

# Supply and Demand

Summer 2023  
Econ S10-A, Harvard University  
Prof. Josh Abel

Textbook chapters 4 and 5

# Gains from Trade

- Last lecture focused on Specialization and Comparative Advantage
- Main takeaway: we have a lot to gain from each other!
  - Jamie was really good at making Watermelons but liked Pumpkins just as much
  - Lee was the reverse
  - By Specializing on their Comparative Advantage, mutually-beneficial trades were possible
- But how do they know what to specialize in? And how much should they trade?

# The Market Mechanism

*“But how do they know know what to specialize in? And how much should they trade?”*

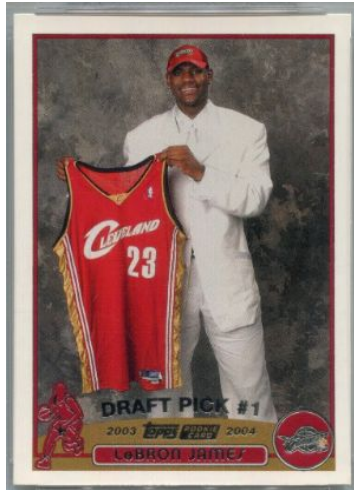
1. Central planning?
  - Government decides what everyone will make, and what everyone will receive
    - Very difficult, especially in a complex economy!
    - Too much power for government officials?
2. Markets
  - Let people respond to prices

Broad consensus among economists:

1. Most things should be left to markets
2. Some markets produce bad outcomes; government can help in these cases

# What is a Market?

- A market is a group of buyers and sellers of a particular good, at a particular time and place
  - E.g. Market for mint-chip ice cream in Harvard Square on 6/22/2023
  - E.g. Market for high school Math instruction in the United States in 2021
  - E.g. International market for electric cars in 2018
  - E.g. Auction for LeBron James rookie card on eBay, held in May 2023

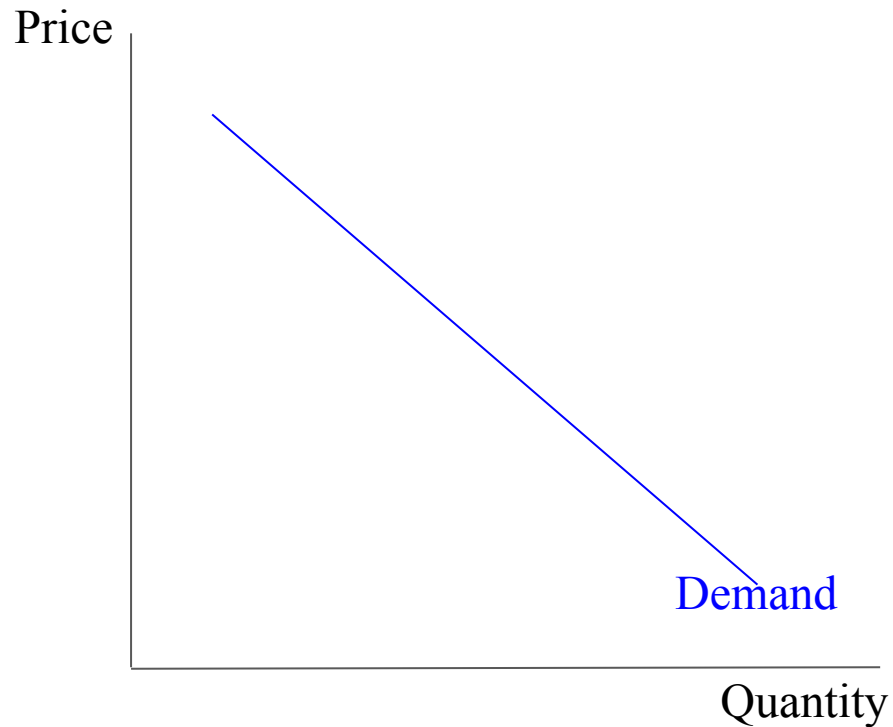


# Supply and Demand

- No matter the market, economists rely on Supply-and-Demand to analyze it

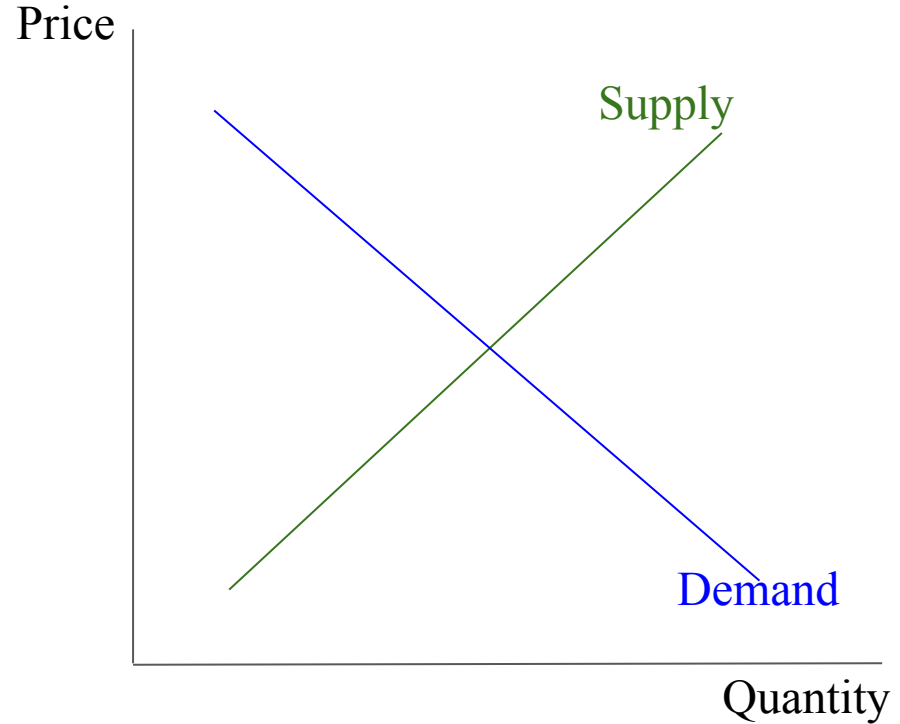
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- Consumer demand depends on price
  - Probably downward-sloping



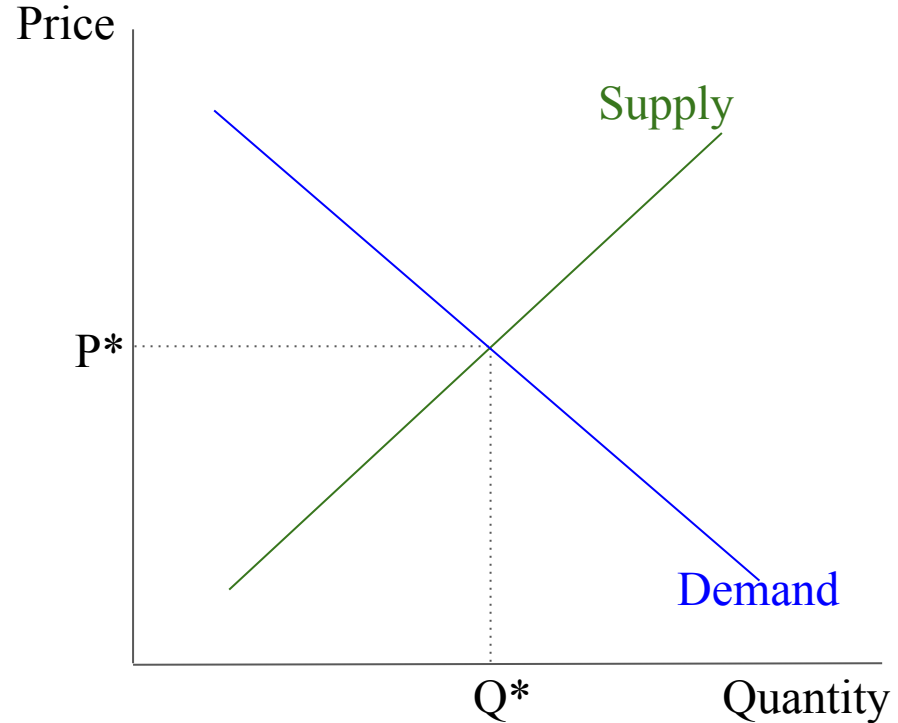
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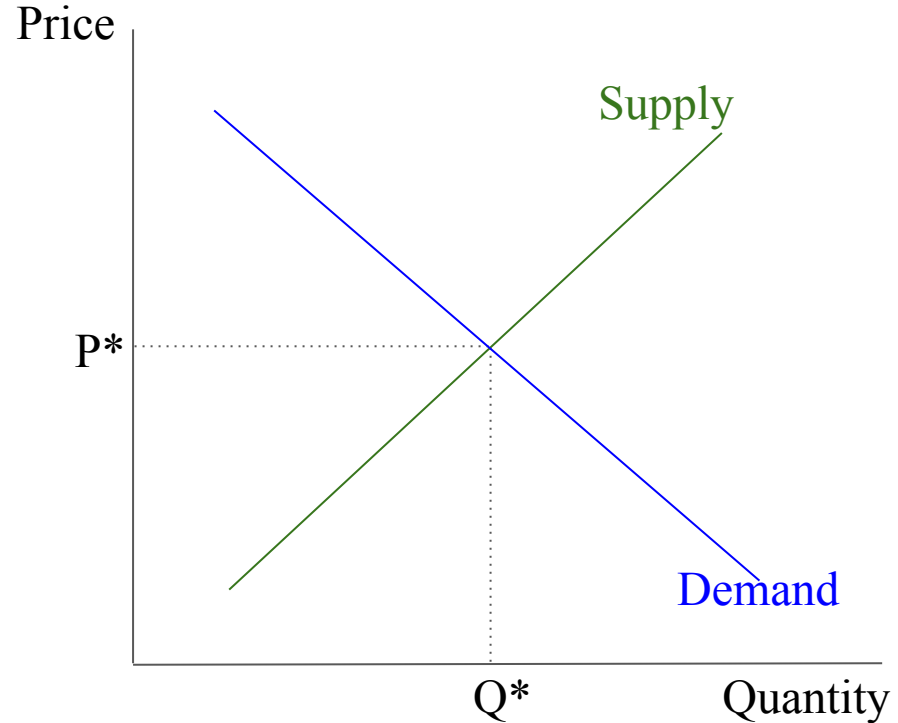
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- Equilibrium: supply equals demand
- $P^*$  “clears the market.” Determines:
  - How much is produced ( $Q^*$ )
  - Who makes it (willing to sell at  $P^*$ )
  - Who gets it (willing to pay  $P^*$ )





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- Need to better understand Supply Curve and Demand Curve.



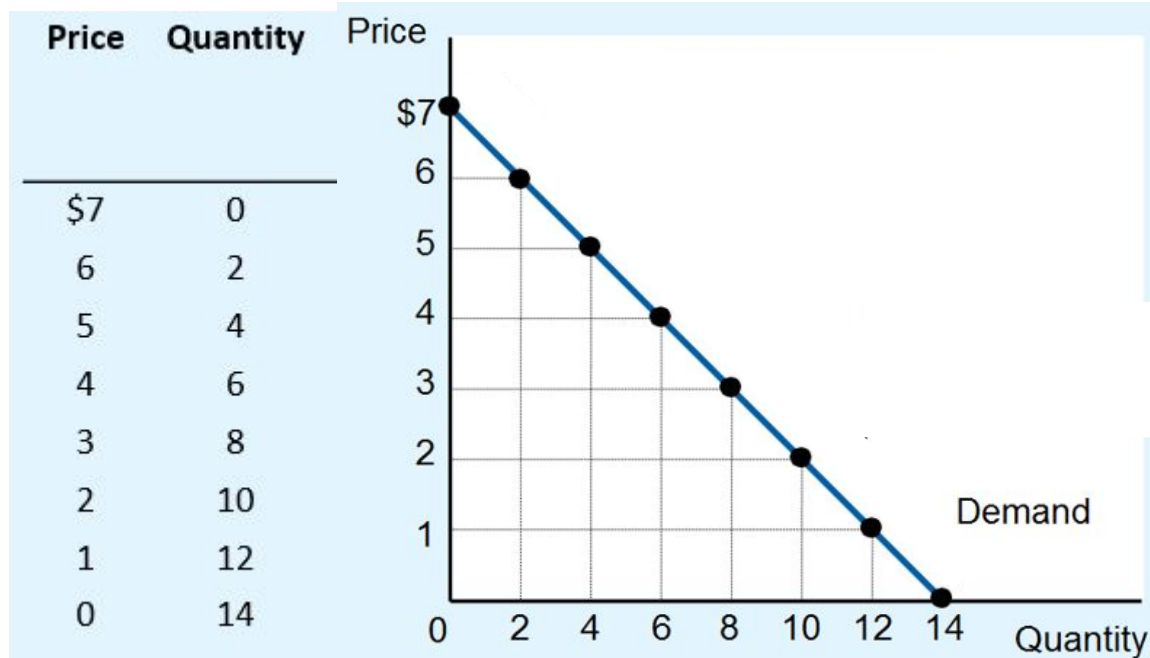
Demand

# Demand

- Demand for a good (e.g. quantity of gallons of gas) has many determinants:
  - Preferences
    - Do consumers have a lot of places to drive to?
  - Consumer income
    - Do consumers have a lot of money to spend?
  - Prices of related goods
    - Are there large highway tolls? How accessible is public transit?
  - Number of consumers in the market
  - *Price*
    - *What does it cost to obtain 1 gallon of gas?*

