **price rises**, the quantity demanded does not fall by much.

Elasticity and Revenue: Impact of Higher Prices

Take-away: The same rise in price caused **total revenue** to **fall** in the **elastic case**, and **rise** in the **inelastic case.**
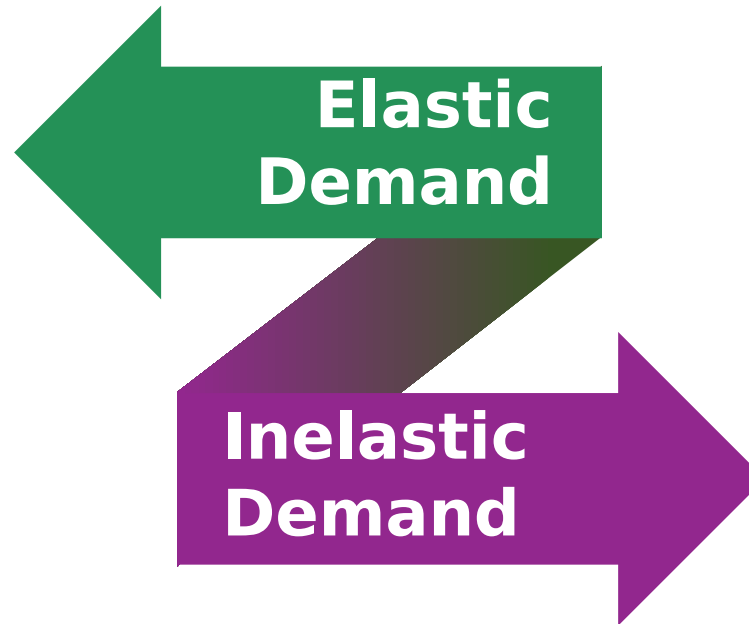
Price

New revenue

Old revenue

Elastic demand curve

Quantity

Price

New revenue

Old revenue

curve

Quantity

Elasticity and Business Strategy

How can you (as a seller) increase your total revenue?

It depends on how elastic the demand for your product is!

If the demand curve for your product is <u>relatively elastic</u>, then you should _lower_ the price of your good to increase your total revenue.

Elastic Demand

Inelastic Demand

If the demand curve for your product is <u>relatively inelastic</u>, then you should _raise_ the price of your good to increase your total revenue.

Concept Check: Elasticity and Revenue

If a company raised the price of its product by 15%, and sold 10% fewer units…

a. demand for the product is currently **elastic** and **revenue decreased**.

b. demand for the product is currently **elastic** and **revenue increased**.

c. demand for the product is currently **inelastic** and **revenue decreased**.

d. demand for the product is currently **inelastic** and **revenue increased**.

STARBUCKS and elasticity

In the mid-1980s Howard Schultz noticed most coffee sellers were following a low-price strategy, selling cheap coffee. Schultz believed many coffee drinkers would be willing to pay higher prices for better quality coffee… and Starbucks was created!

Where has Starbucks opened stores?

➢ In markets where coffee drinkers are **not** going to be **deterred by higher prices**.

➢ **Inelastic** demand

This is why you are more likely to encounter a Starbucks in **wealthier cities**

Key take-aways: Revenue and elasticity

Total revenue = price $\times$ quantity

Revenue and **Elastic** Demand

➤ Buyers are **very responsive** to changes in price.
➤ **Lowering the price** will result in a relatively big increase in quantity purchased.
  ➤ Revenue will ultimately go up.

Revenue and **Inelastic** Demand

➤ Buyers are **not responsive** to changes in price.
➤ **Raising the price** will result in a relatively small decrease in quantity purchased.
  ➤ Revenue will ultimately go up.

