

# PART 2

## How Markets Function

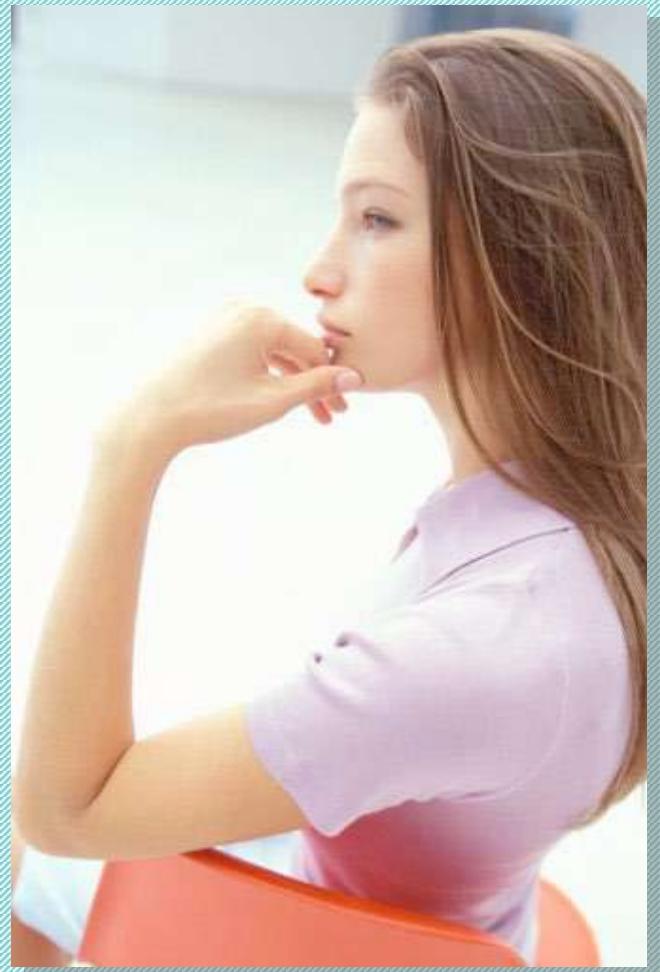
PRINCIPLES OF

# Microeconomics

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Changsha University of Science and Technology

# *Chapter 7: Elasticity and Its Applications*



# Chapter 7: Elasticity and Its Applications

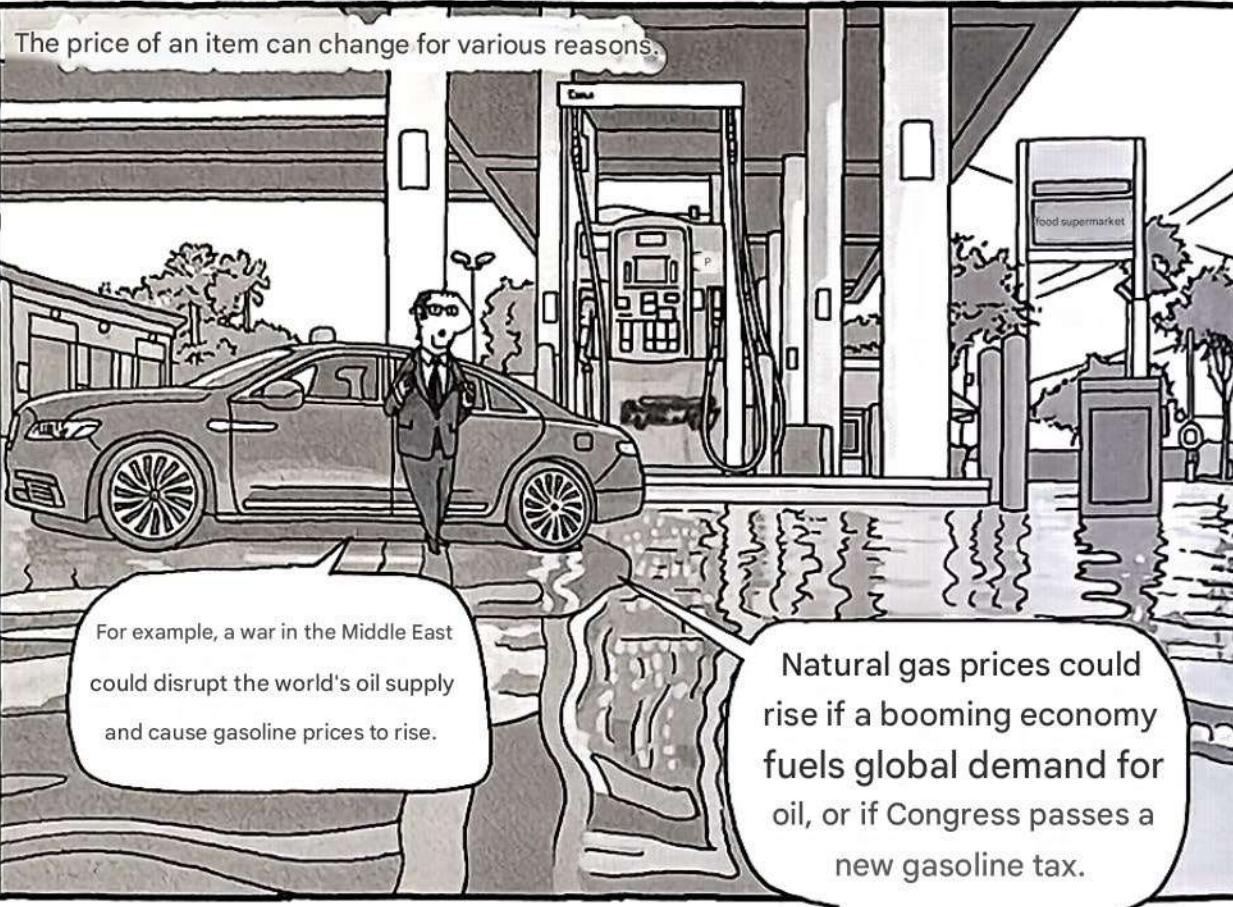
- There's an interesting saying: "Teach a parrot to say 'supply and demand,' and you've got an economist."
- In Chapter 2, "Elasticity and Its Applications," you will find out why this saying makes sense. You will be able to use the supply and demand model to analyze essential economic phenomena and policy outcomes.
- Now, you're on your way to becoming an economist (or at least a well-trained parrot).

# Chapter 7: Elasticity and Its Applications

- **Demand elasticity**
- Supply elasticity
- Three applications of supply, demand, and elasticity

# Demand Elasticity

elasticity of demand



The price of an item can change for various reasons.

For example, a war in the Middle East could disrupt the world's oil supply and cause gasoline prices to rise.

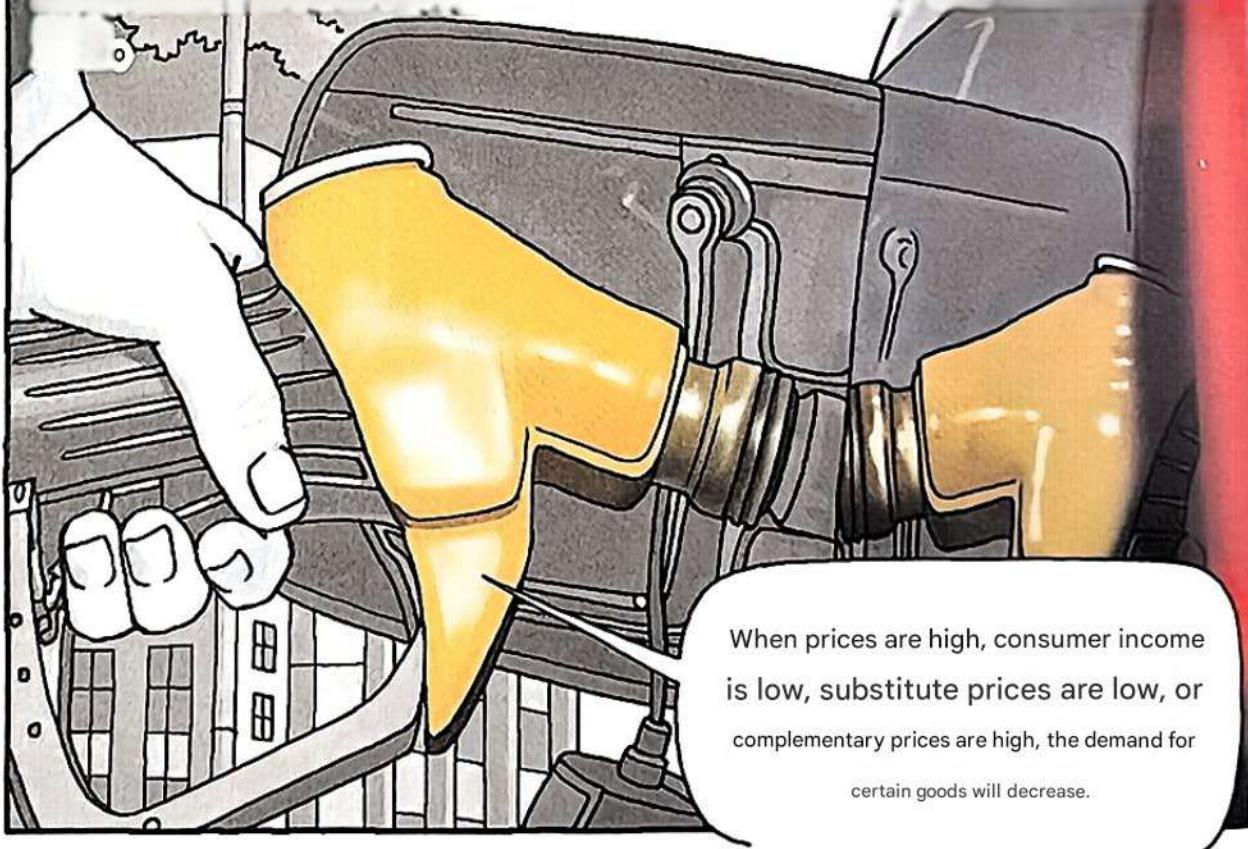
Natural gas prices could rise if a booming economy fuels global demand for oil, or if Congress passes a new gasoline tax.