# Demand Curve

- The Demand Curve is a visualization of demand
  - **Quantity** demanded as a function of **Price**
  - All other determinants are in the background



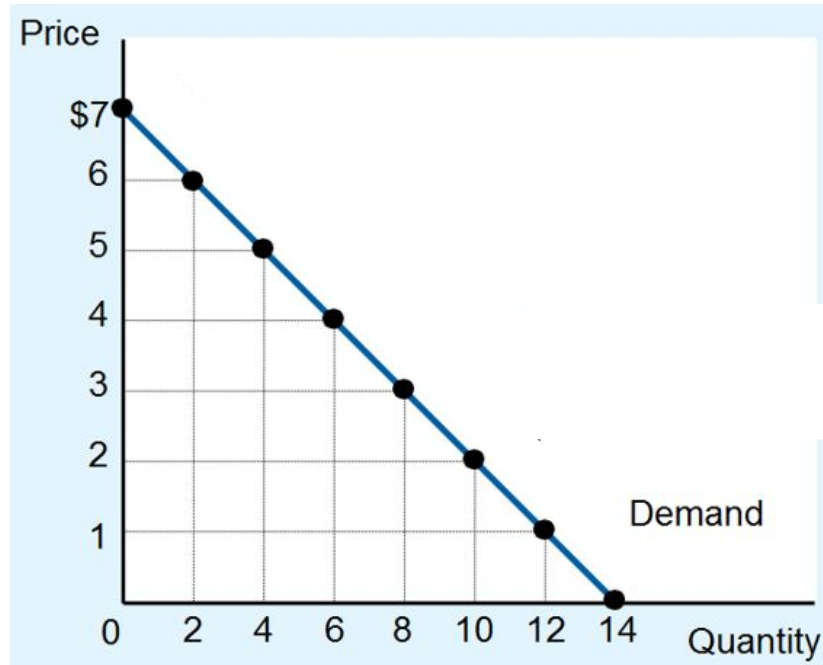
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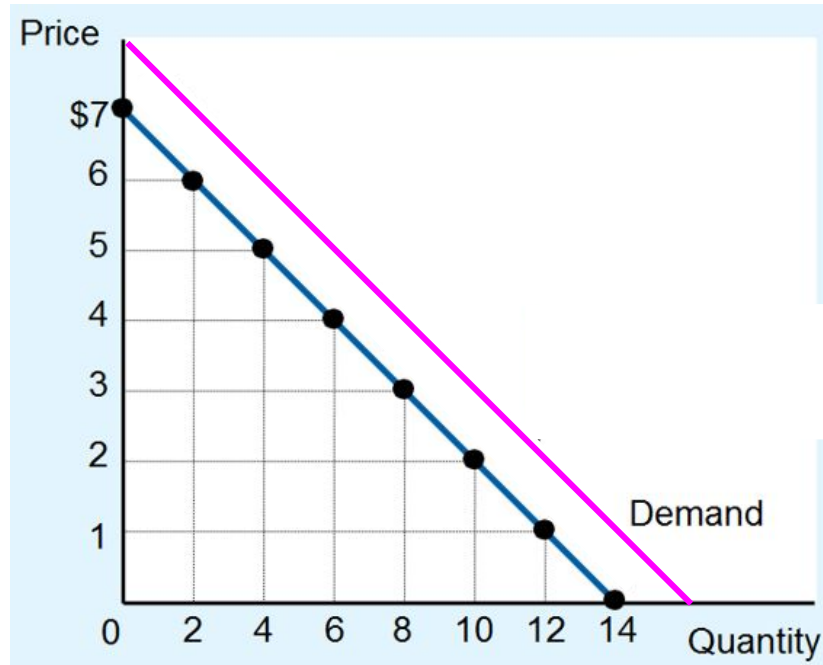
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- Changes in non-Price determinants of Demand (e.g. income rises) shift the Demand Curve



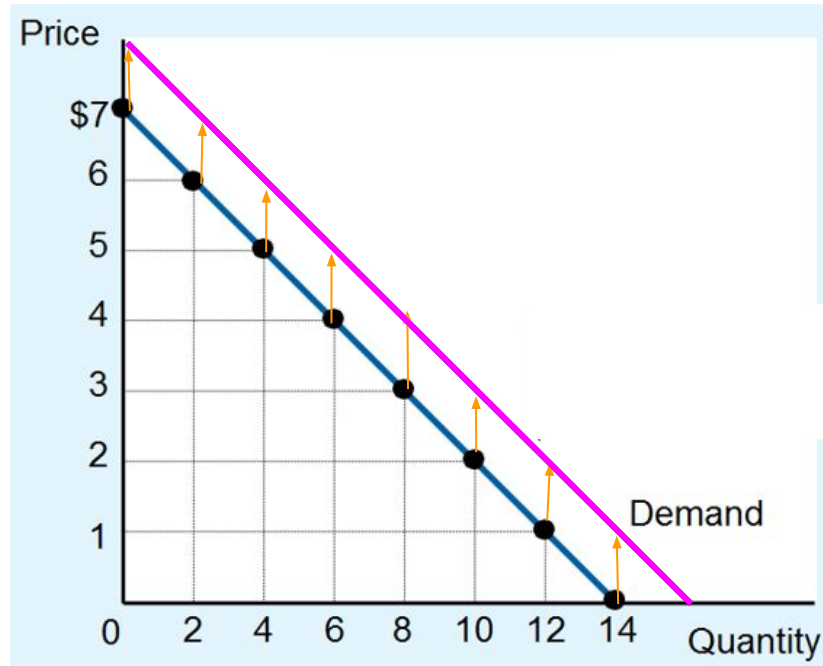
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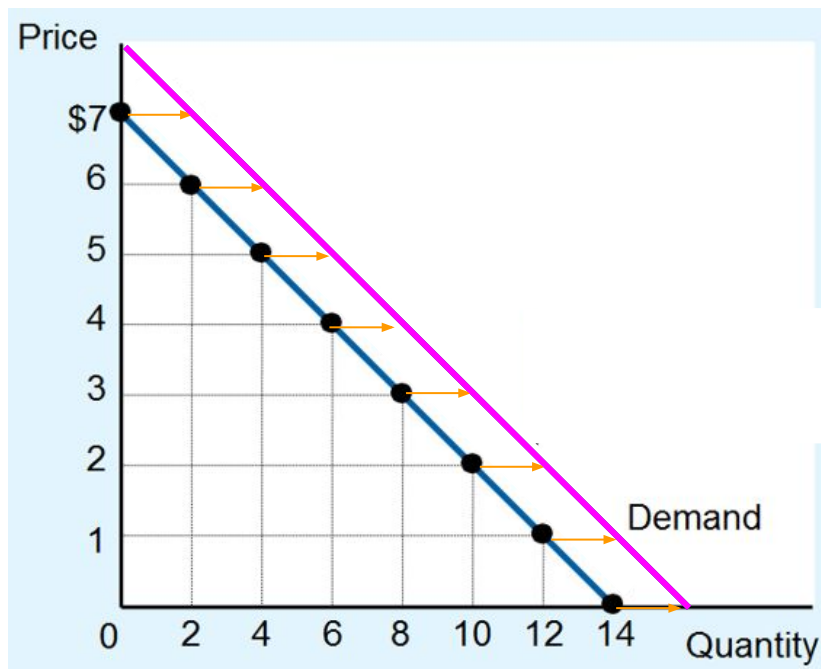
- Changes in non-Price determinants of Demand (e.g. income rises) shift the Demand Curve
  - “I am richer, so I’m willing to pay more for a gallon of gasoline.”





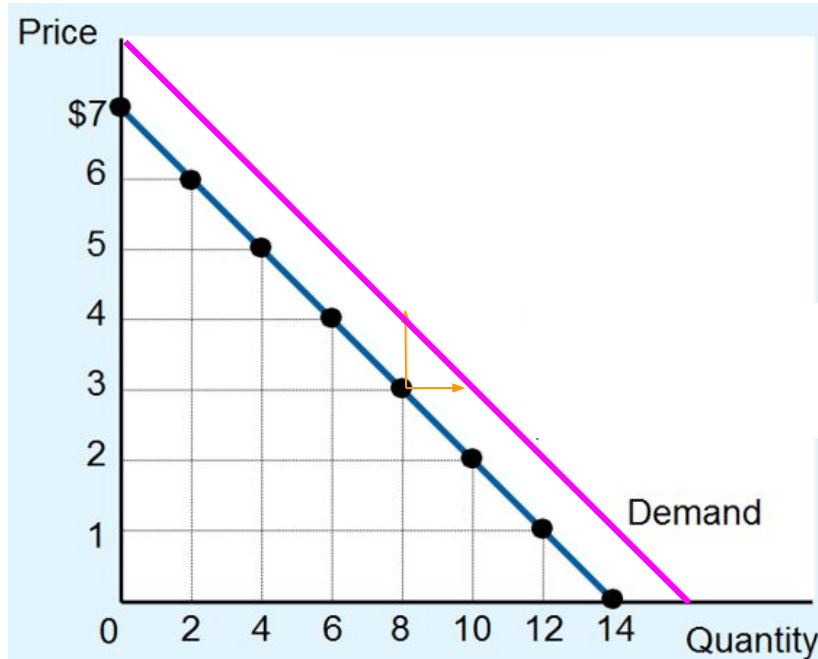
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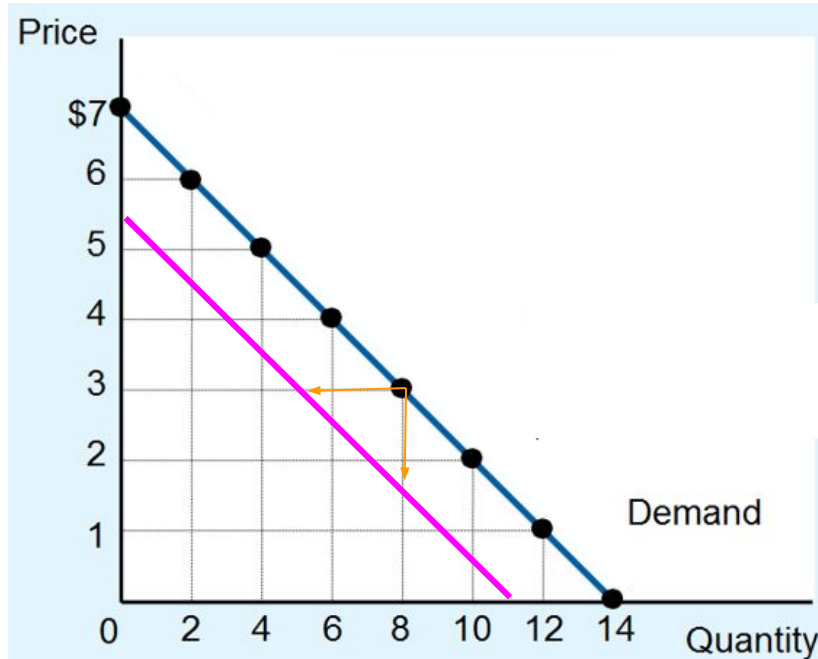
# Normal Goods and Inferior Goods

- If an increase in income shifts the Demand Curve up/right, that is a Normal Good
  - “I am richer, so I will go on more vacations.”