Exploring other demand elasticities:
- ➢ Cross-Price Elasticity of Demand
- ➢ Income Elasticity of Demand

1. Price Elasticity of Demand

2. How Businesses Use Demand Elasticity

3. Other Demand Elasticities

4. Price Elasticity of Supply

Other Demand Elasticities

Demand-related analysis so far…

➢ Price ☾ Price Elasticity of Demand

Up next, factors that shift demand:

➢ Price of Related Goods ☾ Cross-Price Elasticity of Demand

➢ Income ☾ Income Elasticity of Demand

Note: Other elasticities exist, but we will focus on the two listed above.

HELPFUL HINT

Underlying structure of all elasticity formulas: $\dfrac{\% \text{ Change in quantity}}{\% \text{ Change in some factor}}$

Key Definition (3 of 5)

Cross-price elasticity of demand: A measure of **how responsive** the demand of **one good is** to **price changes of another.**

It measures the percentage change in quantity demanded that follows from a 1% change in the price of *another* good.

Cross-price elasticity of demand =

$$\frac{\text{\% Change in quantity demanded}}{\text{\% Change in price of another good}}$$

Diving into the Definition

Scenario: If raising the price of **raspberries 8%** leads to an increase in demand for **blueberries by 12%**, then the **cross-price elasticity of demand for blueberries** (with respect to the price of raspberries)

$$\frac{\text{\%}\Delta Q \text{ blueberries}}{\text{\%}\Delta P \text{ raspberries}} = \frac{+12\%}{+8\%} = 1.5$$

In this case, the outcome is ***not negative!***

➢ The sign of the cross-price elasticity of demand indicates if the two goods are **complements** or **substitutes**

Cross-price elasticity of demand: The sign matters!

Recall, **complements** are goods that you **consume together**. Thus, if one of the pair gets more expensive, then you buy less of both.

Complements have a **negative** cross-price elasticity of demand.

➤ The change in demand for good X goes in the <u>opposite</u> direction as the change in the price of good Y.

Recall, **substitutes** are goods that can **replace one another**. Thus, if good Y gets more expensive, then you simply switch to good X (i.e., the Q_D of good X increases).

Substitutes have a **positive** cross-price elasticity of demand.

➤ The change in demand for good X goes in the <u>same</u> direction as the change in the price of good Y.

Complements   **Substitutes**

-1   0   1

Independent
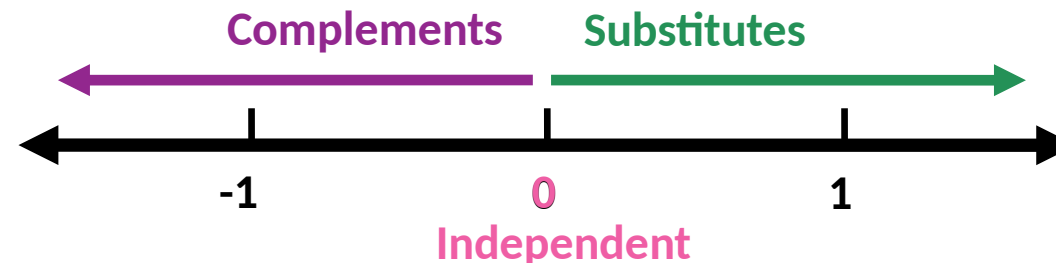
Cross-price elasticity of demand practice

Scenario 1:

The price of cereal goes up 10%, and the demand for milk falls by 6%. What is the cross-price elasticity of demand for cereal?

$$\frac{-6\% \text{ demand for milk}}{+10\% \text{ price of cereal}} = -0.6$$

Interpretation:
The **negative** sign tells us that cereal and milk are **complements**.

Scenario 2:

The price of cookies goes up 5% and the demand for candy rises by 7%. What is the cross-price elasticity of demand for candy?

$$\frac{+7\% \text{ demand for candy}}{+5\% \text{ price of cookies}} = 1.4$$

Interpretation:
The **positive** sign tells us that cookies and candy are **substitutes**.