# Demand Elasticity

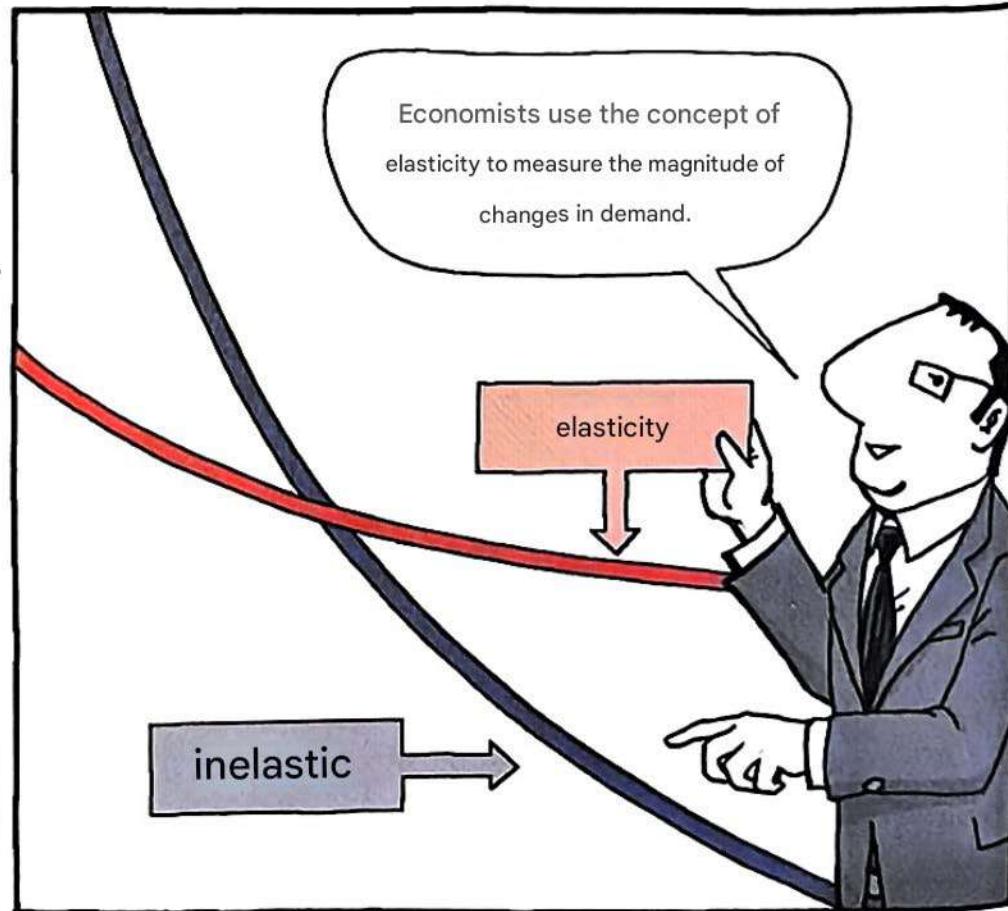
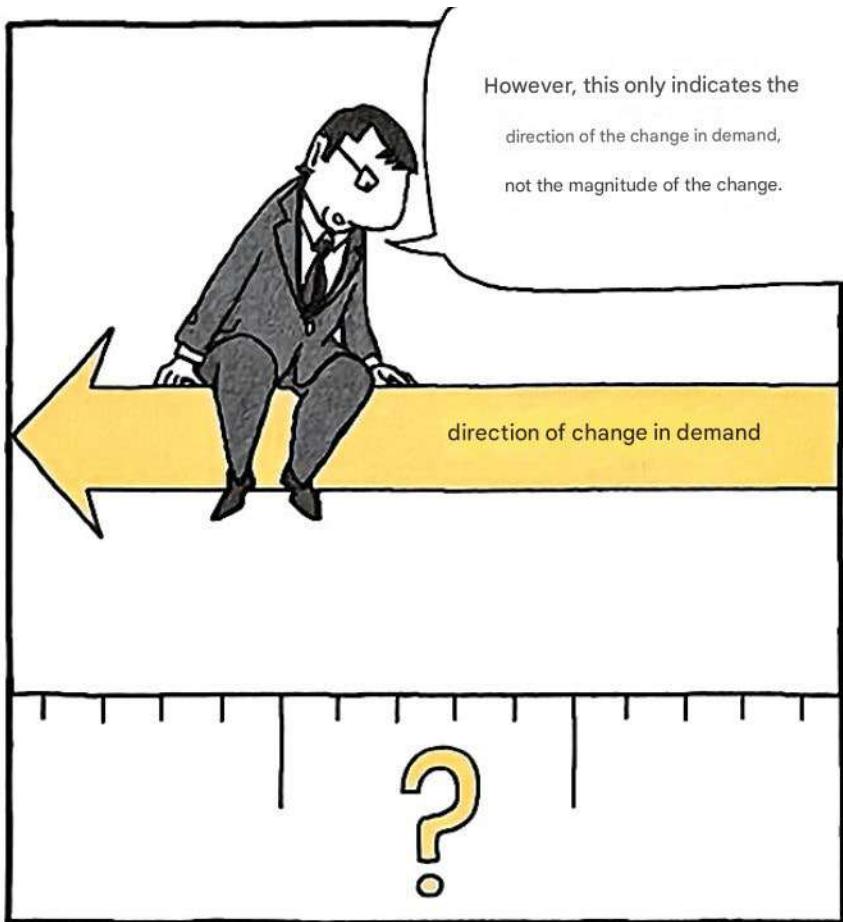
We know that when the price of a good rises, consumers will buy less of it, but how much less will they buy?



As we learned from the law of demand, you could answer that consumers will buy less gasoline.



# Demand Elasticity



# Demand Elasticity

Price elasticity of demand measures the price elasticity of demand.

degree of response to changes.

price elasticity of demand

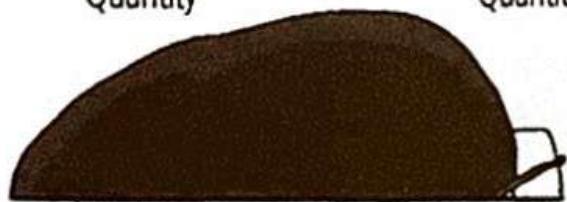
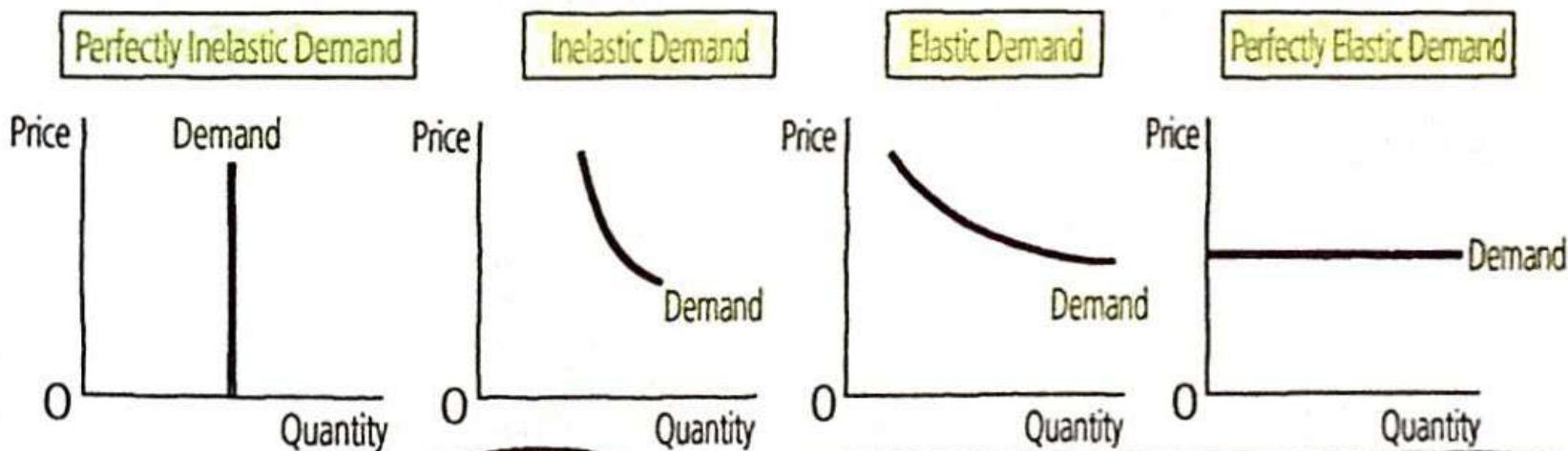
Percentage change in demand

$$= \frac{\text{Percentage change in demand}}{\text{Price change percentage}}$$

Price change percentage

# Demand Elasticity

Demand for a good is said to be elastic if the quantity demanded responds substantially to changes in price, and demand is said to be inelastic if the quantity demanded responds only slightly to changes in price.



The shape of the demand curve reflects the elasticity of demand. A steeper demand curve indicates that consumers do not respond very much to a change in price and a flatter demand curve indicates that consumers respond a lot to a change in price.

# Demand Elasticity

The price elasticity of demand for any good measures how much less a consumer will buy as the price of that good increases.

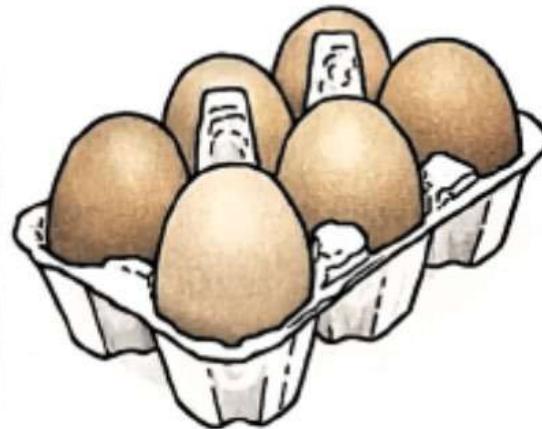
Goods with similar substitutes tend to have more elastic demand because consumers are more likely to switch from one good to another.

For example, butter and margarine are easily substitutable for each other. A slight increase in the price of butter can lead to a significant decrease in butter sales.



# Demand Elasticity

In contrast, since eggs are a food with no close substitutes, a slight increase in egg prices will not cause a significant decrease in egg sales.



# Demand Elasticity



The demand elasticity of a product depends on how broadly we define the boundaries of that product.

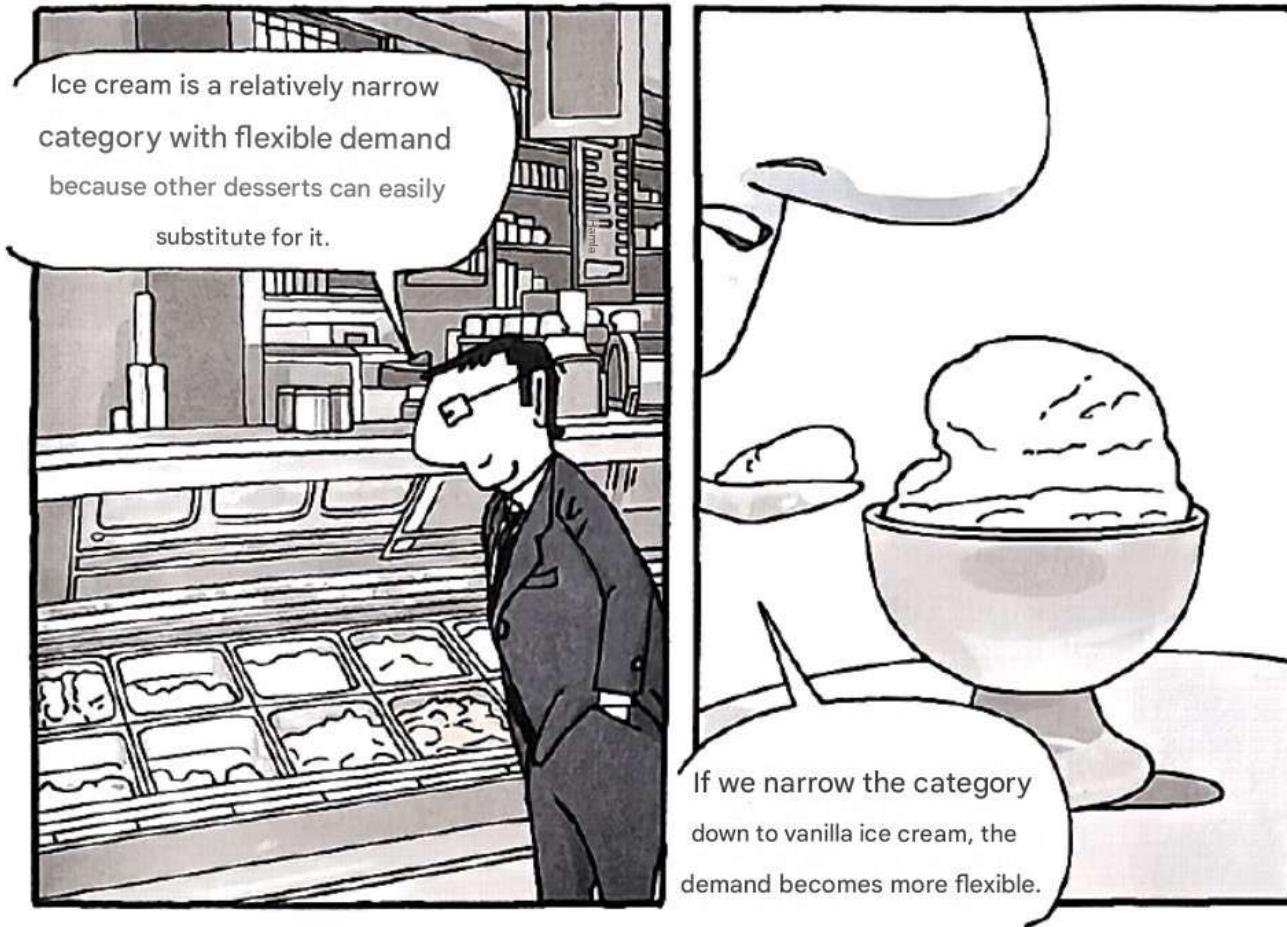


Demand for narrowly defined products is often more elastic than that for broadly defined products because narrowly defined products are easier to find.

\*Close substitutes.

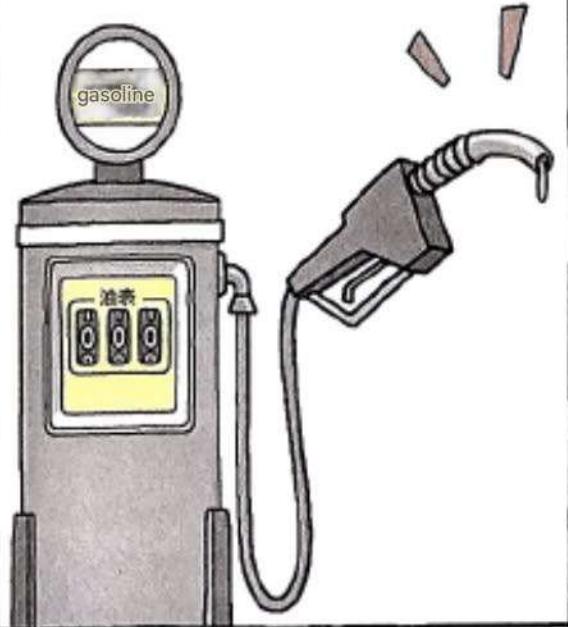
For example, the demand for the "groceries" category is quite inelastic because there are no good substitutes.