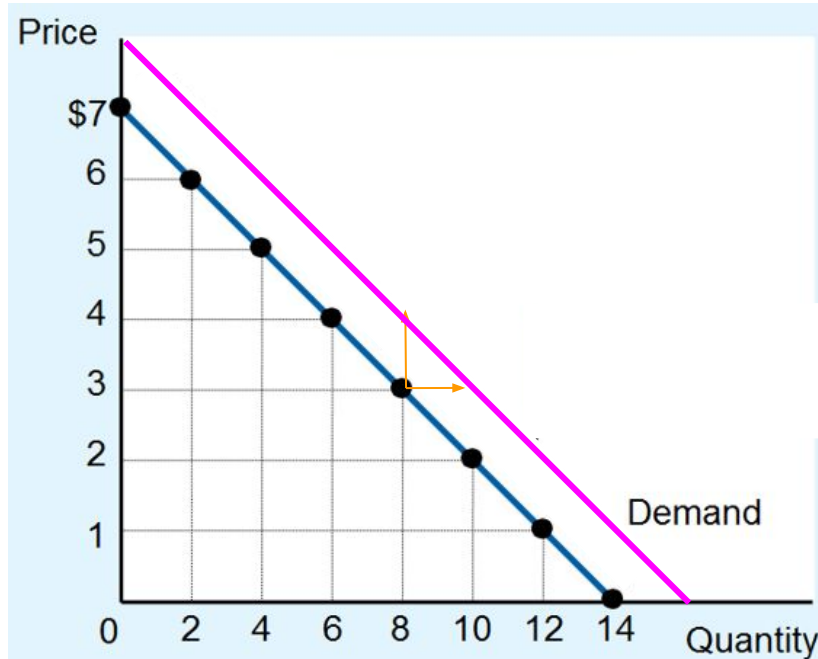
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- If an increase in income shifts the Demand Curve up/right, that is a Normal Good
  - “I am richer, so I will go on more vacations.”
- If an increase in income shifts the Demand Curve down/left, that is an Inferior Good
  - “I am richer, so I will buy fewer ramen noodles – I can eat something fancier.”



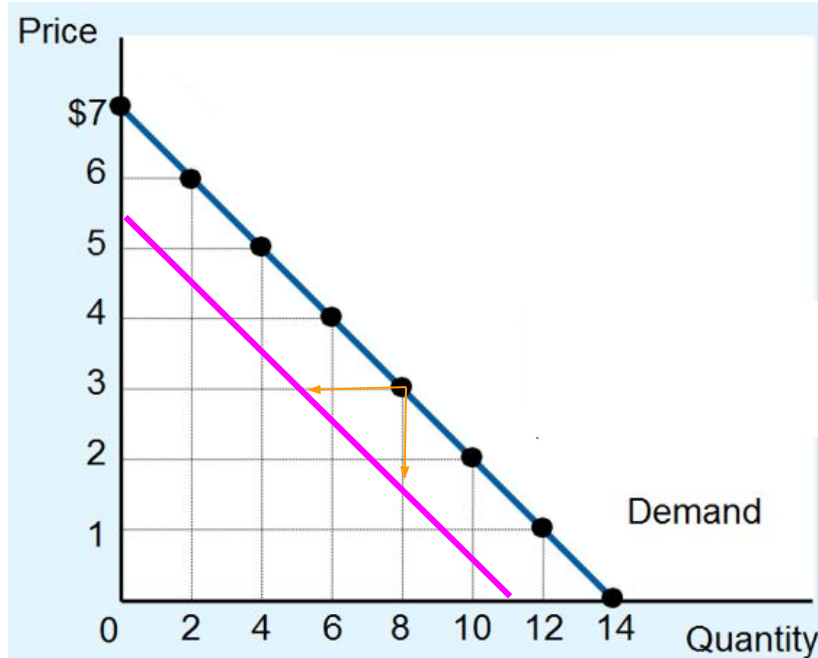
# Complements and Substitutes

- An increase in public transit prices shifts the Demand Curve for cars up/right
  - Public transit is a Substitute for cars



# Complements and Substitutes

- An increase in public transit prices shifts the Demand Curve for cars up/right
  - Public transit is a Substitute for cars
- An increase in gas prices shifts the Demand Curve for cars down/left
  - Gas is a Complement for cars



# Preferences

How might the weather (rainy vs. sunny) affect the Demand Curve for ice cream?

# Elasticity

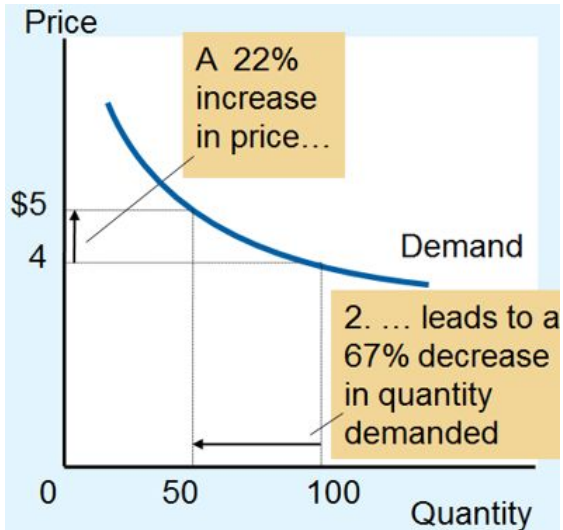
- An increase in price typically reduces quantity demanded (i.e. Demand Curve slopes down)
- But by how much?
- Elasticity of Demand describes how responsive quantity demanded is to price
  - Inelastic Demand: a 1% increase in price causes quantity demanded to fall less than 1%
    - Steep Demand Curve
  - Elastic Demand: a 1% increase in price causes quantity demanded to fall more than 1%
    - Flat Demand Curve

$$\text{Price elasticity of demand} = \frac{(Q_2 - Q_1) / [(Q_2 + Q_1) / 2]}{(P_2 - P_1) / [(P_2 + P_1) / 2]}$$

# Different Elasticities

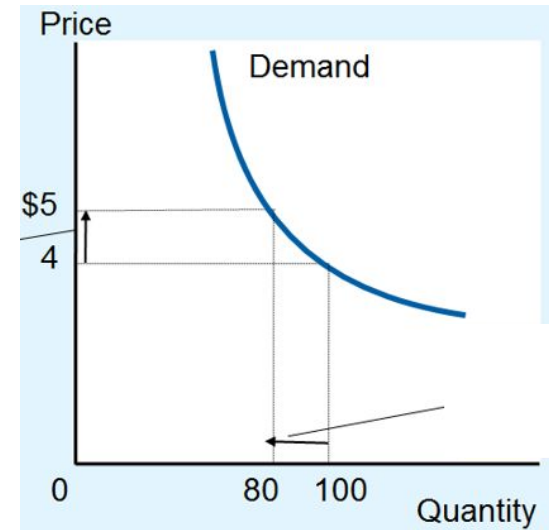
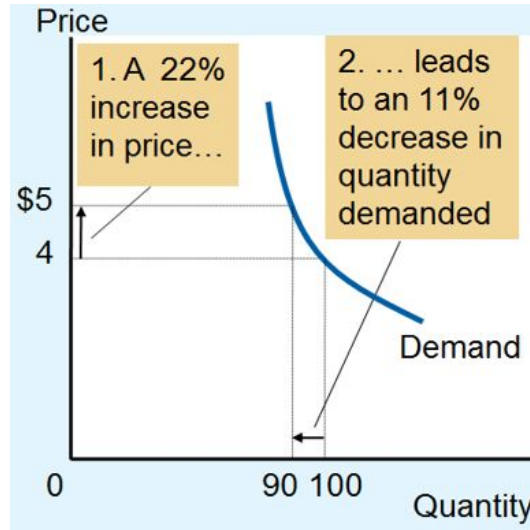
“If the price of Cheerios goes up, I can easily substitute to Corn Flakes.”

*ELASTIC*



“If the price of eggs goes up, I have to keep buying them, as they cannot be replaced.”

*INELASTIC*

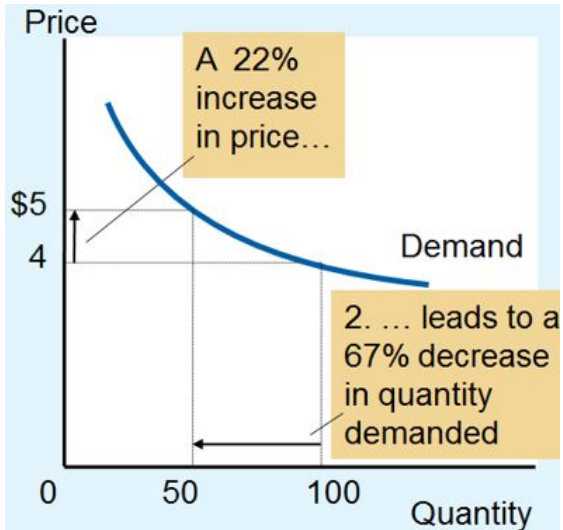




# Different Elasticities

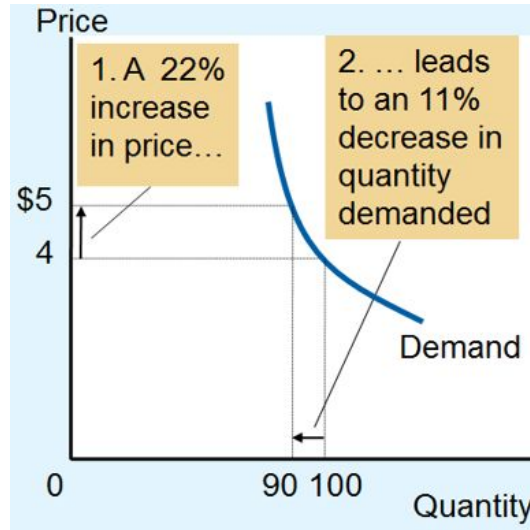
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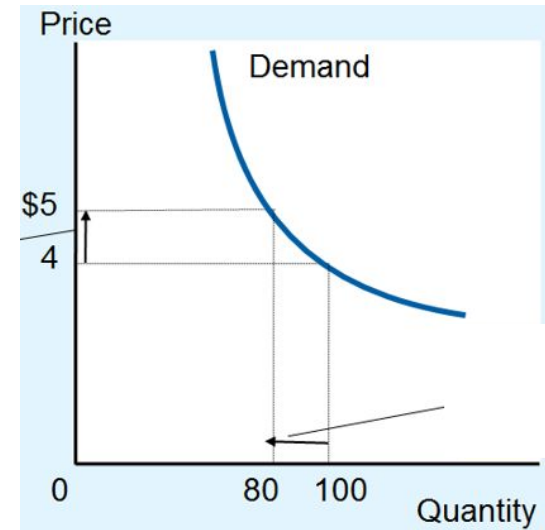
“If the price of eggs goes up, I have to keep buying them, as they cannot be replaced.”

*INELASTIC*



“If the price of beef goes up, I can switch to chicken for some dishes, but not others.”

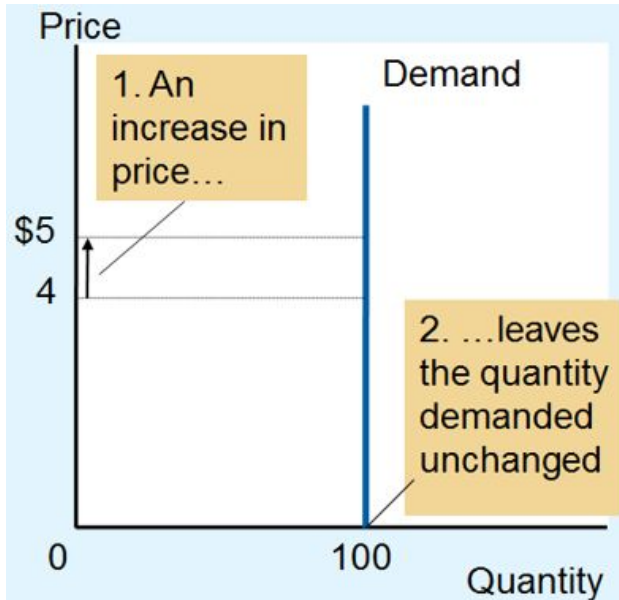
*UNIT ELASTIC*



# Extreme Elasticities

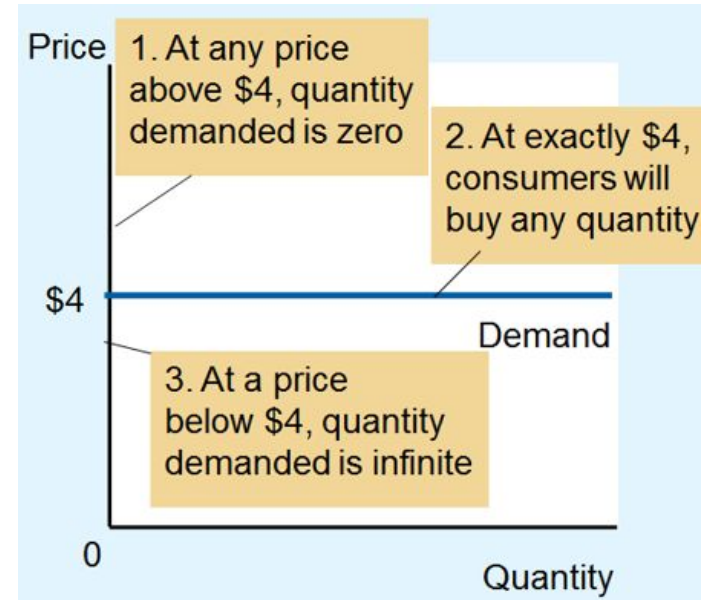
“Even if the price of my medicine goes up, I have to keep buying the same dose.”