Scenario 3:

The price of sweaters goes up by 15%, and the demand for iPhones remains unchanged. What is the cross-price elasticity?

$$\frac{0\% \text{ demand for iPhones}}{+15\% \text{ price of sweaters}} = 0$$

Interpretation:
Sweaters and iPhones are **unrelated** goods. Having a sweater doesn't make you more or less likely to have an iPhone.

Taylor Swift and cross-price elasticity of demand

Taylor Swift pulled her music from Spotify in 2014 (though she eventually returned to Spotify). She believed that when fans stream music, they spend less on CDs and downloads, which causes musicians to earn less.

Taylor Swift believed the cross elasticity between streaming services like Spotify and paid downloads/CDs is positive (i.e., the two are substitutes in consumption).

Others argued that streaming services actually lead to more sales of CDs and paid downloads (that Spotify is like letting people hear the song on the radio).

These people believed the cross elasticity between Spotify and CDs is negative (i.e., the two are complements in consumption).

Taylor Swift was right: the cross elasticity between Spotify and CD purchases was positive, indicating Spotify was a substitute for purchasing a CD. However, this elasticity was relatively small, and so the losses were roughly offset by the fees that Spotify paid to musicians.

Income elasticity of demand: A measure of **how responsive** the demand for a good is to **changes in income.**

It measures the percentage change in quantity demanded that follows from a 1% change in income.

Income elasticity of demand $= \dfrac{\text{\% change in quantity demanded}}{\text{\% change in income}}$

Diving into the Definition

Scenario: Your income rises by **10%** and you buy **16% more restaurant meals**, then your **income elasticity of demand** for restaurant meals is...

$$\frac{\%\Delta Q \text{ restaurant meals}}{\%\Delta \text{ income}} = \frac{+16\%}{+10\%} = 1.6$$

In this case, the outcome is **positive**.

➢ The sign of the income elasticity of demand indicates whether the good is **normal** or **inferior**.

Income elasticity of demand: The sign matters!

Recall, **inferior goods** are goods that you **buy less** of when your **income goes up** (and more of when income goes down).

Example: Shopping at Goodwill

Inferior goods have a **negative** income elasticity of demand.

➢ The change in demand for good X goes in the <u>opposite</u> direction as the change in income.

Recall, **normal goods** are goods that you **buy more** of when your **income goes up** (and less of when your income goes down).

Example: Restaurant meals

Substitutes have a **positive** income elasticity of demand.

➢ The change in demand for good X goes in the <u>same</u> direction as the change in income.

Inferior Goods   **Normal Goods**

-1   **0**   **1**

Scenario 1:

Your income goes up 5%, and the demand for plane tickets rises by 9%. What's your income elasticity of demand for tickets?

$$\frac{+9\% \text{ demand for tickets}}{+5\% \text{ income}} = 1.8$$

Interpretation:

The **positive** sign tells us that plane tickets are a **normal good**.

Scenario 2:

Income goes down 4%, and demand for box Mac & Cheese rises by 3%. What is the income elasticity of demand for Mac & Cheese?

$$\frac{+3\% \text{ box Mac \& Cheese}}{-4\% \text{ income}} = -0.75$$

Interpretation:

The **negative** sign tells us that box Mac & Cheese is an **inferior good**.

Scenario 3:

Income rises by 7%, and demand for McDonald's meals falls by 7%. What is the income elasticity of demand for McDonald's meals?

$$\frac{-7\% \text{ McDonald's meals}}{+7\% \text{ income}} = -1$$

Interpretation:

The **negative** sign tells us that McDonald's meals are an **inferior good**.

Income elasticity of demand: Necessities and luxuries

Necessities tend to have small income elasticities.

➢ Necessities have relatively **inelastic demand.**

➢ You have to buy toilet paper, and if your income goes up, you aren't going to buy that much more.

Luxuries tend to have larger income elasticities.