# Demand Elasticity



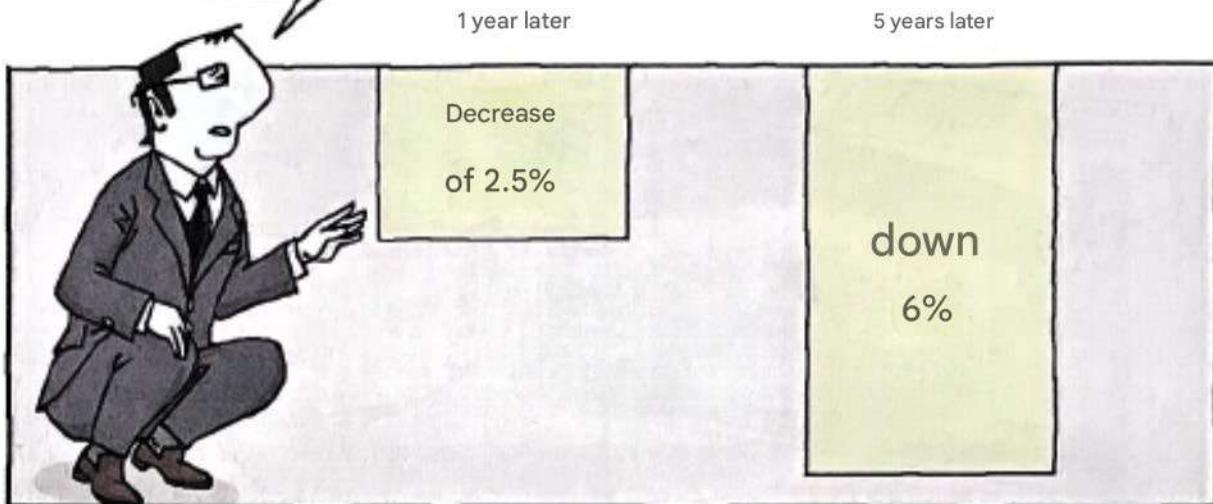
# Demand Elasticity

Numerous studies have explored consumer responses to changes in gasoline prices.



When gasoline prices increase by 10%, the impact on consumption decline one year later is different from the impact five years later.

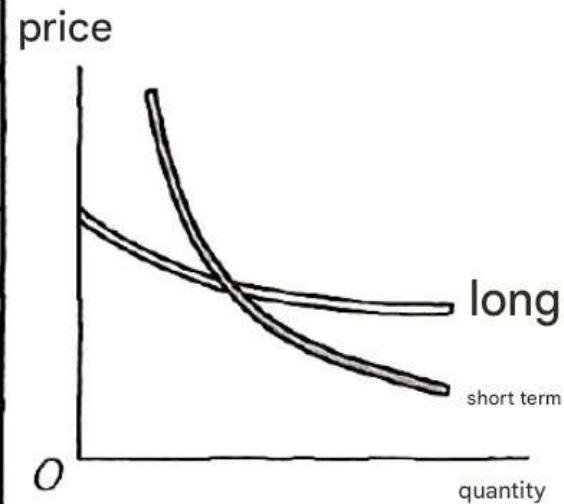
Generally speaking, price changes have a greater long-term impact on demand than a short-term impact.



# Demand Elasticity



As we have seen before, time also affects the elasticity of demand: the impact of rising gasoline prices on reduced consumption changes over time.



# Demand Elasticity

In addition to the price elasticity of demand, economists use other elasticities to describe the behavior of buyers in a market.

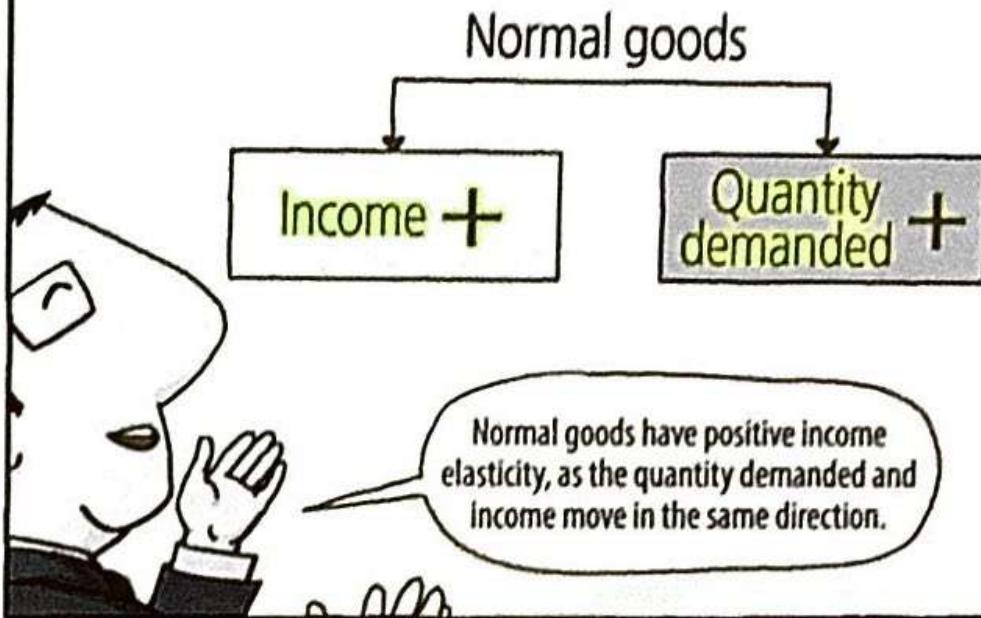
## Income elasticity of demand

$$= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

## Cross-price elasticity of demand

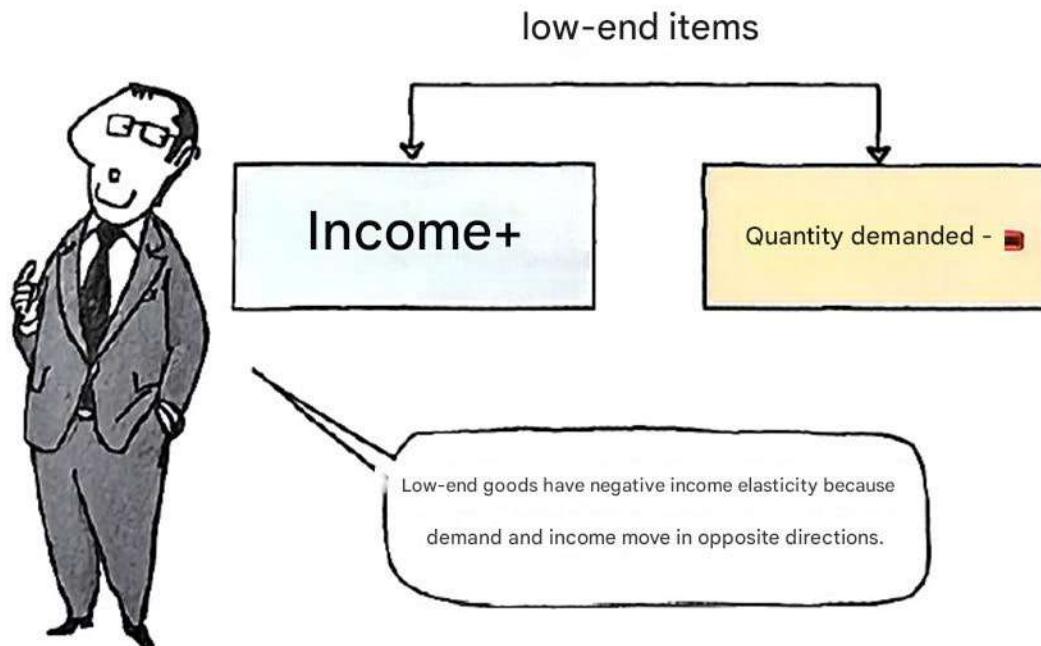
$$= \frac{\text{Percentage change in quantity demanded of good 1}}{\text{Percentage change in the price of good 2}}$$

To measure how the quantity demanded changes as consumer income changes, the income elasticity of demand is used.



# Demand Elasticity

For low-end items like taking public transportation, the higher the income, the lower the demand.

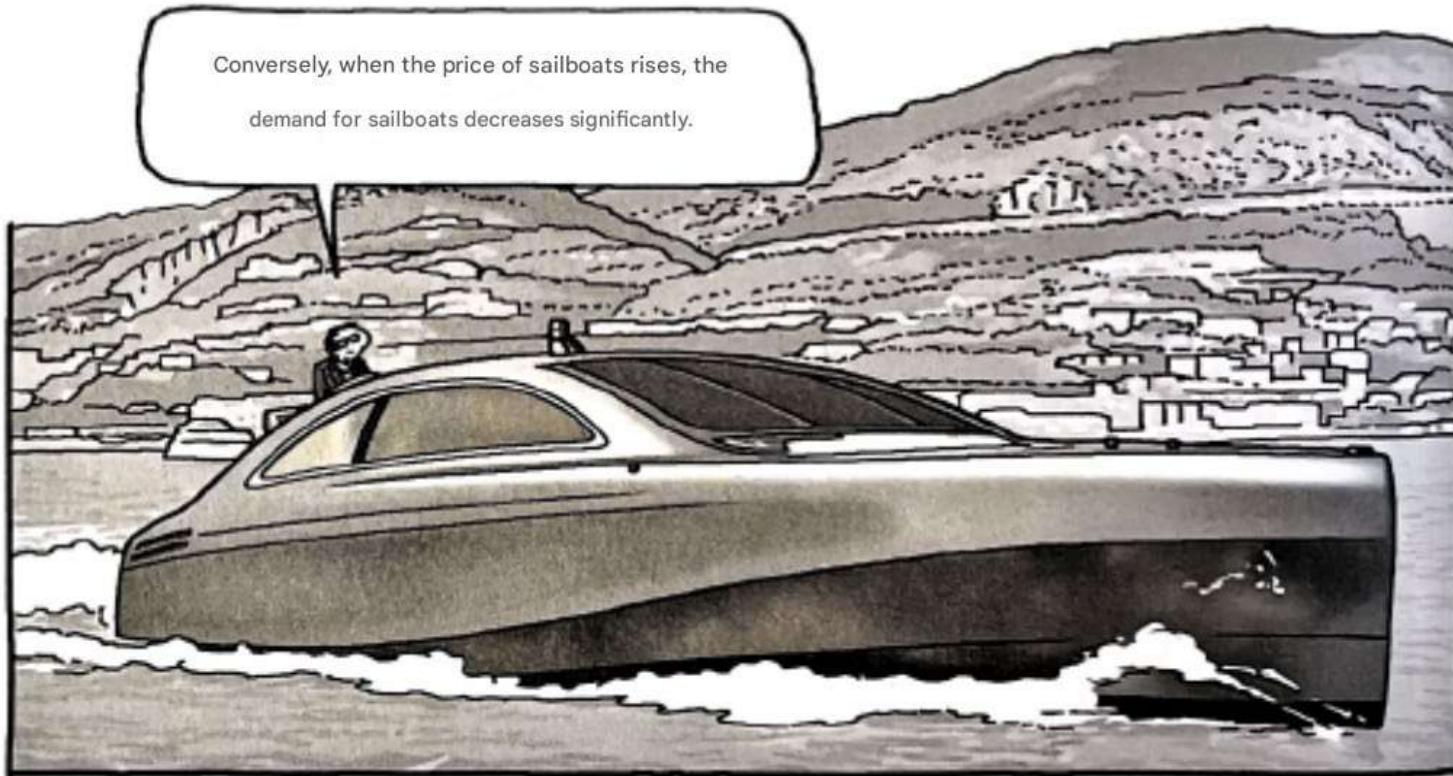


Even for ordinary goods, the income elasticity largely depends on whether the item is a necessity or a luxury.



# Demand Elasticity

Demand for necessities is often inelastic, while demand for luxuries is often elastic. When the price of medical care increases, people may visit the doctor slightly less often than usual, but not significantly.