*PERFECTLY INELASTIC*



“If the price of Mountain Dew goes up, I’ll just buy Sprite – they’re the same.”

*PERFECTLY ELASTIC*



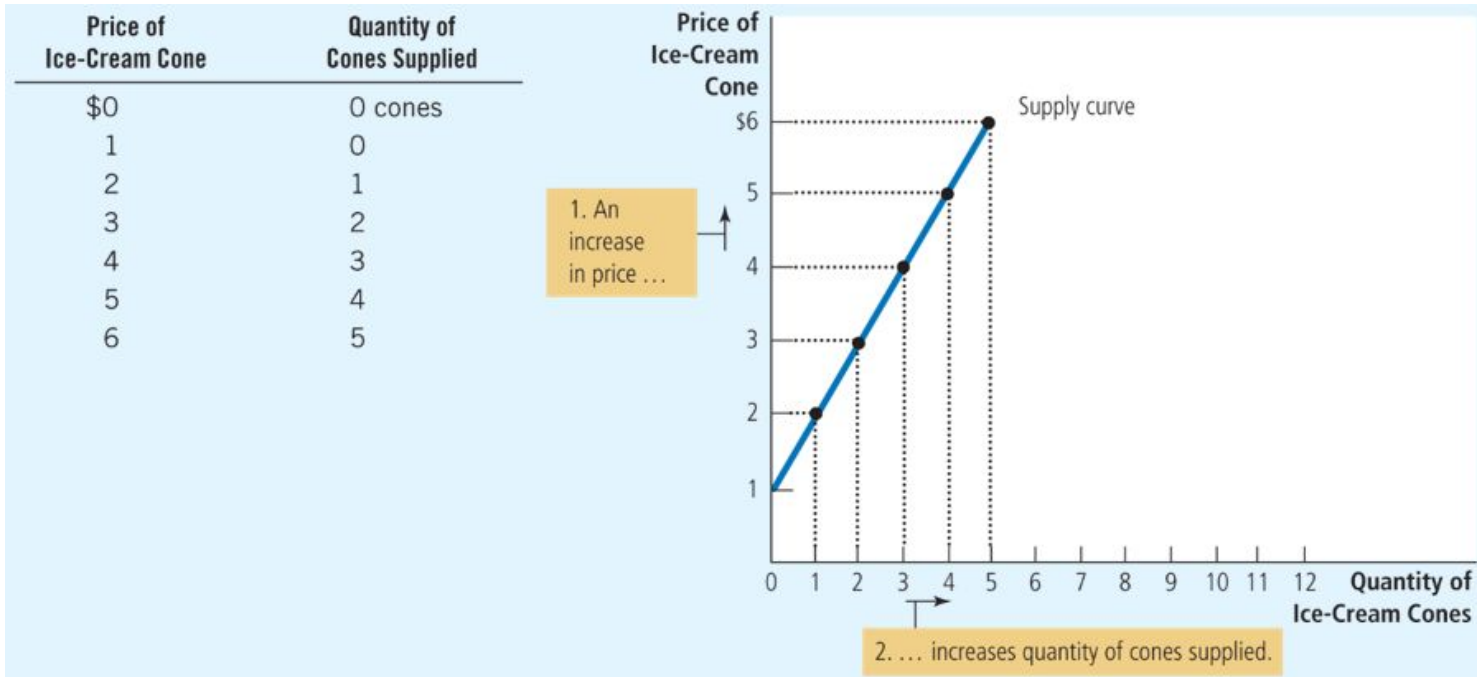
Supply

# Supply

- Supply of a good (e.g. quantity of gallons of gas) has many determinants:
  - Costs
    - What is the price of crude oil (an input)?
    - What must be paid to transport gas from the refinery to the gas station?
  - Number of producers in the market
  - *Price*
    - *How much can 1 gallon of gas be sold for?*

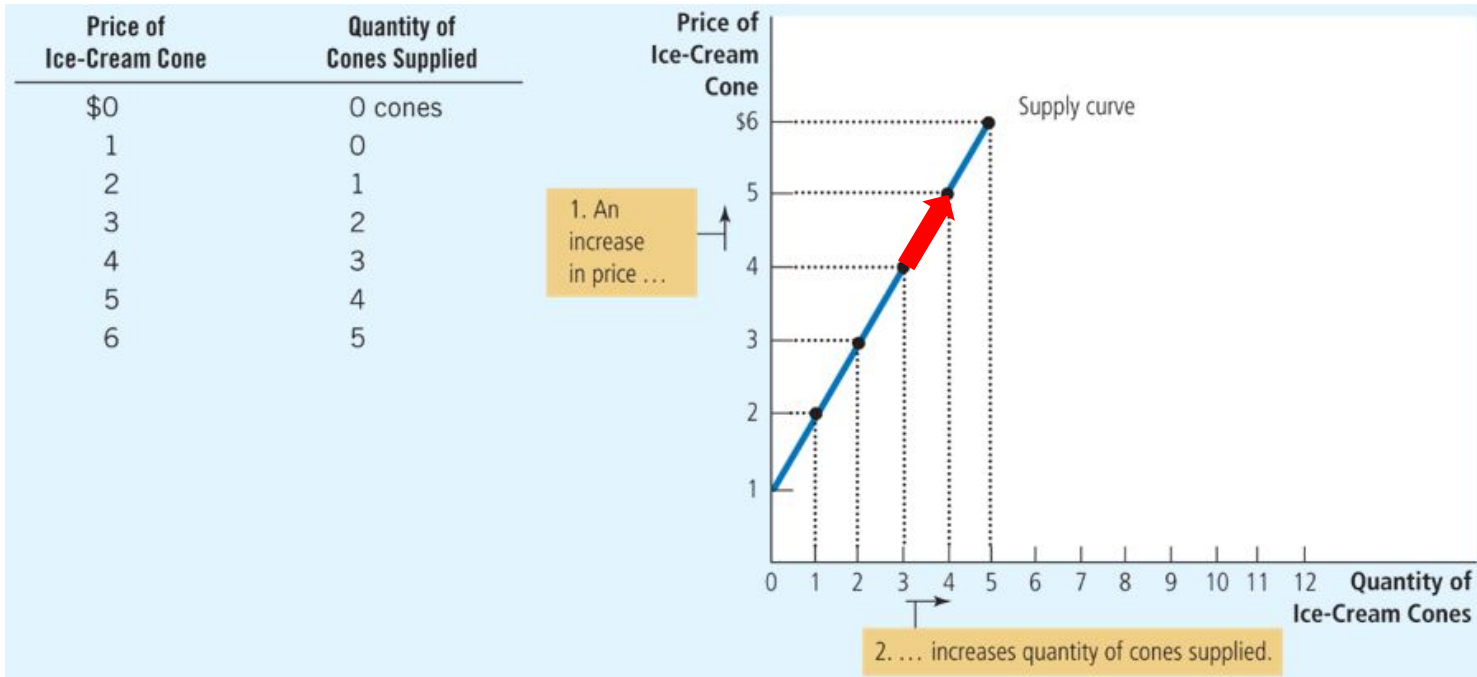
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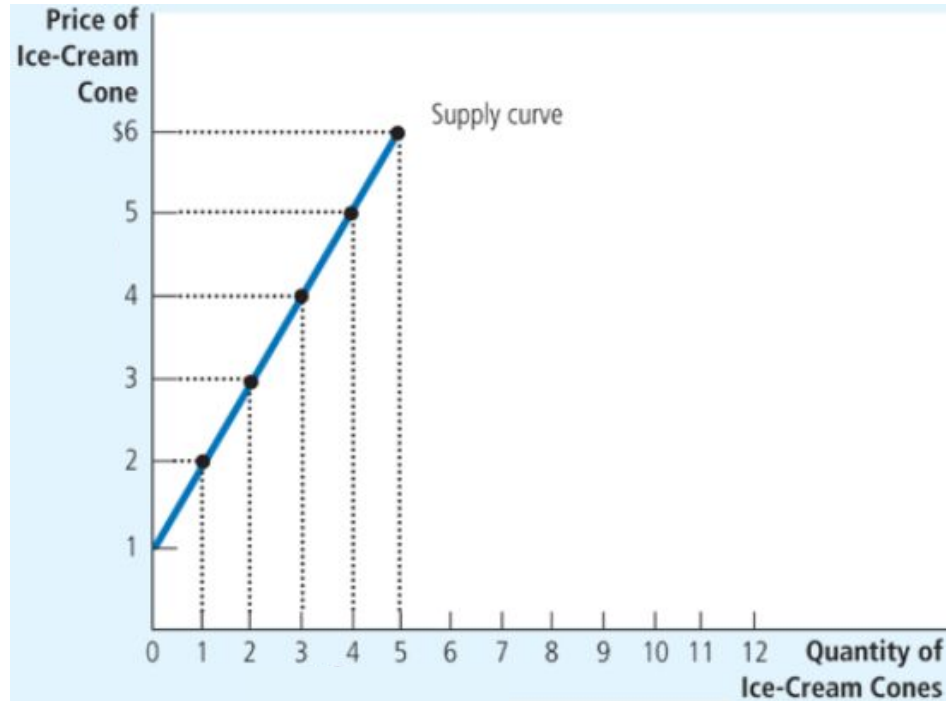
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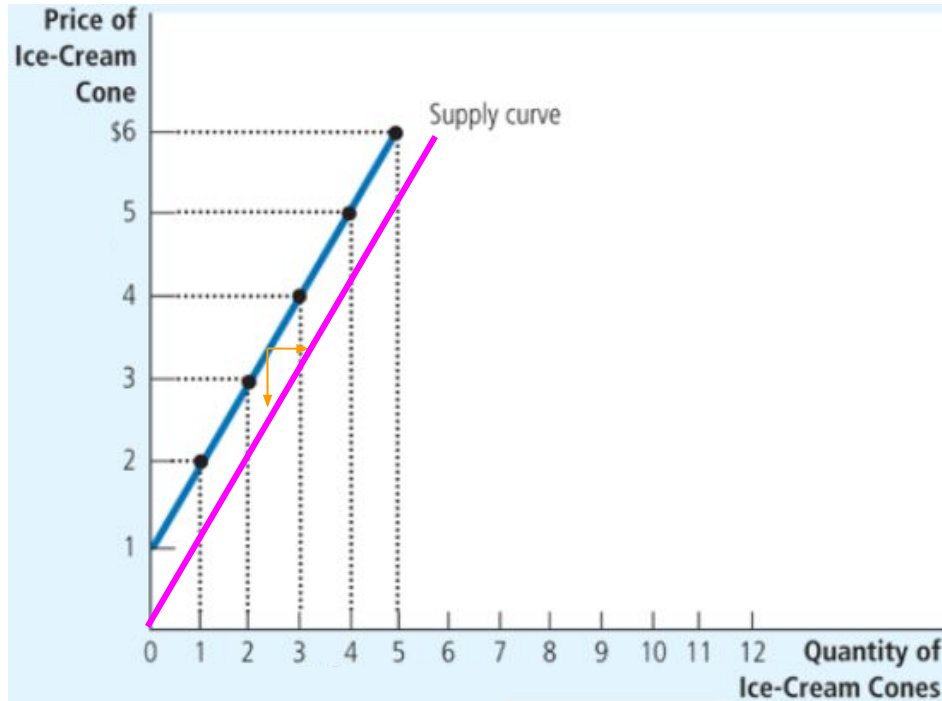
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  - “My costs went down, so I can accept a lower price when I sell an ice cream cone.”
  - “My costs went down, so I can sell more ice cream cones at any given price.”





# Supply Elasticity and Time Horizon

Harder to make adjustments

Easier to make adjustments

“If you want more *tomorrow*, I’ll have to short another customer, so I cannot give you very much.”