➢ Luxuries have relatively **elastic demand.**

Product	Income Elasticity of Demand
Electricity	0.0 (inelastic)
Health Expenditure	0.4 (inelastic)
Homeownership	0.5 (inelastic)
Gasoline	0.5 (inelastic)
New Cars	1.7 (elastic)
Airplane Tickets	1.8 (elastic)

Key take-aways: Other demand elasticities

Elasticity ☾ how **responsive** one variable is to **changes in another variable.**

Underlying structure of all elasticity formulas: $\dfrac{\% \text{ Change in quantity}}{\% \text{ Change in some factor}}$

Cross-price elasticity of demand

➢ How buyers respond to a **change in the price of a related good**

➢ Positive sign ☾ **Substitutes** in consumption

➢ Negative sign ☾ **Complements** in consumption

Income elasticity of demand

➢ How buyers respond to a **change in income**

➢ Positive sign ☾ **Normal** good

➢ Negative sign ☾ **Inferior** good

Price Elasticity of Supply:
- ➤ Definition and visualization
- ➤ Determinants of the price elasticity of supply
- ➤ Calculation

1. Price Elasticity of Demand

2. How Businesses Use Demand Elasticity

3. Other Demand Elasticities

4. Price Elasticity of Supply

Price elasticity of supply: A measure of **how responsive sellers** are **to price** changes.

It measures the percentage change in quantity supplied that follows from a 1% price change.

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

Diving into the Definition

Scenario: If raising the price of donuts **12%** leads to a rise in quantity supplied by **16%,** then the **price elasticity of supply** for donuts is…

$$\frac{\%\Delta Q}{\%\Delta P} = \frac{+16\%}{+12\%} = 1.33$$

The price elasticity of supply is a **positive number** (of course!).

➢ The **law of supply** tells us price and quantity supplied move in the same direction.

Elastic versus inelastic price elasticity of supply

Elastic: When suppliers **can** increase the quantity supplied in response to higher prices.

➤ The seller **is very responsive** to price.

The percentage change in quantity supplied is **larger** than the percentage change in price:

$$|\%\Delta Q| > |\%\Delta P| \text{ implies } \frac{|\%\Delta Q|}{|\%\Delta P|} > 1$$

$$|35\%| > |-20\%| \text{ implies } \frac{|+35\%|}{|-20\%|} = 1.75$$

$$|-8\%| > |3\%| \text{ implies } \frac{|-8\%|}{|+3\%|} = 2.67$$

Take-away: Elastic values are **greater than 1.**

Inelastic: When suppliers **cannot** increase the quantity supplied by much in response to higher prices.

➤ The seller is **not responsive** to changes in price.

The percentage change in quantity supplied is **smaller** than the percentage change in price:

$$|\%\Delta Q| < |\%\Delta P| \text{ implies } \frac{|\%\Delta Q|}{|\%\Delta P|} < 1$$

$$|14\%| < |-18\%| \text{ implies } \frac{|+14\%|}{|-18\%|} = 0.78$$

$$|-3\%| < |10\%| \text{ implies } \frac{|-3\%|}{|+10\%|} = 0.3$$

Take-away: Inelastic values are **less than 1.**
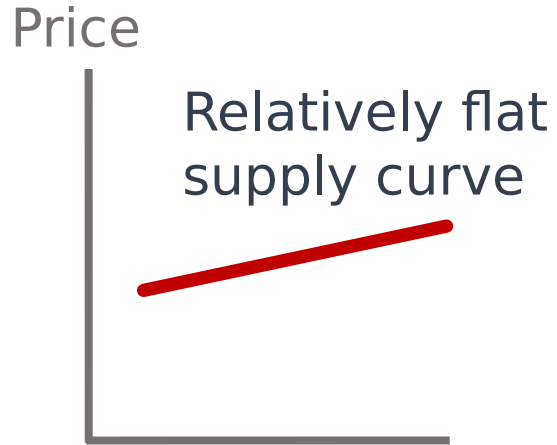
Elastic and Inelastic Supply