# Demand Elasticity

Necessities such as food and clothing tend to have low income elasticity because consumers will buy these items even if their income is low.



necessity



luxury goods

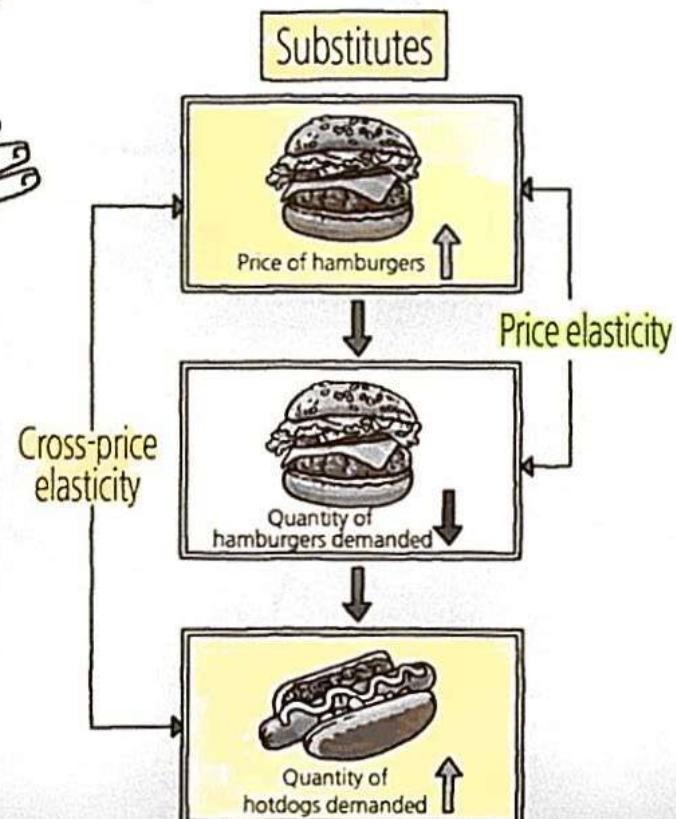


Luxury items such as caviar and diamonds often have high income elasticity because people can live without them.

The cross-price elasticity of demand measures how the quantity demanded of one good responds to a change in the price of another good.

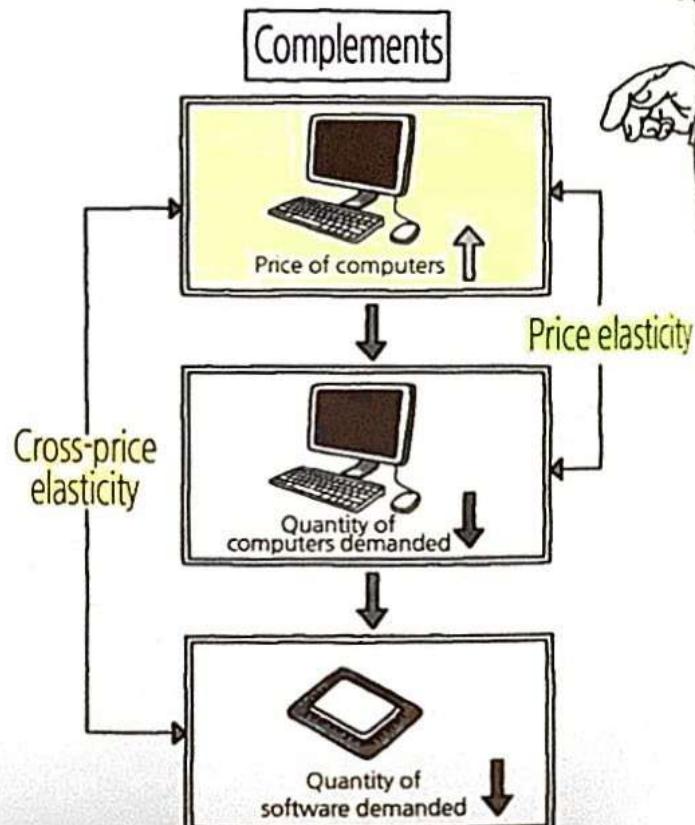
Substitutes are goods that are typically used in place of one another, such as hamburgers and hot dogs.

An increase in hot dog prices induces people to grill hamburgers instead. As the price of hot dogs and the quantity of hamburgers demanded move in the same direction, the cross-price elasticity is positive.



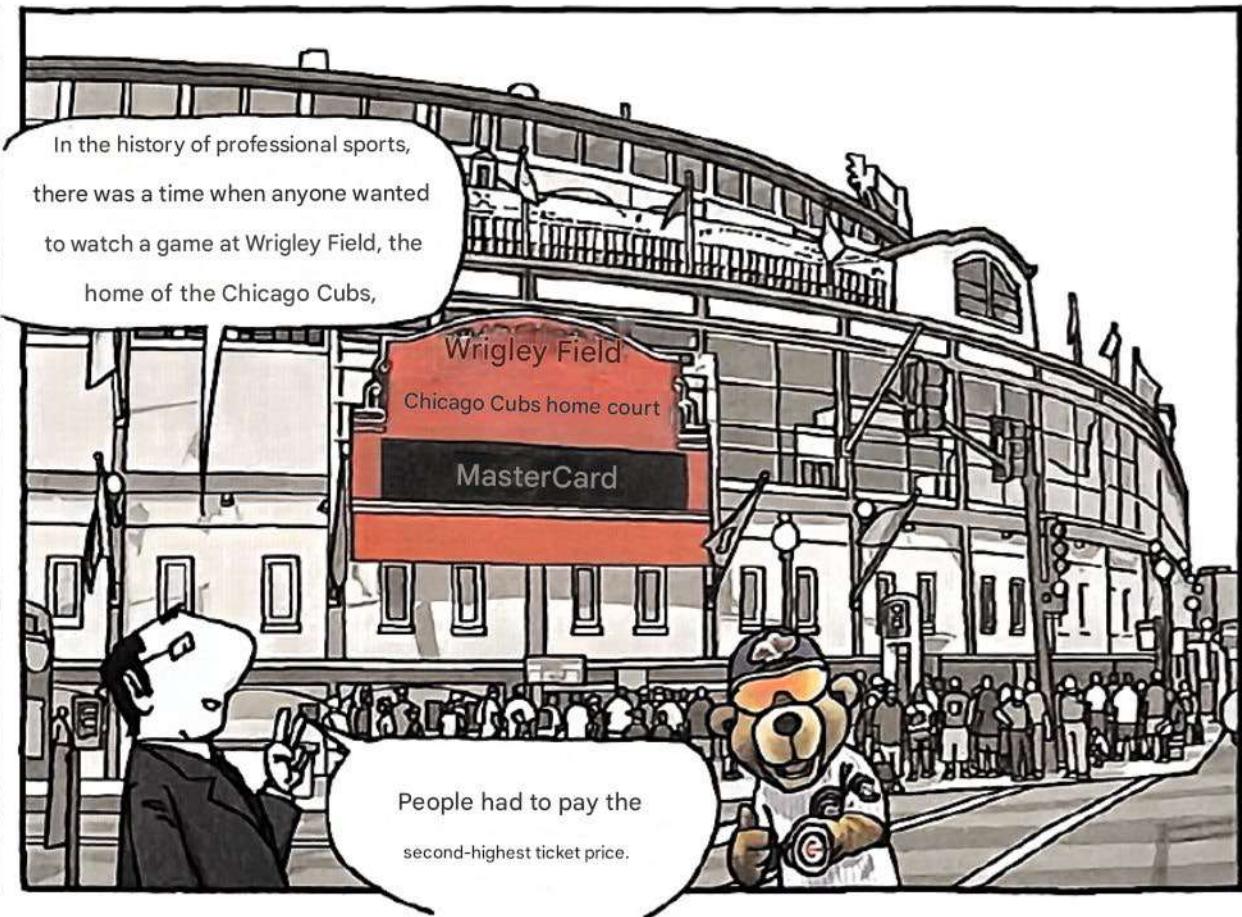
Complements are goods that are typically used together, such as computers and software.

In this case, an increase in the price of computers reduces the quantity of software demanded. Thus, the cross-price elasticity is negative.



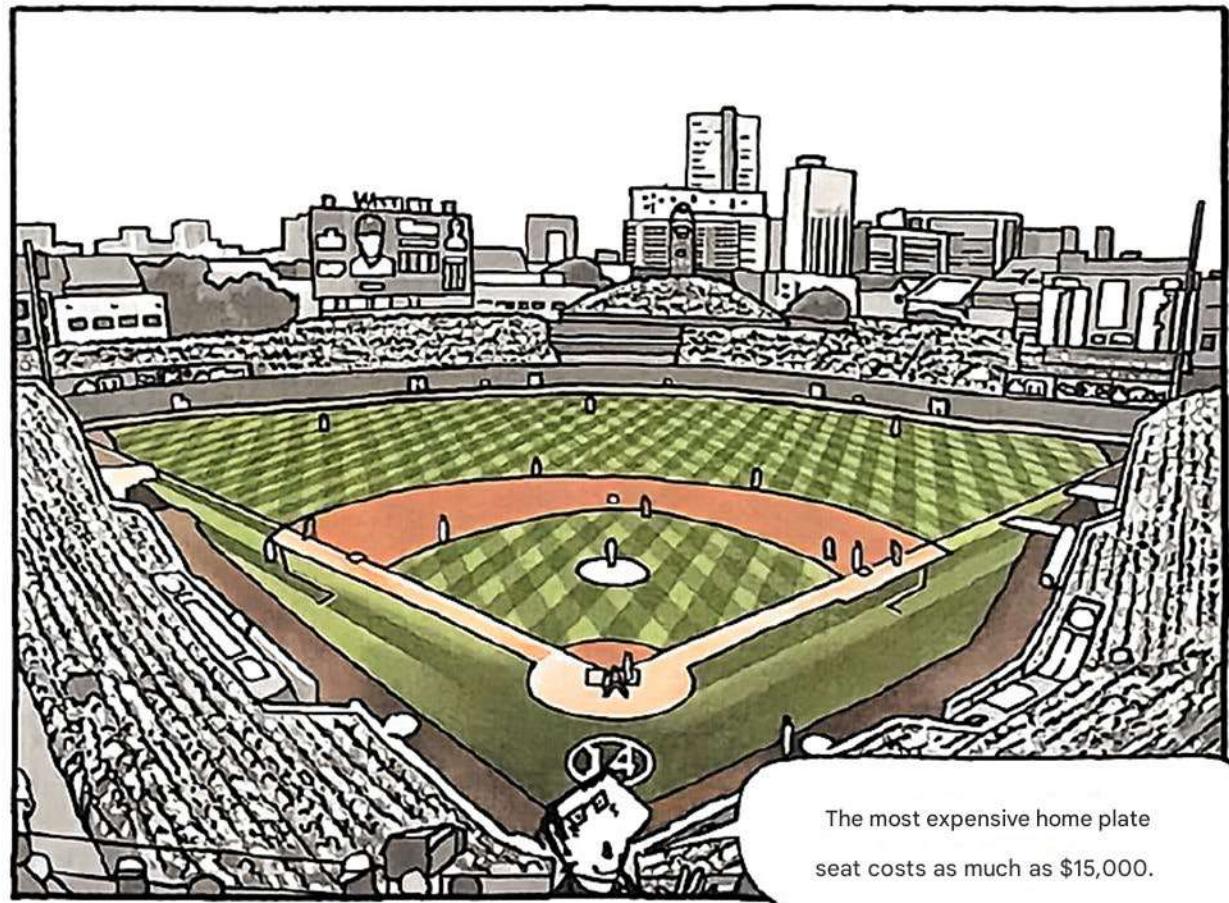
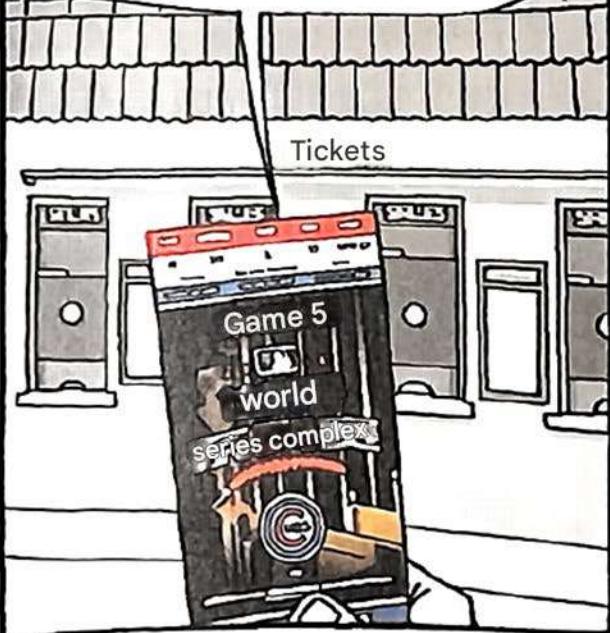
# Discrimination in Major League Baseball

## Discrimination in Major League Baseball



# Discrimination in Major League Baseball

The Cubs are hoping to end their 108-year championship drought, and the average ticket price for Game 5 of the series, their final home game, is \$4,614.