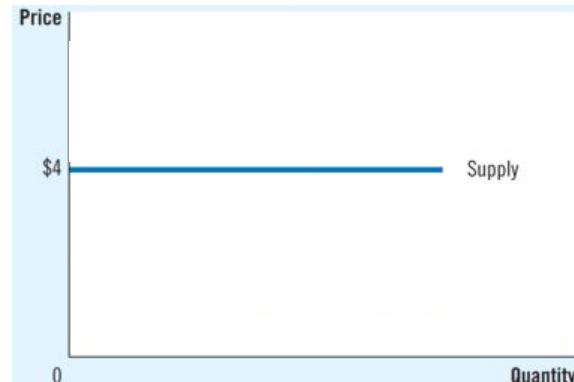
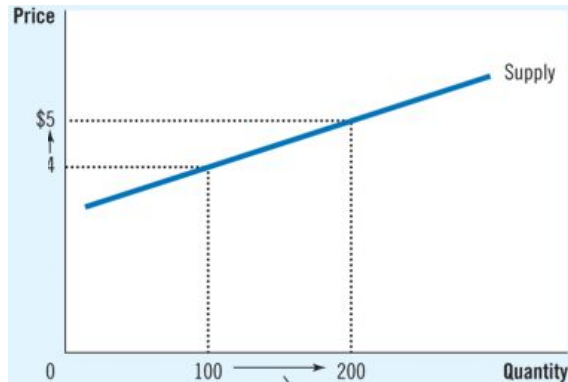
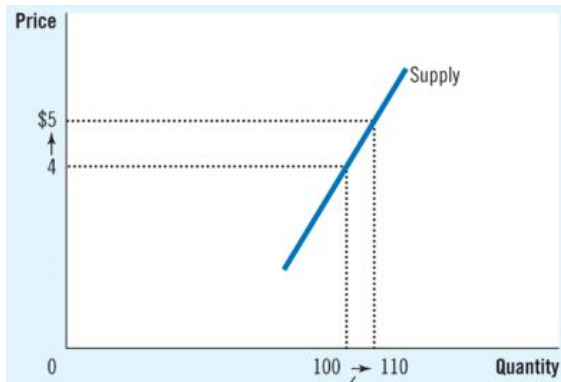
*INELASTIC*

“If you want more *in a month*, I can increase production, but not very efficiently. So I can get you more, but there are limits.”

*ELASTIC*

“If you want more in *five years*, I can incorporate that into my new factory, so just tell me how much you need.”

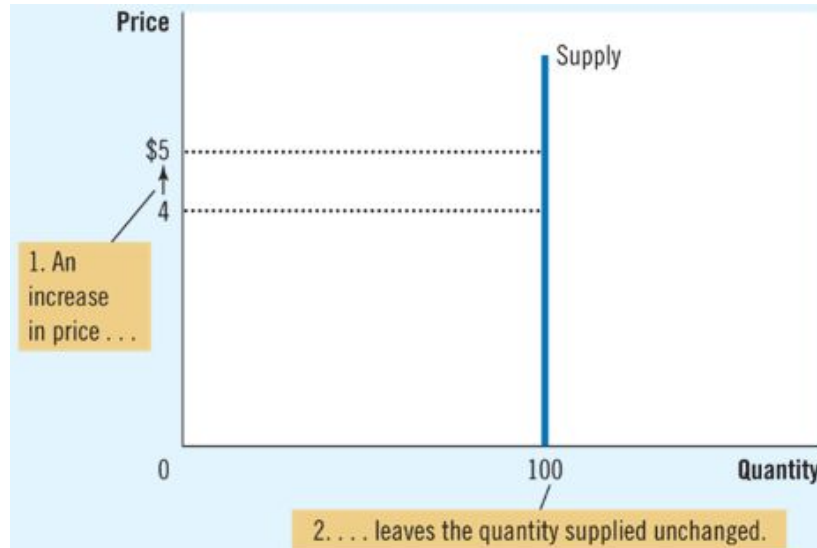
*PERFECTLY ELASTIC*



# Some Things Really are Inelastic

“Regardless of what you pay me, I cannot make more land.”

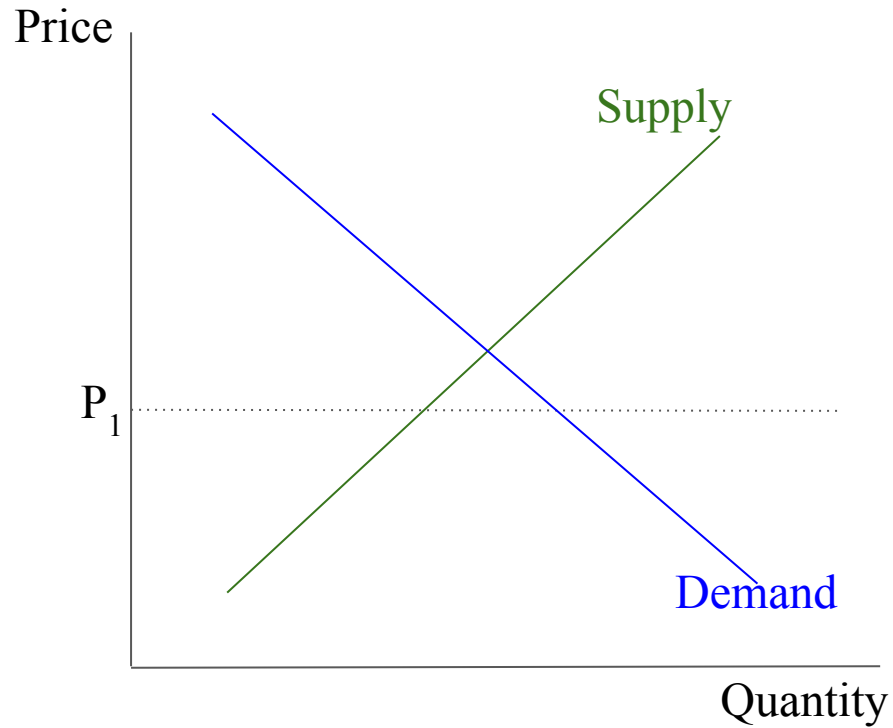
“There are only 24 hours in a day.”



Equilibrium

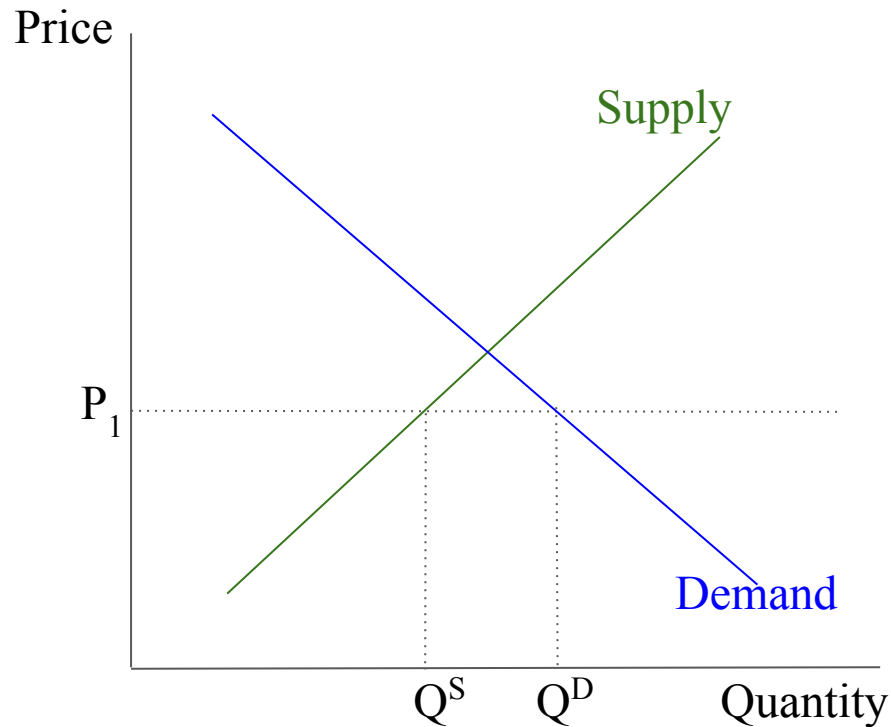
# Why Are Some Prices Wrong

- Why will  $P_1$  not be the price?



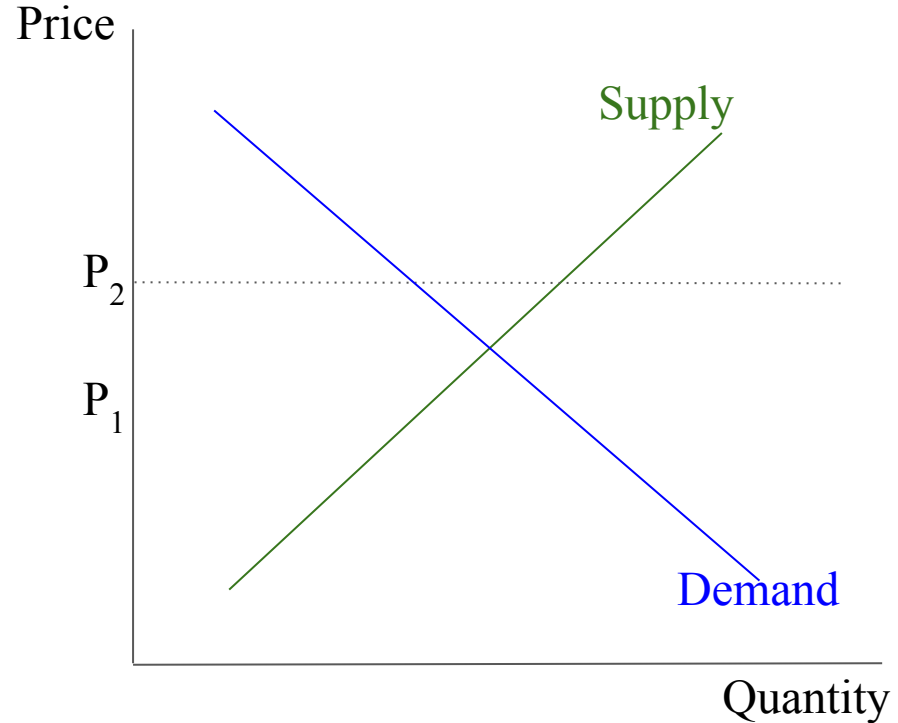
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  - Consumers will “bid up” the price
  - Where will the price stop?



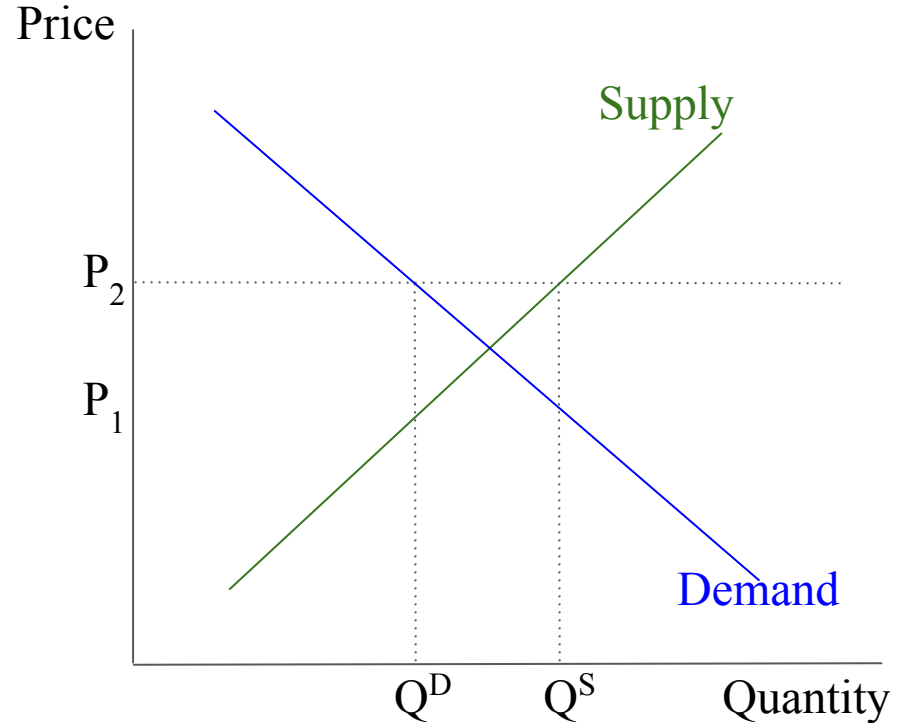
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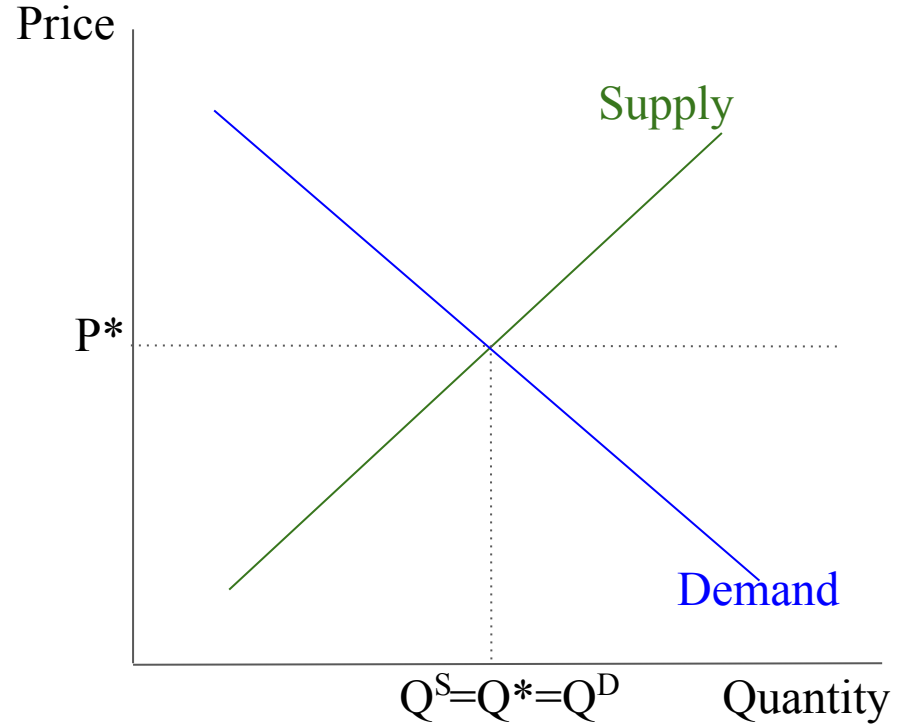
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  - Where will the price stop?
- Why will  $P_2$  not be the price?
  - Supply exceeds Demand (Surplus)
  - Producers will undercut each other
  - Where will the price stop?