Price

Horizontal supply curve

Quantity

| % change in quantity | is **infinite** for any | % change in price |

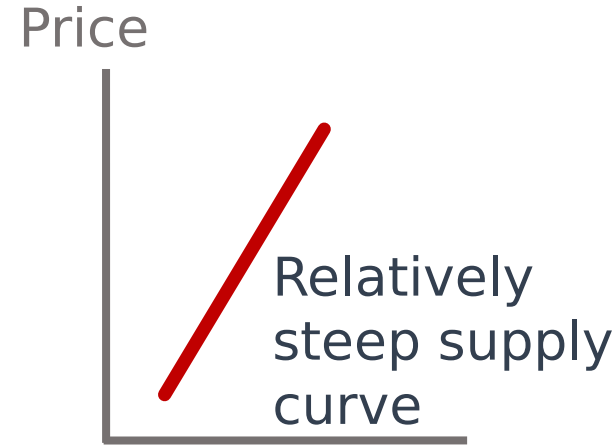The quantity supply is **infinitely responsive** to a change in price:

Price

Relatively flat supply curve

Quantity

| % change in quantity | is **larger** than | % change in price |

The quantity supplied is **relatively responsive** to a change in price:
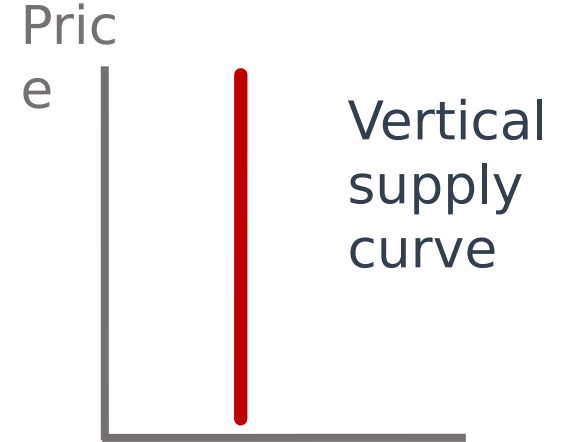
Price

Relatively steep supply curve

Quantity

| % change in quantity | is **smaller** than | % change in price |

The quantity supplied is **relatively unresponsive** to a change in price:

Price

Vertical supply curve

Quantity

| % change in quantity | is **zero** for any | % change in price |

The quantity supplied is **unchanged** for any change in price:

Perfectly Elastic **Elastic** | *pri* **Inelastic** < 1 **Perfectly Inelastic**

Supply elasticity is all about **flexibility**!

1. Inventories make supply more elastic.

2. Easily available variable inputs make supply elastic.

3. Extra capacity makes supply elastic.

4. Easy entry and exit make supply more elastic.

5. Over time, supply becomes more elastic.

Storable Products: gasoline
Non-storable products: baked goods

If your product is **easily stored**, then…

➢ **stockpile** your product if prices are **low.**

➢ dial up supply by **selling stored inventories** when the prices are **high.**

Result: elastic supply

➢ Sellers can **respond** rapidly to price changes.

➢ **Sellers have the flexibility to**

Determinants of the price elasticity of supply (2 of 5)

Supply elasticity is all about **flexibility**!

1. Inventories make supply more elastic.

2. Easily available variable inputs make supply elastic.

3. Extra capacity makes supply elastic.

4. Easy entry and exit make supply more elastic.

5. Over time, supply becomes more elastic.

If the variable inputs needed to expand production are **easily available**, then...

➢ quickly **acquire more** of these inputs and start producing more.

Result: elastic supply

➢ sellers have the **flexibility to respond** to price changes.

Landscaping Example: You can easily hire more workers and buy more lawncare supplies when prices of landscaping services rise — **elastic supply**.