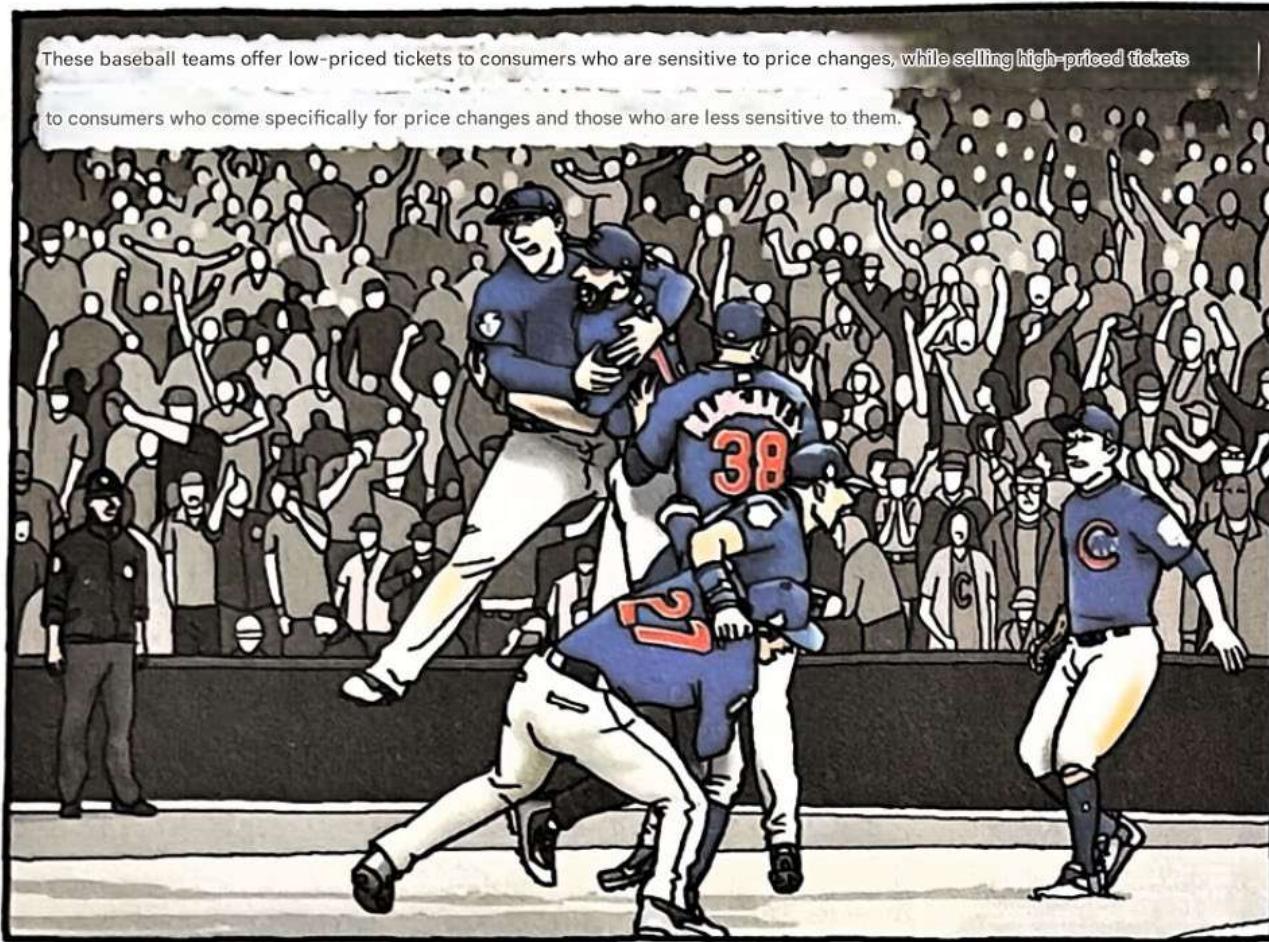


# Discrimination in Major League Baseball

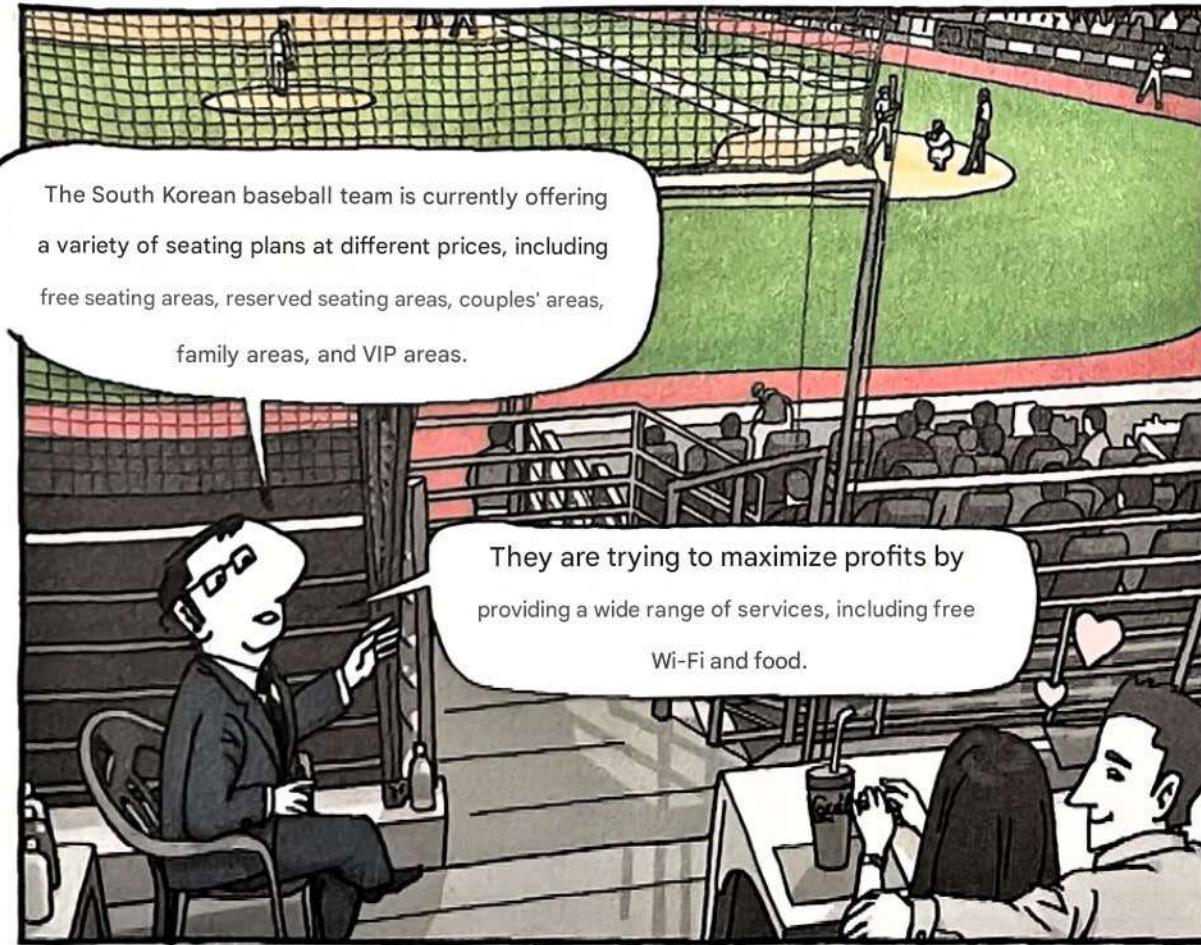
Professional baseball teams utilize the concept of price elasticity of demand and employ a market segmentation pricing system based on seating location.



# Discrimination in Major League Baseball



# Discrimination in Major League Baseball

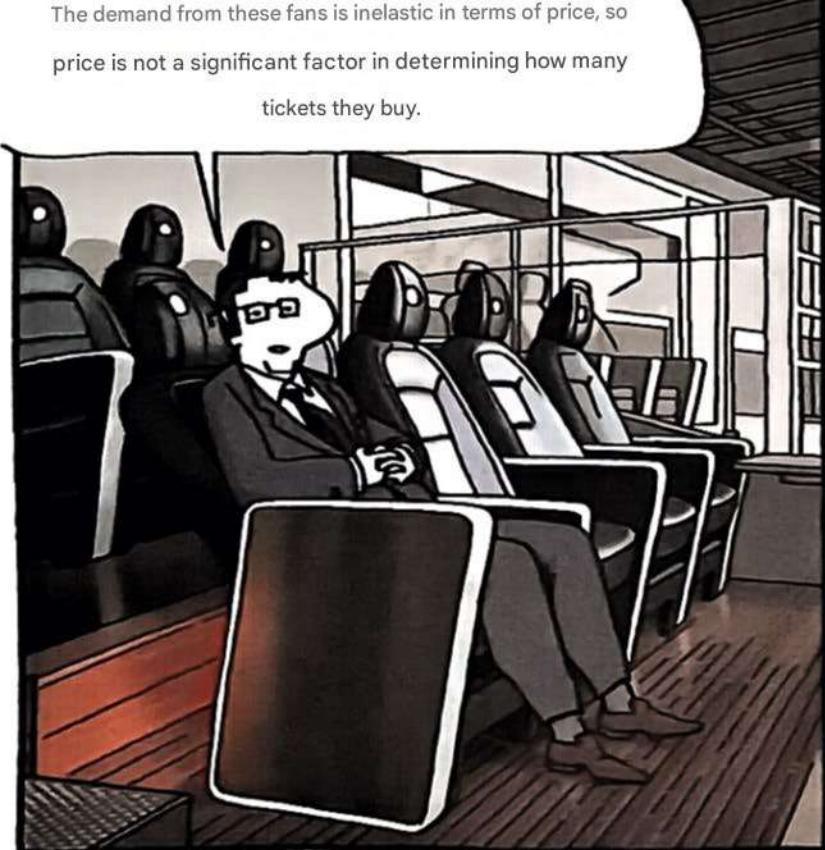


Those willing to pay the highest prices are the die-hard fans who value convenient facilities and expansive views, rather than the price.



# Discrimination in Major League Baseball

The demand from these fans is inelastic in terms of price, so price is not a significant factor in determining how many tickets they buy.



Fans with price-elastic demand prefer outdoor venues.



# Discrimination in Major League Baseball



# Discrimination in Major League Baseball



# SUMMARY



- The Law of Demand states that a decrease in the price of a good will lead to an increase in the quantity demanded. The price elasticity of demand measures how much the quantity demanded responds to a change in price.
  - If the quantity demanded responds substantially to a price change, the demand for that good is said to be elastic.
  - If the quantity demanded responds only slightly to a price change, the demand is said to be inelastic.
  - Demand tends to be more elastic when the good is a luxury rather than a necessity, when close substitutes are available, when the market is narrowly defined, and when consumers have more time to adjust to the price change.

# SUMMARY



- The price elasticity of demand is calculated as the percentage change in quantity demanded divided by the percentage change in price.

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

# SUMMARY

$$\text{Price elasticity} = \frac{20\%}{10\%} = 2$$

- For example, suppose a 10% increase in the price of ice cream causes the quantity demanded to fall by 20%. In this case, the price elasticity of demand would be calculated as follows:
  - When the elasticity is greater than 1, demand is considered elastic, meaning that the change in quantity demanded is proportionally larger than the change in price.
  - When the elasticity is less than 1, demand is considered inelastic, meaning that the change in quantity demanded is proportionally smaller than the change in price.
  - If the elasticity is exactly 1, the percentage change in quantity demanded equals the percentage change in price, which is called unit elastic demand.

# SUMMARY



- Since the price elasticity of demand measures the responsiveness of quantity demanded to changes in price, it is closely related to the slope of the demand curve.
  - In general, the flatter the tangent line to the demand curve at a given point, the greater the price elasticity of demand.
  - Conversely, the steeper the tangent line to the demand curve at a given point, the smaller the price elasticity of demand.
- Total revenue, which is the amount paid by buyers and received by sellers for a good, is calculated as the price of the good multiplied by the quantity sold. If demand is inelastic, a price increase will raise total revenue. If demand is elastic, a price increase will reduce total revenue.

# SU

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

- Demand Income Elasticity measures how the quantity demanded changes when consumer income changes. It is calculated as the percentage change in quantity demanded divided by the percentage change in income.
  - The income elasticity for normal goods is positive because as income increases, the demand for these goods also rises.
  - However, the income elasticity for inferior goods, such as public transportation, is negative because demand and income move in opposite directions.
  - Necessities like food and clothing tend to have a low-income elasticity, while luxuries like caviar and diamonds tend to have a high-income elasticity.

$$\text{Cross-price elasticity} = \frac{\text{Percentage change in quantity demanded of good 1}}{\text{Percentage change in the price of good 2}}$$

- The cross-price elasticity of demand measures how the quantity demanded of one good responds to a change in the price of another good. It is calculated as
  - Substitutes are goods that can typically replace each other in use, such as hamburgers and hot dogs. Since the price of hot dogs and the quantity demanded of hamburgers move in the same direction, their cross-price elasticity is positive.
  - Complements are goods that are usually used together, such as computers and software. Since an increase in the price of computers reduces the quantity demanded of software, their cross-price elasticity is negative.