# The Price is Right

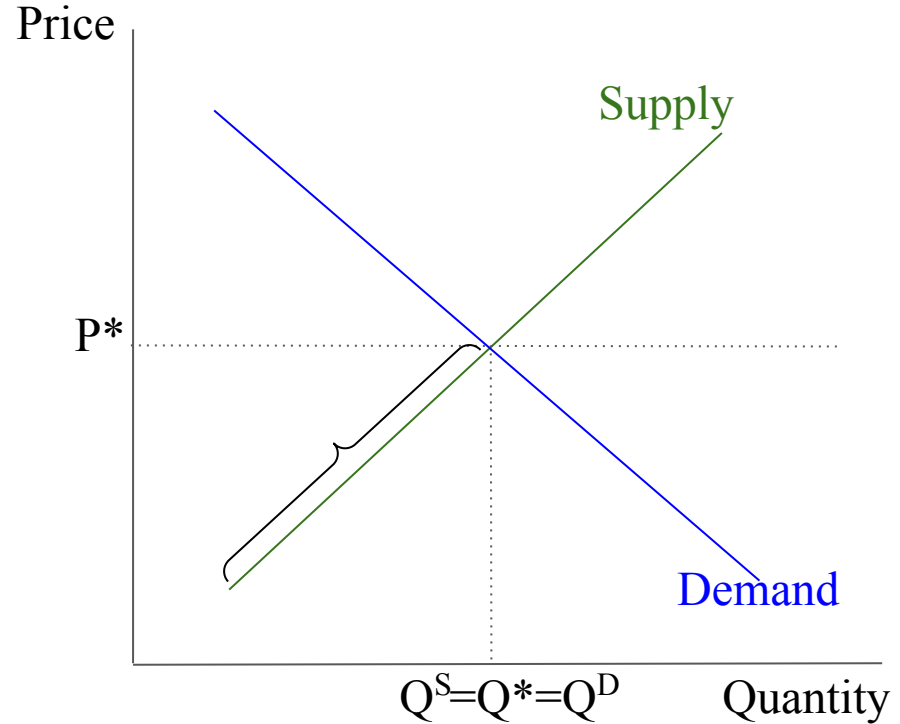
- $P^*$  clears the market
  - Demand equals Supply (Equilibrium)





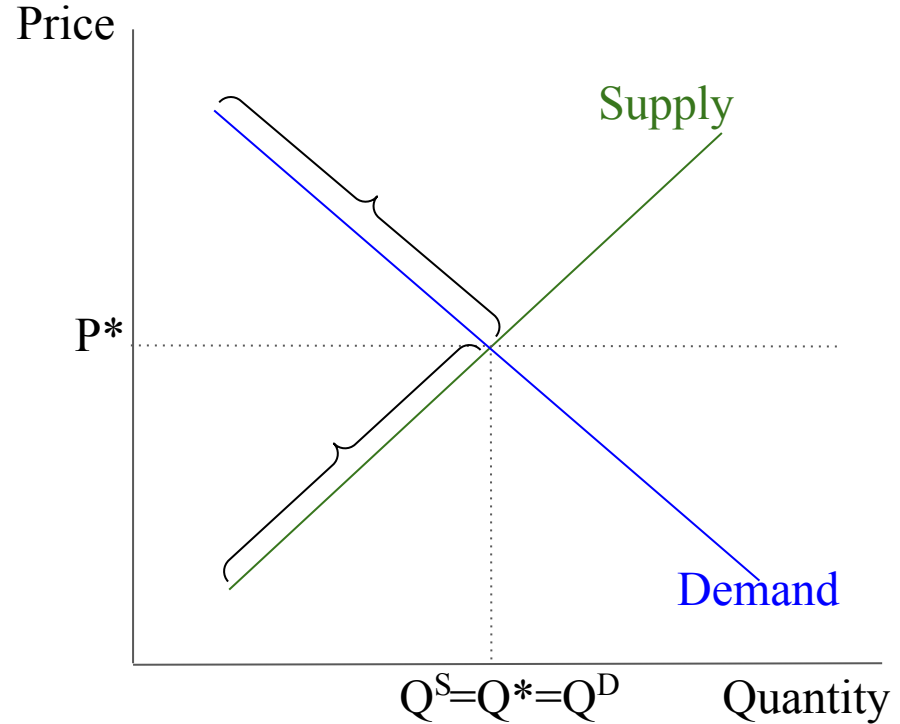
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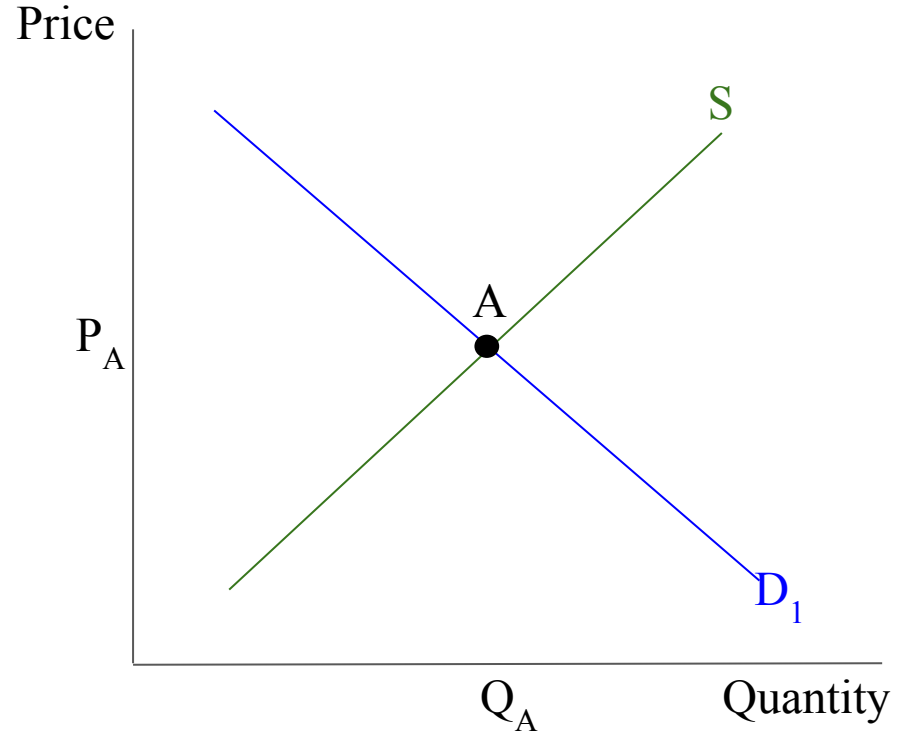
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# A Positive Demand “Shock”

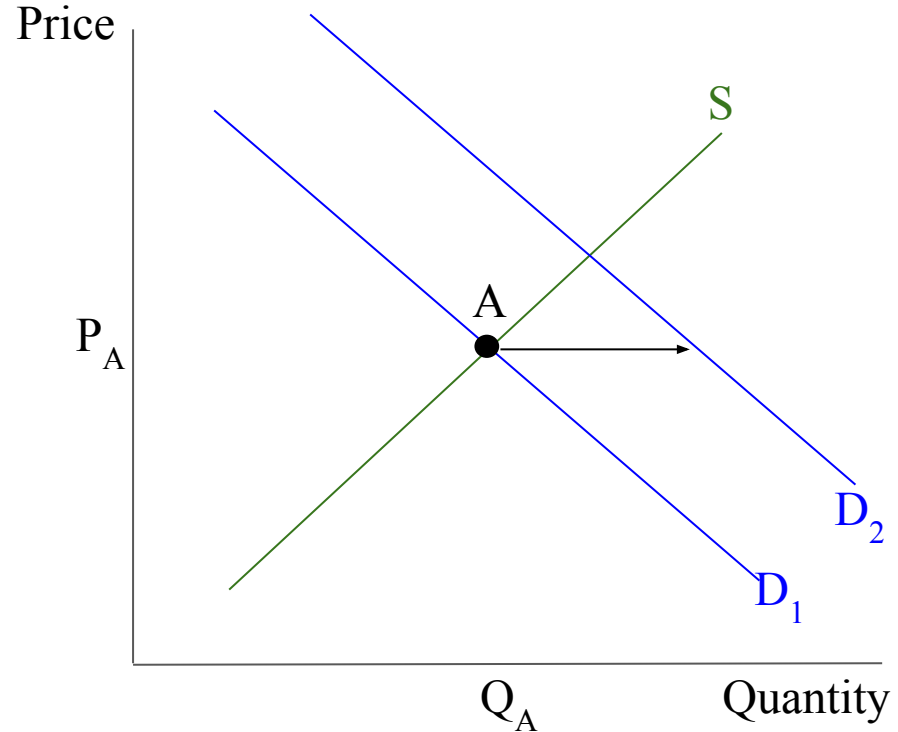
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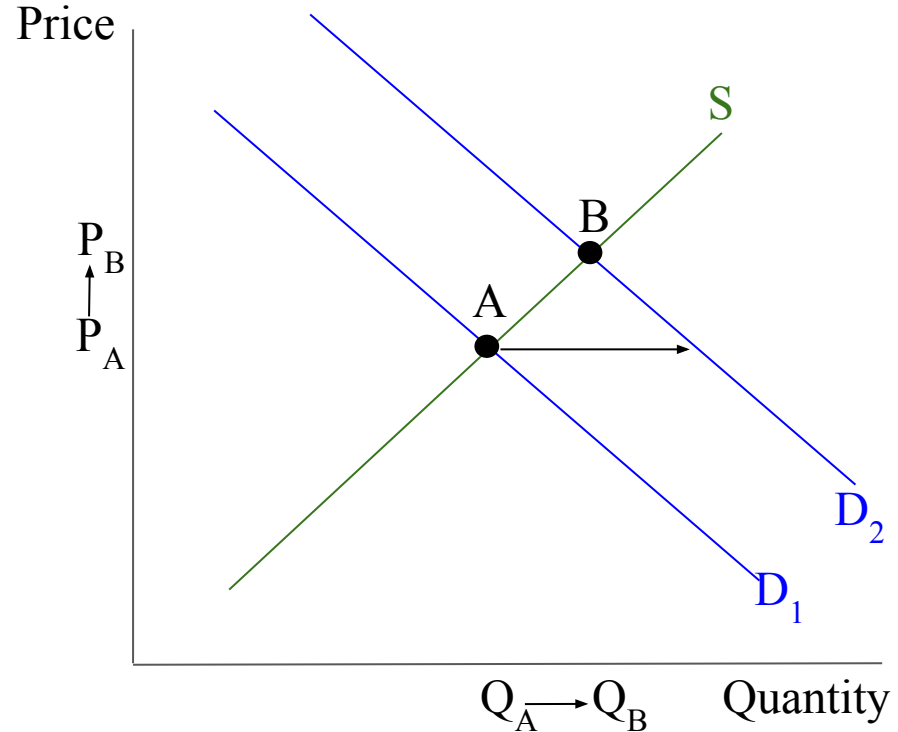
- At any price, quantity demanded goes up
  - Shift the Demand Curve up/right
- At the old price, there is a shortage
  - Consumers bid up the price