Vehicle Example: If microprocessors (chips) are not readily available, then car suppliers cannot easily produce more cars even when prices are high — **inelastic supply**.

Supply elasticity is all about **flexibility**!

1. Inventories make supply more elastic.
2. Easily available variable inputs make supply elastic.
3. Extra capacity makes supply elastic.
4. Easy entry and exit make supply more elastic.
5. Over time, supply becomes more elastic.

Fixed inputs (a factory, a kitchen, an office space), **act as a constraint** on a business's ability to expand production.

Restaurant Example 1: If a restaurant has a larger kitchen than it needs, then this **extra capacity provides flexibility.**

➢ If prices rise, then use this extra capacity to increase meal production.

➢ **Result:** elastic supply

Restaurant Example 2: If a restaurant is already using its kitchen at **full capacity**, then it will be harder to increase production.

➢ **Result:** inelastic supply

Supply elasticity is all about **flexibility**!

1. Inventories make supply more elastic.
2. Easily available variable inputs make supply elastic.
3. Extra capacity makes supply elastic.
4. Easy entry and exit make supply more elastic.
5. Over time, supply becomes more elastic.

Market supply will be **more elastic** when it is **easier** for businesses **to enter or exit** a market.

To enter as a seller in the **catering market**, you need a kitchen, cooking skills, and $100,000 to cover start-up costs.

To enter as a seller in the **airline market**, you need planes, pilots, crew, etc., and a single Boeing 747 costs over $300 million!

➢ **Catering** market supply is relatively **elastic.**

➢ **Airline** market supply is relatively **inelastic**.

Supply elasticity is all about **flexibility**!

1. Inventories make supply more elastic.
2. Easily available variable inputs make supply elastic.
3. Extra capacity makes supply elastic.
4. Easy entry and exit make supply more elastic.
5. Over time, supply becomes more elastic.

Price elasticity of supply is typically larger (more elastic) when viewed over a longer time frame:

If prices rise **today**…

➢ most sellers rely on their stockpiled inventories to increase quantity supplied that same day.

➢ **limited ability to respond** to price changes.

If prices stay up, then, **over time**…

➢ expand production or capacity by building a new factory.

➢ **bigger response** to price changes.

Tutor Scenario: If you can charge $15 per hour for your tutoring services, then you are willing to tutor 5 hours per week. If your rate rises to $20, then you are willing to tutor for 8 hours per week.

Calculate the price elasticity of supply for your tutoring services.

HELPFUL HINT: Use the **same three-step calculation recipe** from price elasticity of demand. Recall, we **use the midpoint formula** when calculating **percentage changes.**

➢ yields a **consistent measure** of the price elasticity of supply between two points.

1. What was the percentage change in price (as calculated by the midpoint formula)?

$$\frac{P_2 - P_1}{(P_2 + P_1)/2} = \frac{20 - 15}{(20 + 15)/2} \times 100 = 28.57\%$$

2. How much did the quantity demanded change as a percent, in response (as calculated by the midpoint formula)?

$$\frac{Q_2 - Q_1}{(Q_2 + Q_1)/2} = \frac{8 - 5}{(8 + 5)/2} \times 100 = 46.15\%$$

3. Calculate the elasticity.

$$\frac{|+46.15\%|}{|+28.57\%|} = 1.615, \text{ approximately } 1.6$$

Key take-aways: Price elasticity of supply

Price elasticity of supply ☾ how **sellers respond** to a **change in price**.

Elastic supply

➢ Sellers are **very responsive** to changes in price.

➢ Visually, elastic supply curves are relatively **flat.**

➢ Sellers have **flexibility** regarding production.

Inelastic supply

➢ Sellers are **not responsive** to changes in price.

➢ Visually, inelastic supply curves are relatively **steep.**

➢ Sellers **do not have flexibility** regarding production.

Elasticity calculations

➢ Use the **midpoint formul**a when calculating percentage changes.