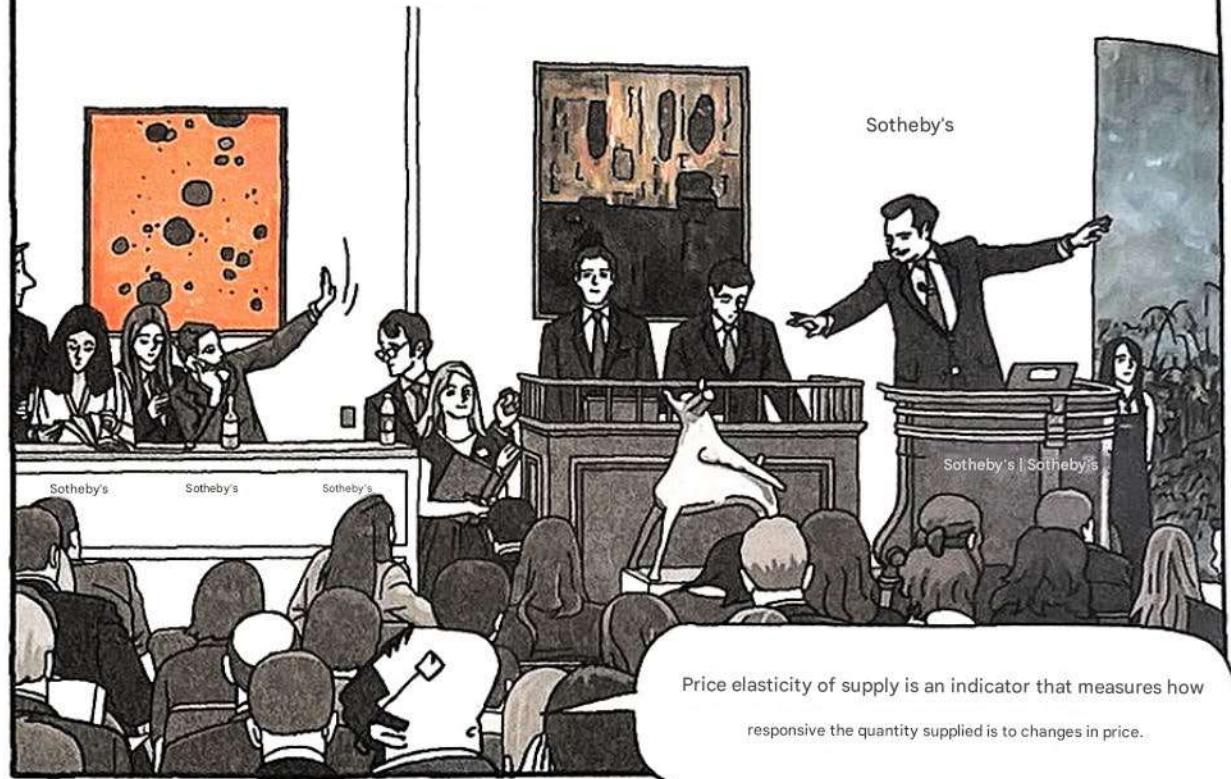
# Chapter 7: Elasticity and Its Applications

- Demand elasticity
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# Supply Elasticity

elasticity of supply

The law of supply states that an increase in price will increase the quantity supplied.



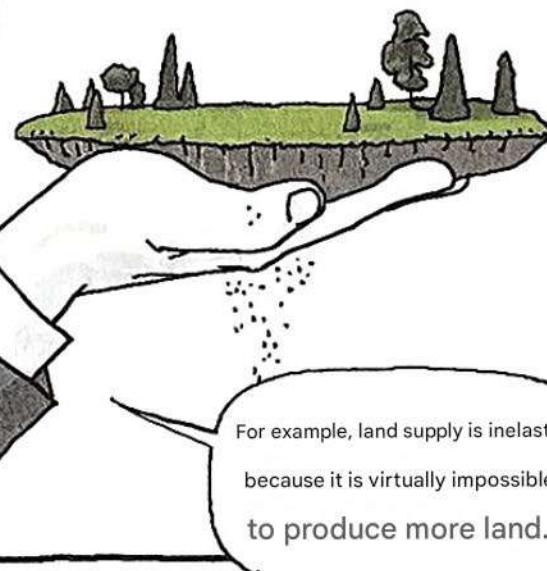
Price elasticity of supply is an indicator that measures how responsive the quantity supplied is to changes in price.

# Supply Elasticity

If the quantity supplied of a good is highly responsive to changes in price, the supply of that good is said to be elastic; if the quantity supplied of a good is poorly responsive to changes in price, the supply of that good is said to be inelastic.

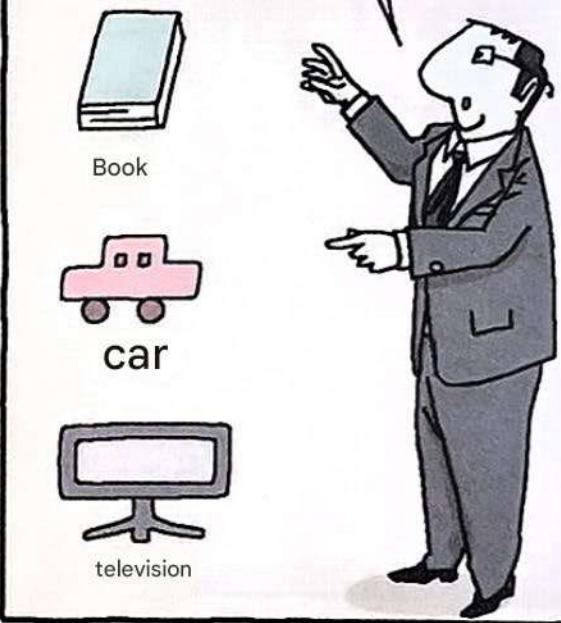


The price elasticity of supply depends on the flexibility of sellers to change the quantity of goods they produce.



For example, land supply is inelastic because it is virtually impossible to produce more land.

In contrast, the supply of manufactured goods such as books, cars, and televisions is more flexible because companies that produce these products can keep their factories running for longer when prices rise.

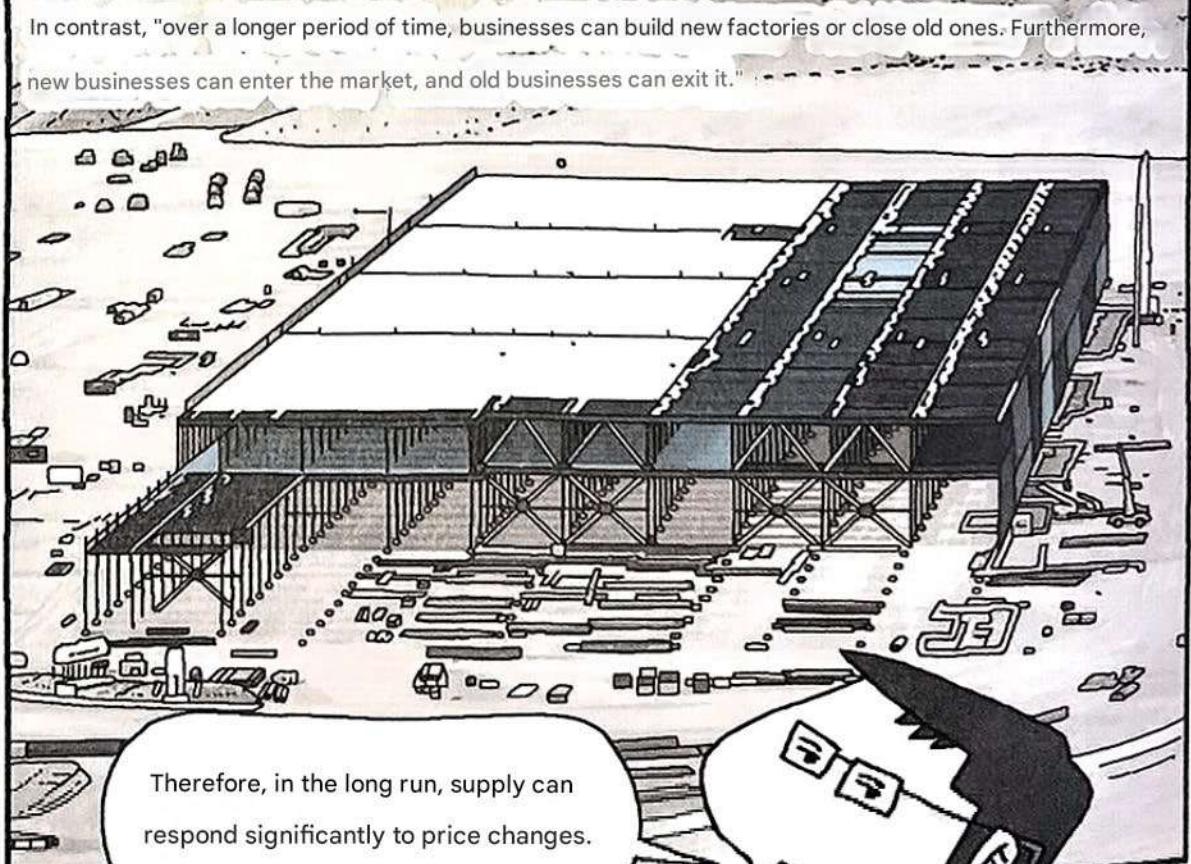


# Supply Elasticity



In the long run, the elasticity of supply is usually greater than in the short run.

In the short term, companies cannot easily change the scale of their factories. Therefore, in the short term, supply is not very sensitive to price changes.



In contrast, "over a longer period of time, businesses can build new factories or close old ones. Furthermore, new businesses can enter the market, and old businesses can exit it."

Therefore, in the long run, supply can respond significantly to price changes.

# Valentine's Day chocolates and flowers

One of the most popular symbols of love for Valentine's Day  
is chocolate.



# Valentine's Day chocolates and flowers



# Valentine's Day chocolates and flowers



Agriculture goods such as flowers need a certain period to become a marketable product.

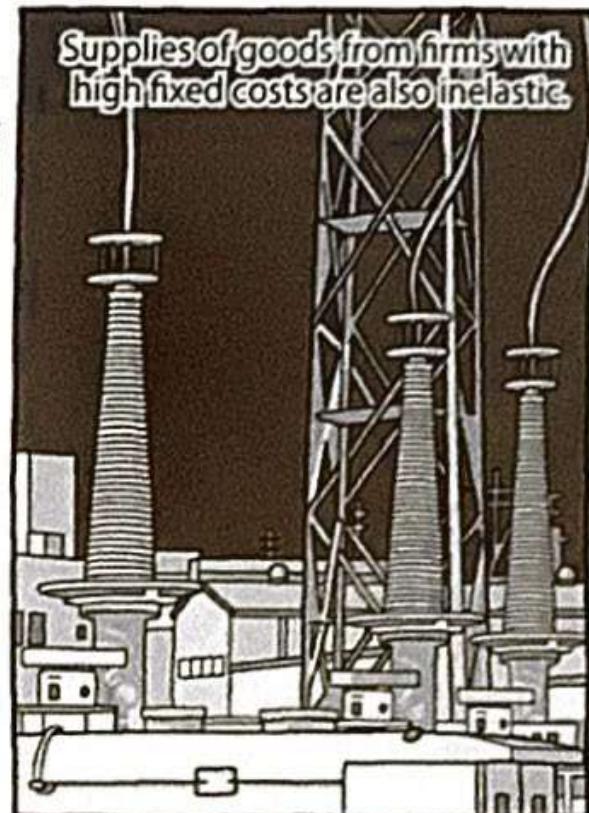
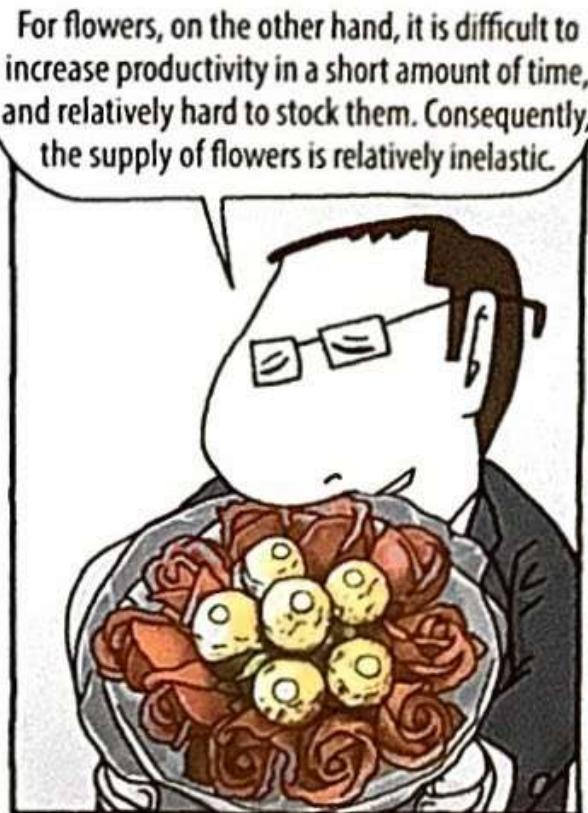
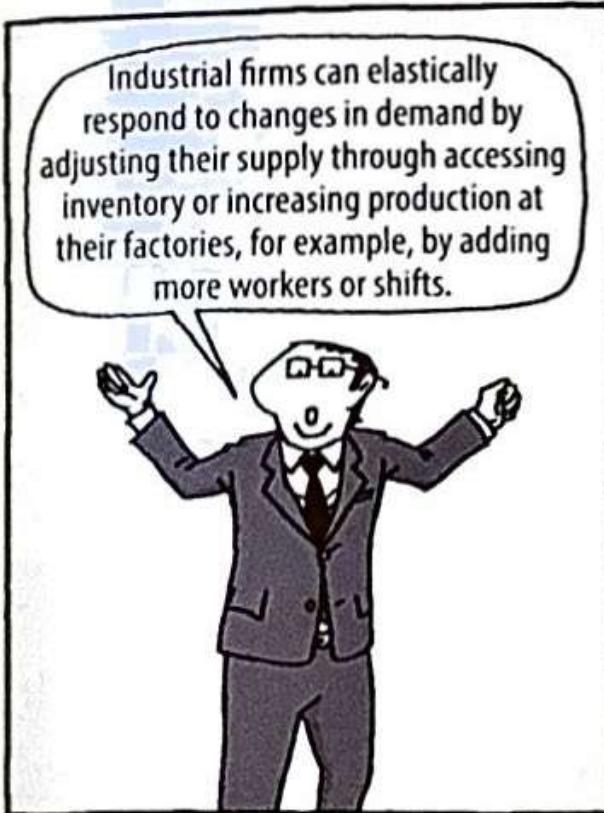