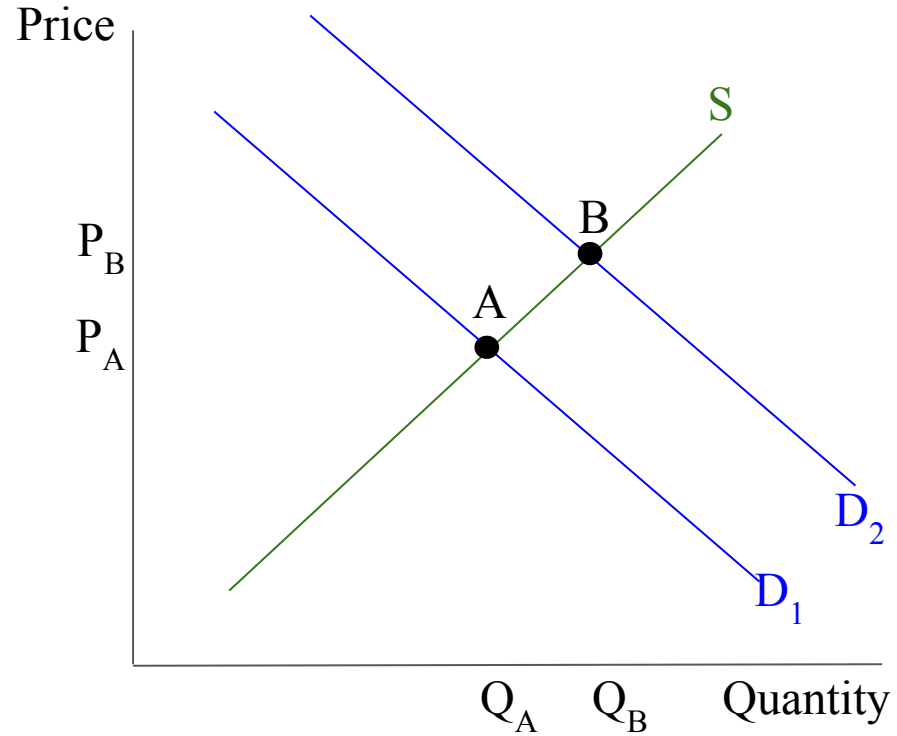
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- At any price, quantity demanded goes up
  - Shift the Demand Curve up/right
- At the old price, there is a shortage
  - Consumers bid up the price
- Producers respond in 2 ways
  - Raise price
  - Supply more (cost is now justified)
- Part of the increase in demand is “choked off” by price increase from Supply Curve

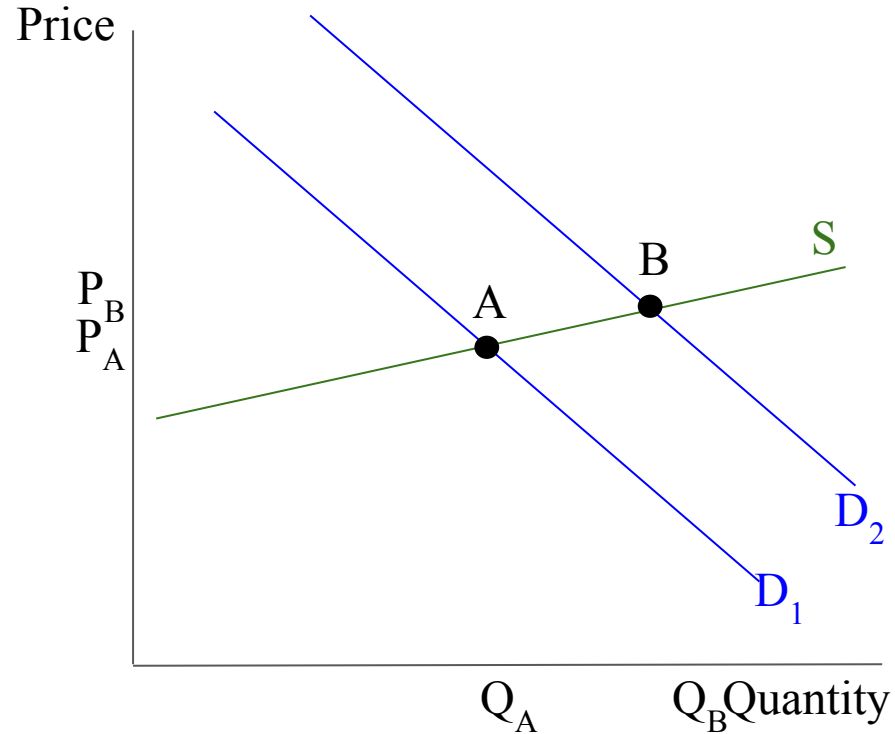


# Shocks and Elasticities



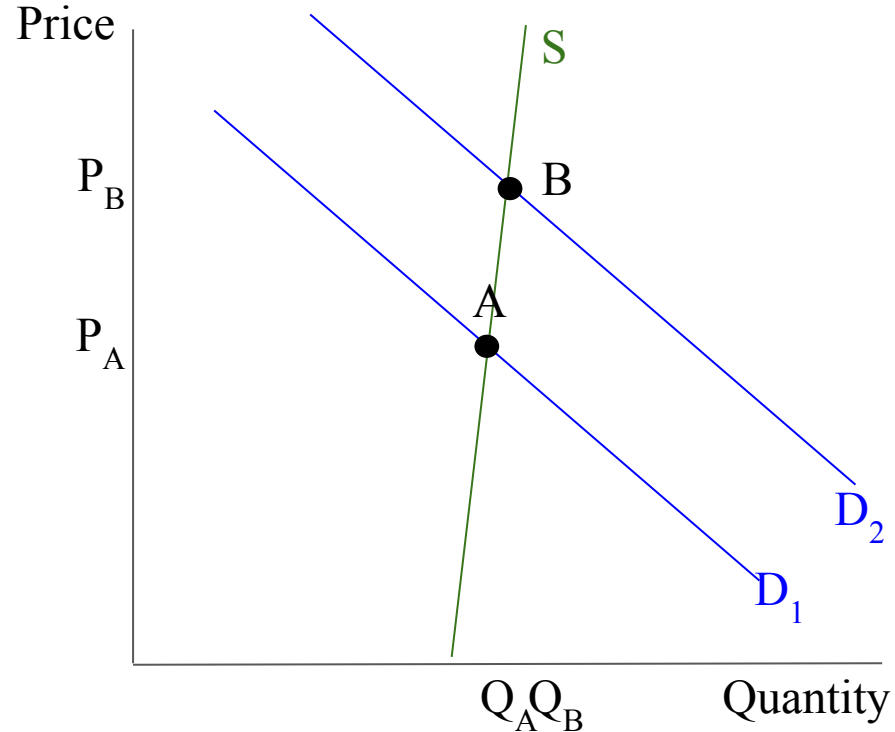
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*More elastic curves lead to larger quantity changes, smaller price changes*



# Shocks and Elasticities

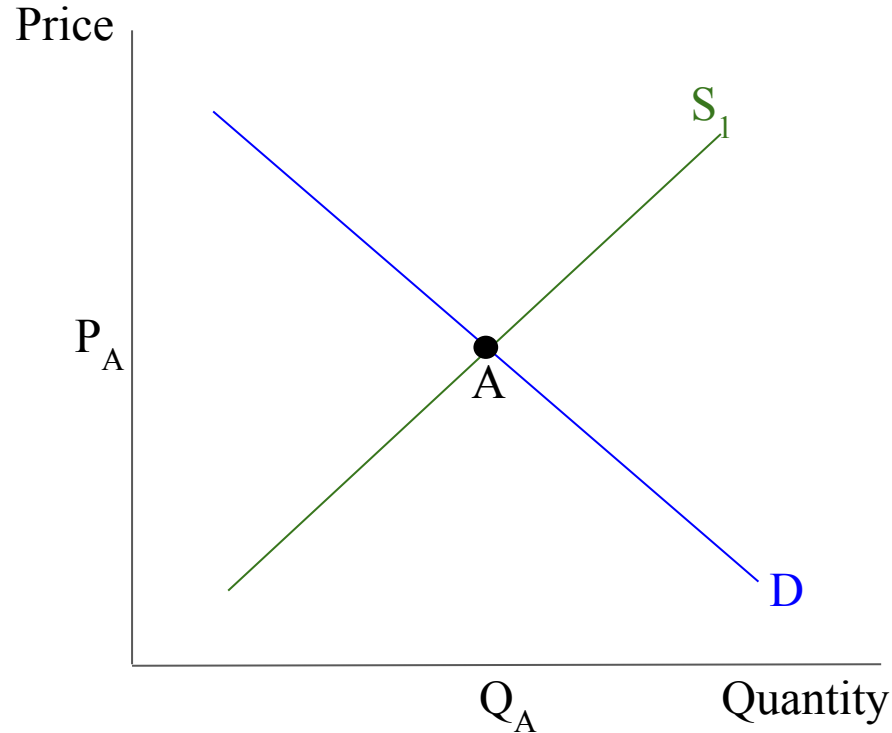
*More elastic curves lead to larger quantity changes, smaller price changes*  
*Less elastic curves lead to smaller quantity changes, larger price changes*





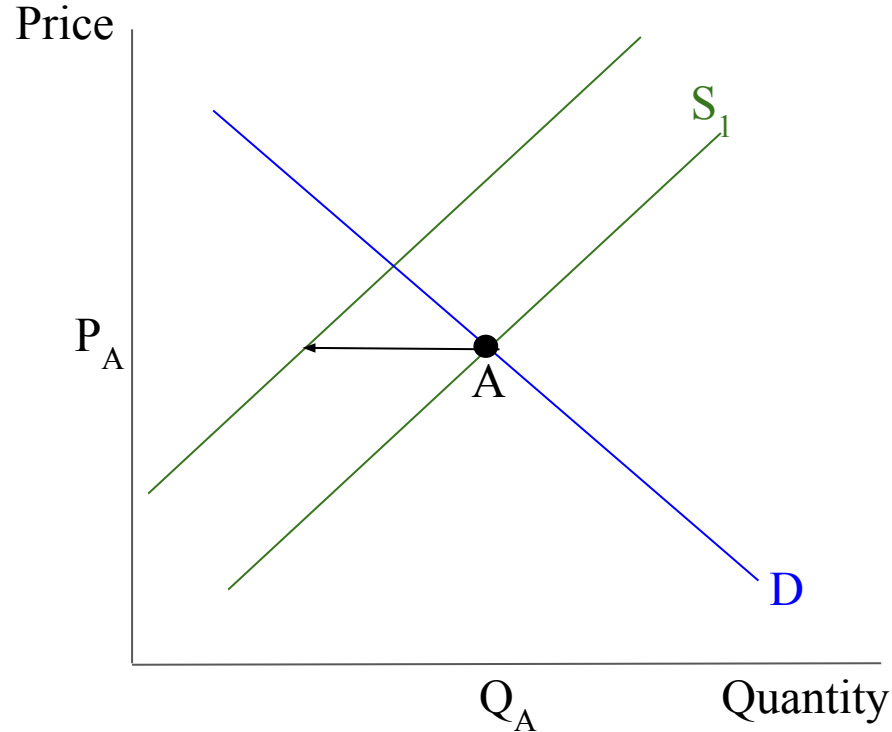
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How would a nasty storm out at sea affect the market for fish?