# Valentine's Day chocolates and flowers



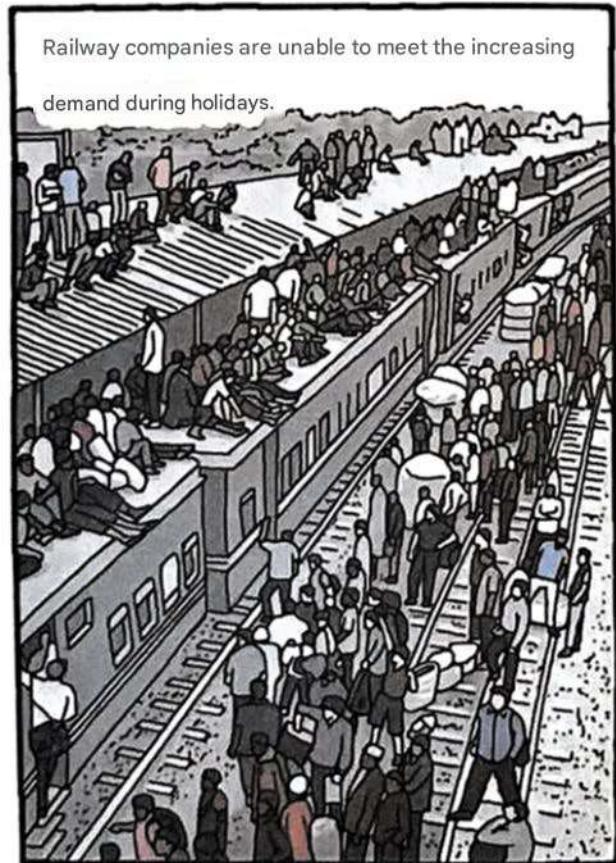
Industrial products like chocolate can relatively easily meet market demand by improving factory efficiency.

# Valentine's Day chocolates and flowers



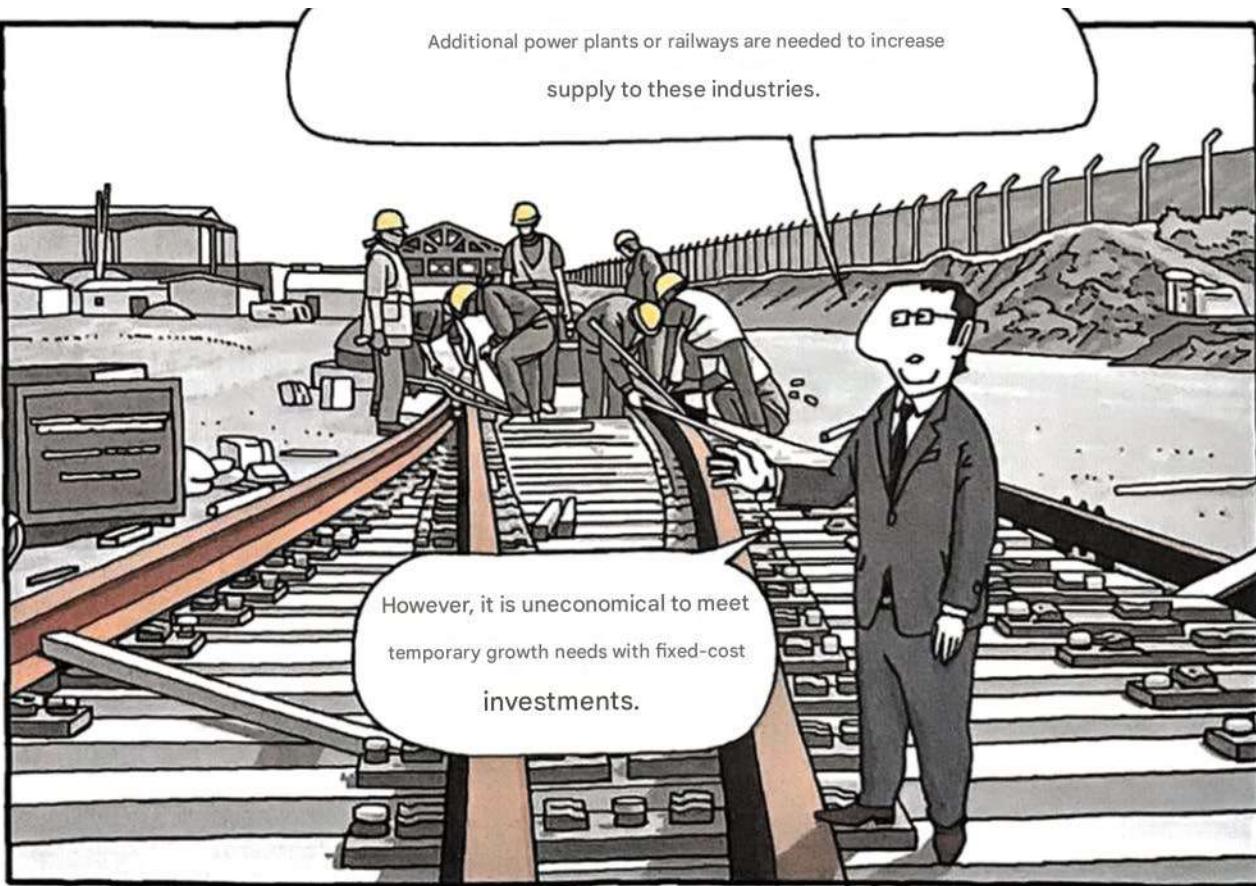
# Valentine's Day chocolates and flowers

Railway companies are unable to meet the increasing demand during holidays.



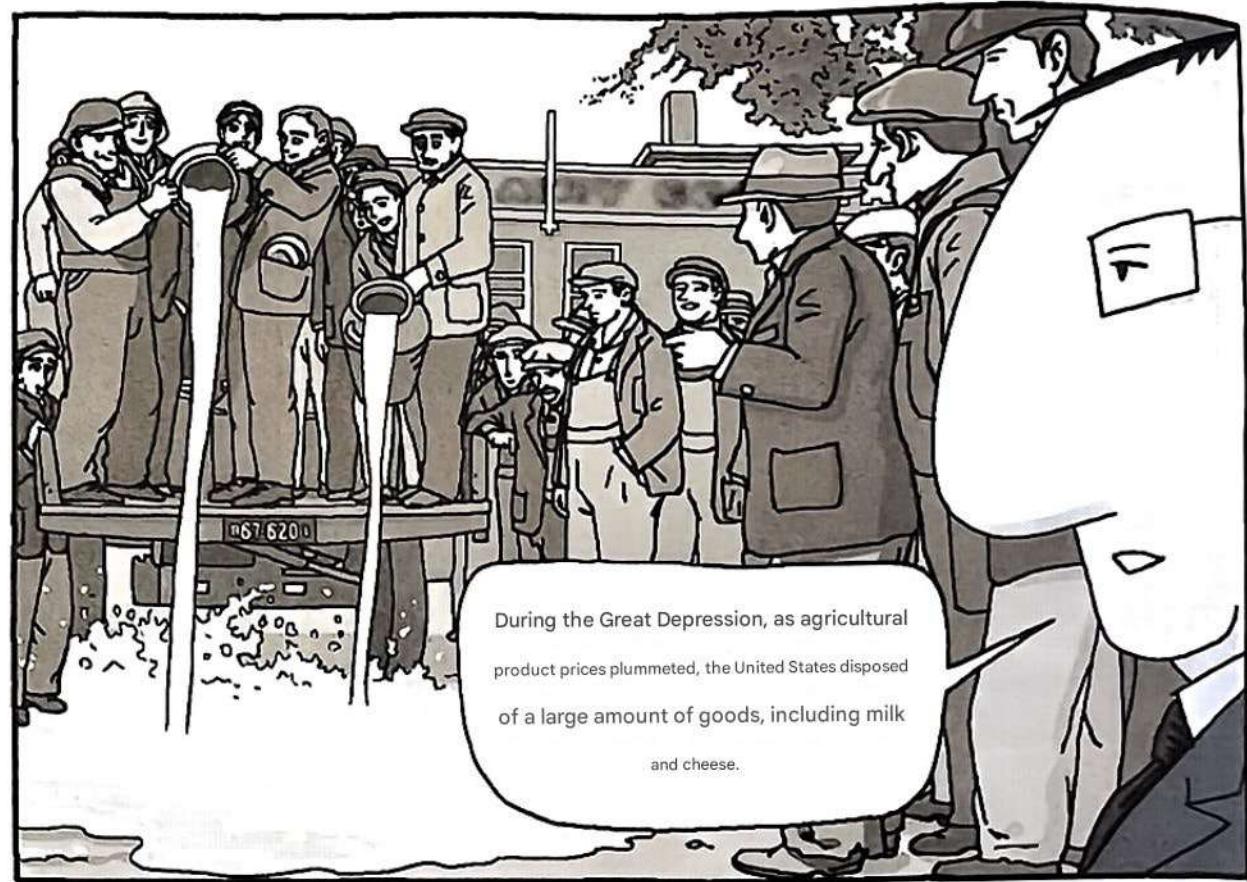
Additional power plants or railways are needed to increase supply to these industries.

However, it is uneconomical to meet temporary growth needs with fixed-cost investments.