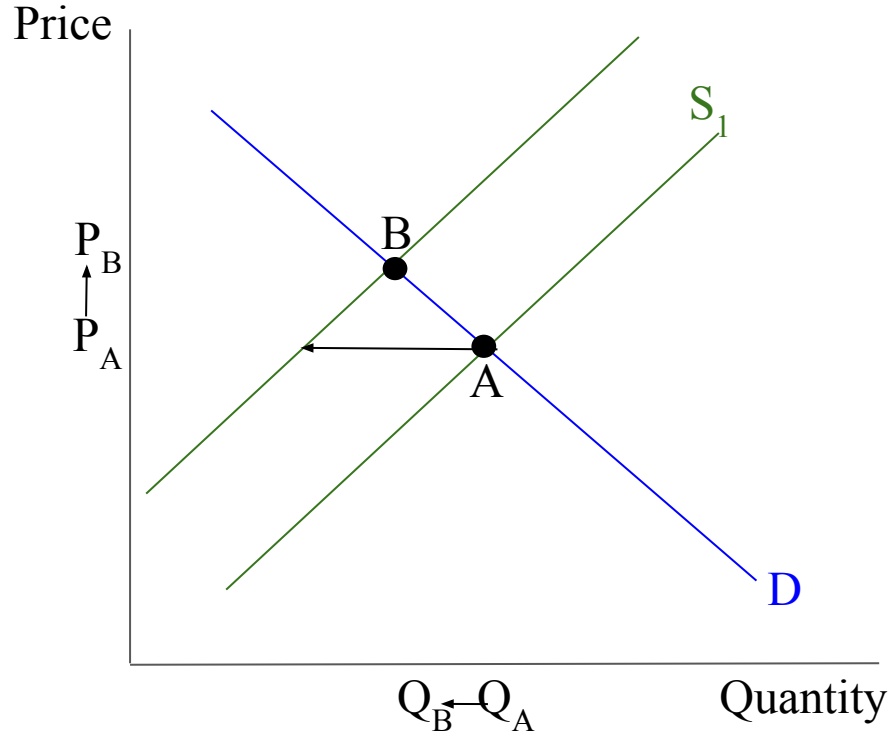
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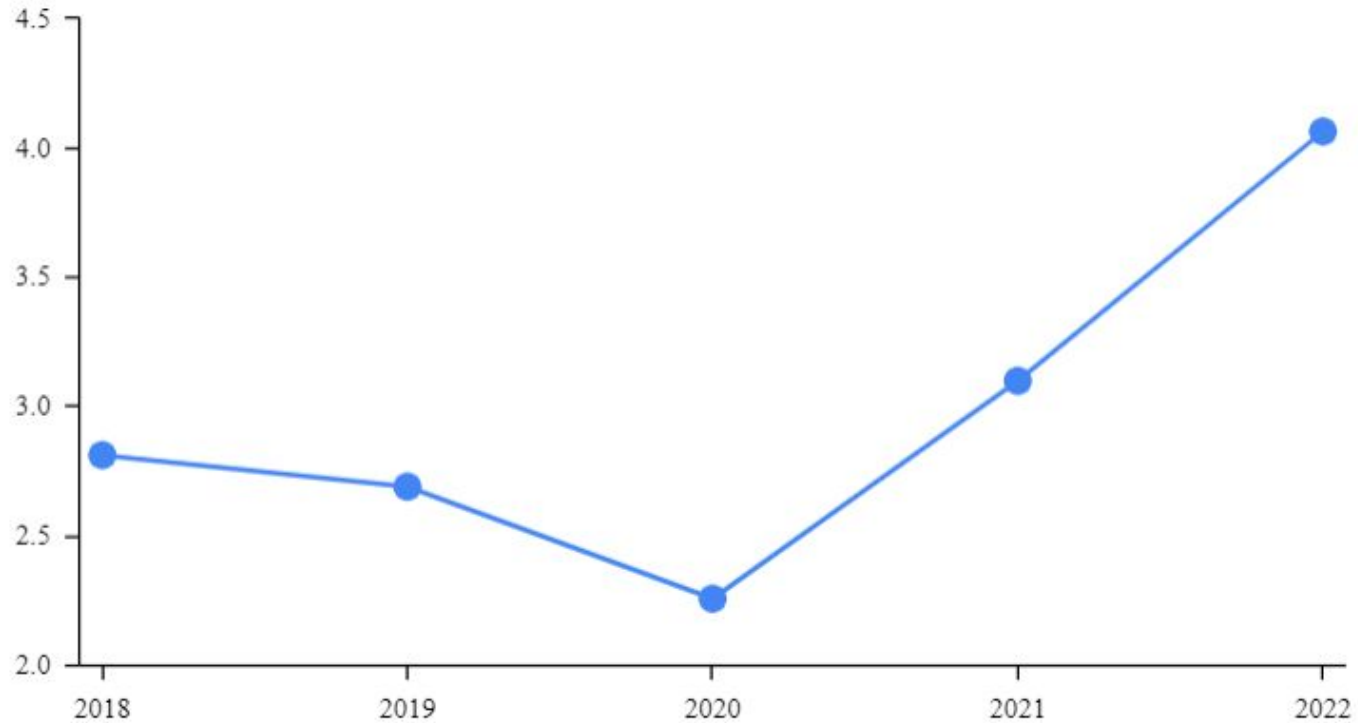
# Analyzing a Shock with Supply and Demand

1. Determine which Curve(s) are affected by the shock
  - Supply, Demand, neither, or both!
2. Determine whether the affected Curve(s) are negatively or positively impacted
  - Demand
    - Positive: shift up/right
    - Negative: shift down/left
  - Supply
    - Positive: shift down/right
    - Negative: shift up/left
3. Shift curves and find new intersection
4. Results
  - Demand shocks move Price and Quantity in the same direction
  - Supply shocks move Price and Quantity in opposite directions
  - Size of effects depend on the size of the shock and the elasticities of the Curves
    - Elastic: Quantity changes a lot, Price changes very little
    - Inelastic: Quantity changes very little, Price changes a lot

# Supply and Demand Application: Gas Prices

# Retail Gas Prices

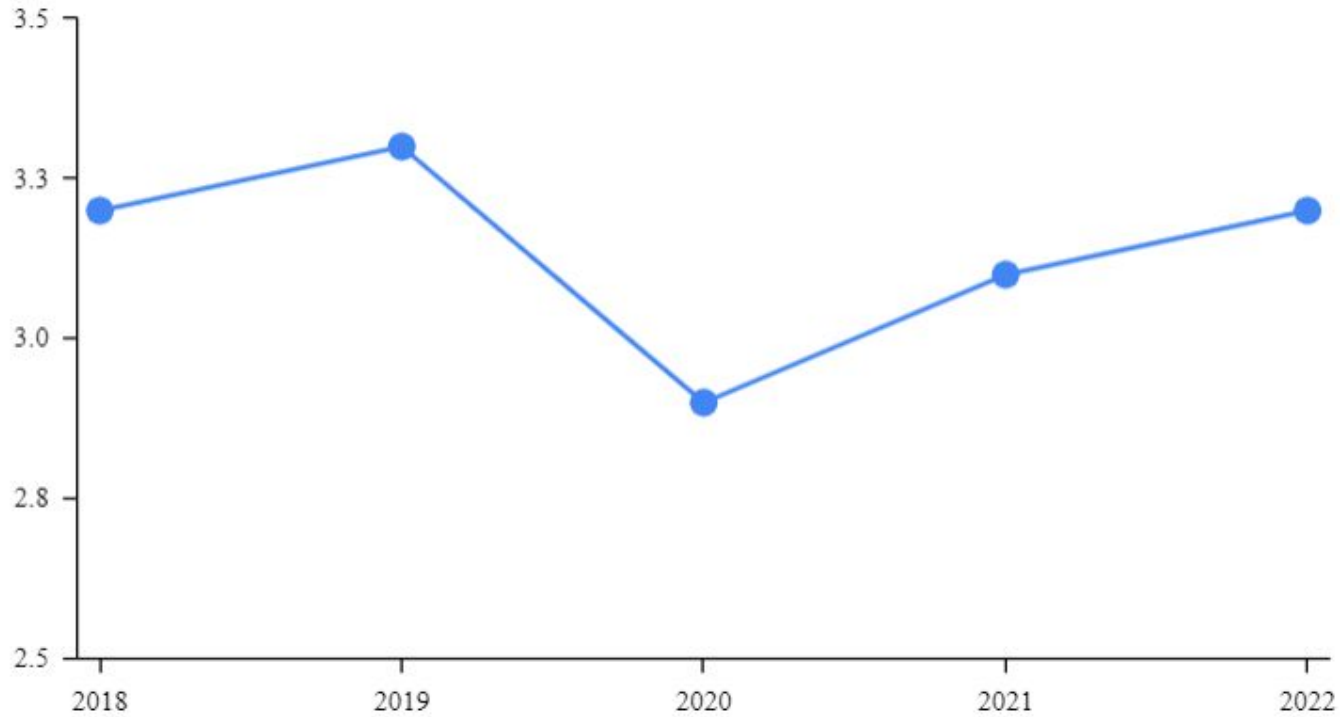
Retail Gas Prices (All Grades, Dollars per Gallon)



Source: U.S. Energy Information Administration

# Car Travel

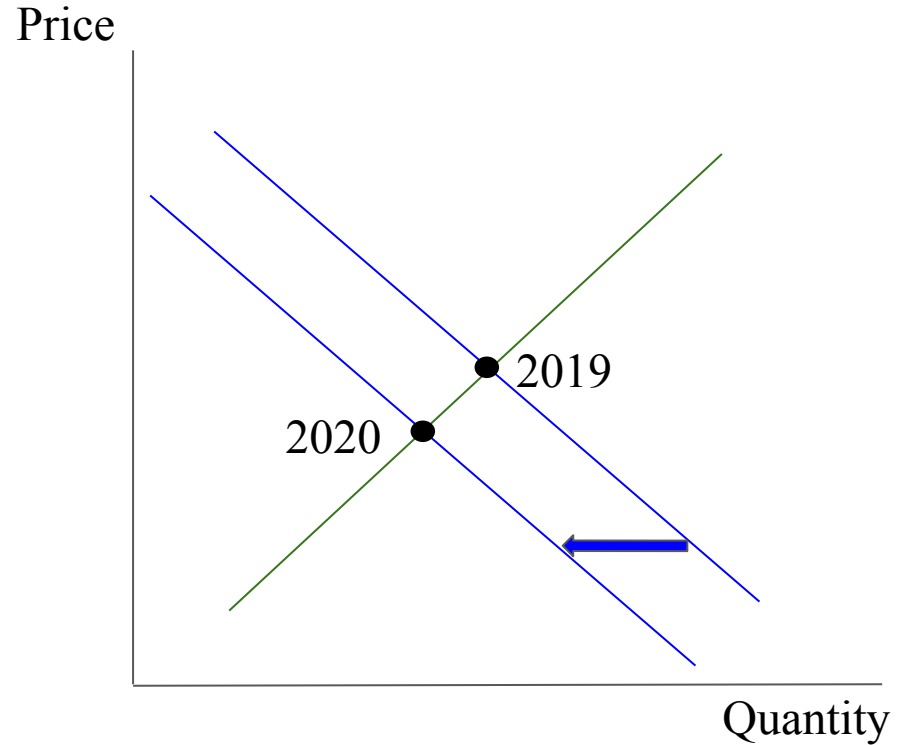
Miles driven per day (millions)



Source: U.S. Federal Highway Administration

# 2020

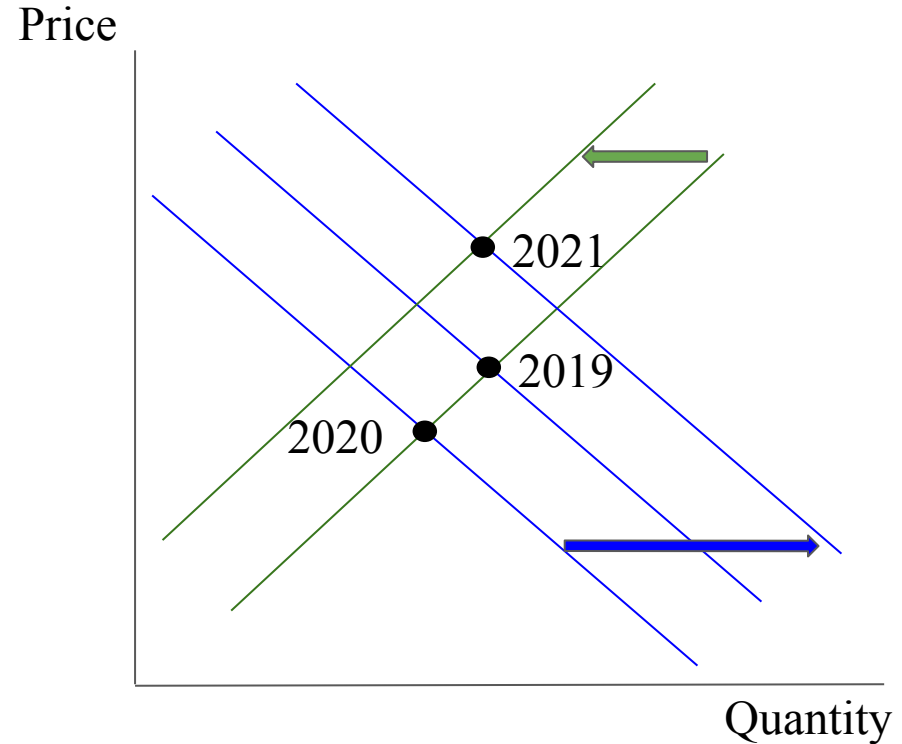
- Compared to 2019, 2020 saw lower prices and less usage.
- This was driven by the drastic reduction in activity caused by the pandemic
- When price and quantity move in the same direction, that is the classic sign of a demand shock.





# 2021

- In 2021, usage returned close to 2019, but prices were notably higher.
- Such a pattern requires shifts in both the demand and supply curves.
- Demand shifted out due to vaccinations and optimism about a return to normal
- And supply shifted in due to labor shortages and supply chain problems



# 2022

- War in Ukraine (supply) and continued post-Omicron normalization push price higher and higher.