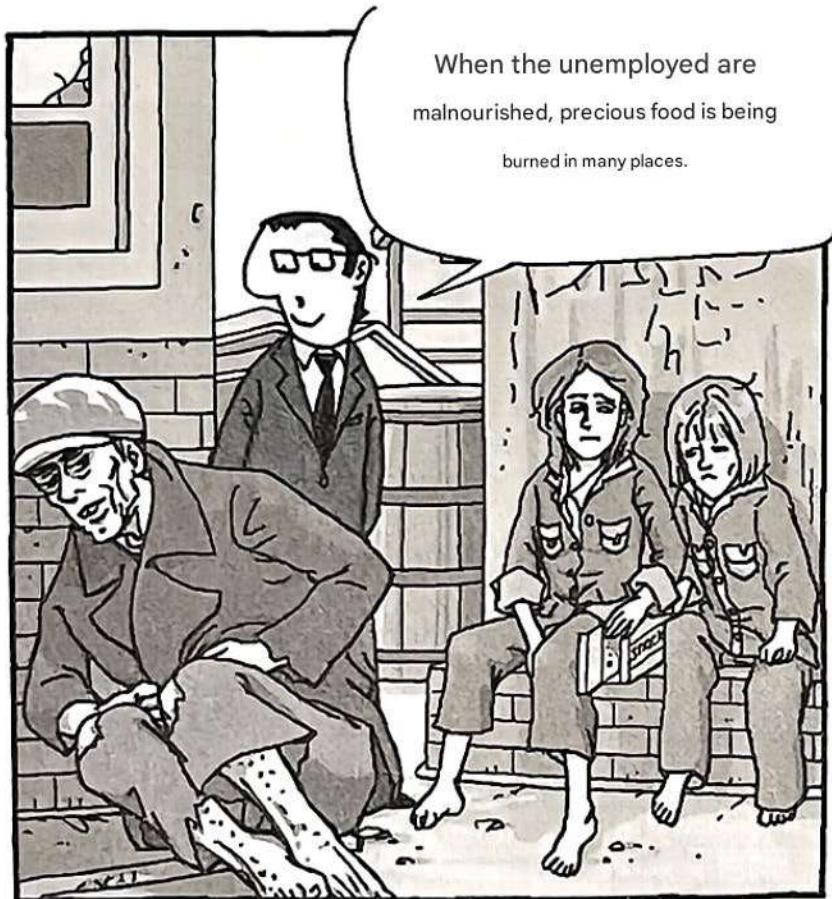


# Cobweb Theorem

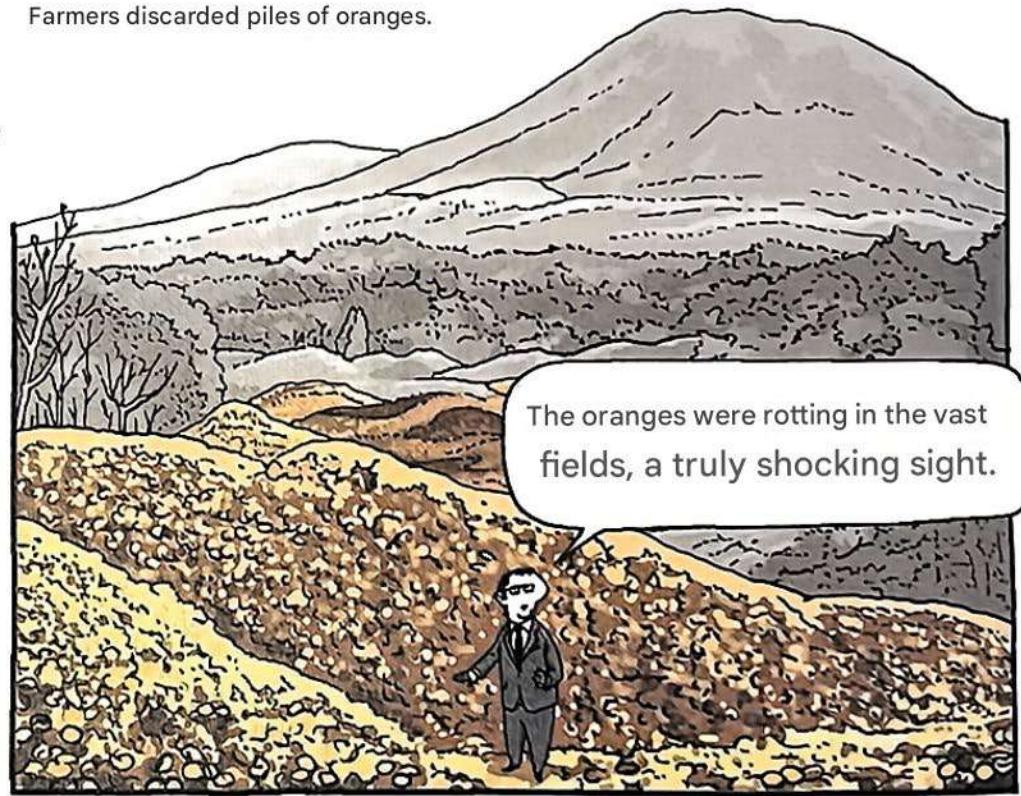
cobweb theorem



# Cobweb Theorem

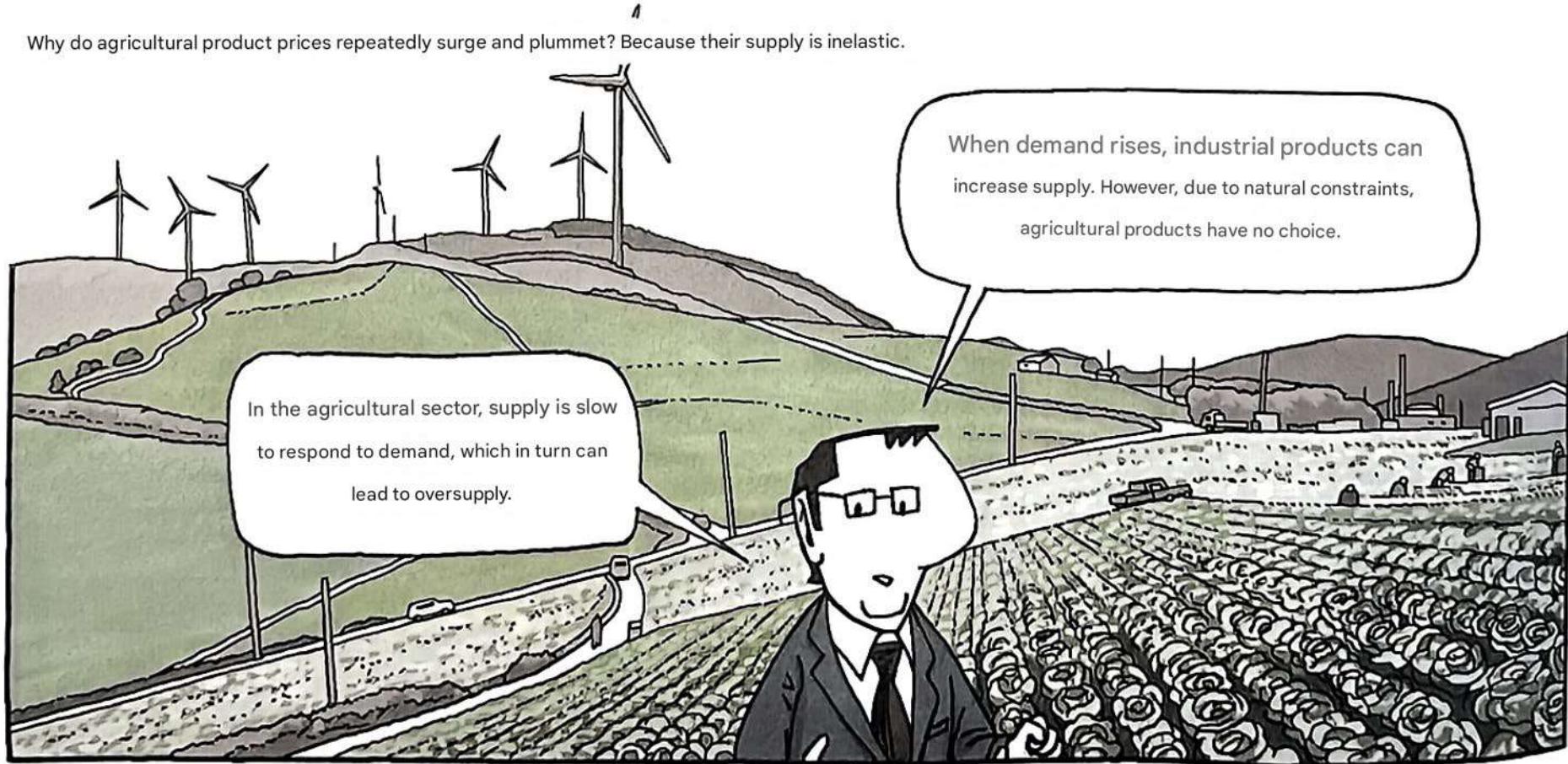


In California, an oversupply of oranges caused prices to plummet. Farmers discarded piles of oranges.



# Cobweb Theorem

Why do agricultural product prices repeatedly surge and plummet? Because their supply is inelastic.

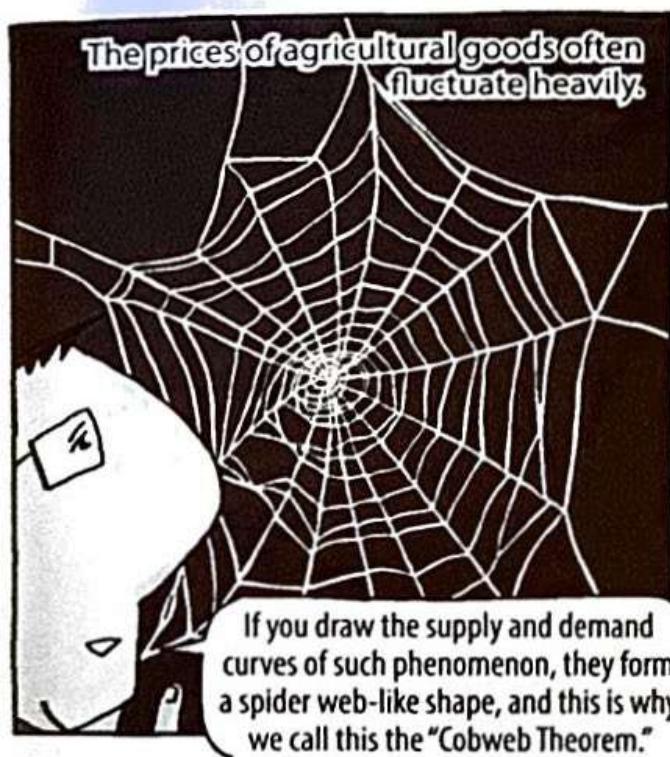


# Cobweb Theorem

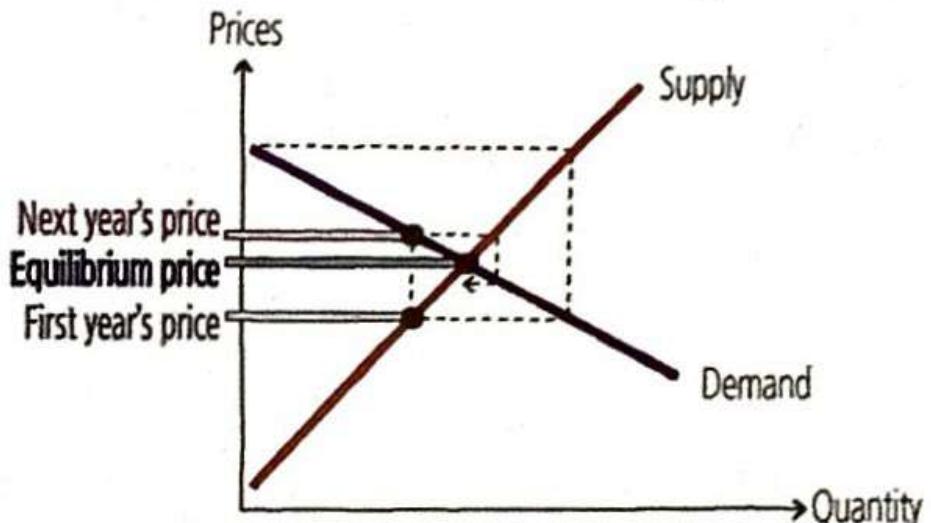
For example, the price of Napa cabbage soared last year, leading farmers to expand their cabbage planting area in addition to importing from China the following spring.



# Cobweb Theorem



The cobweb theorem is an economic model that explains why prices might be subject to periodic fluctuations in certain types of markets.



Because of the time lag in production, producers can only decide on future output based on past prices. This "misaligned" decision-making causes market prices and output to fluctuate cyclically around the equilibrium point.

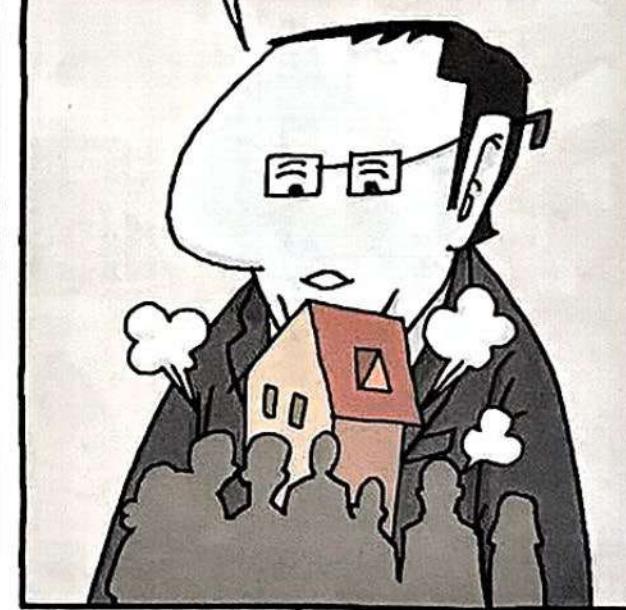
# Cobweb Theorem

This theorem also applies to the real estate market.

The real estate market can be divided into two parts: the "space market" which determines demand and the "capital market" which determines investment.



In countries with continuous economic growth or population increase, consumer competition naturally erupts when the demand for space increases.



# Cobweb Theorem

Both rents and selling  
prices have increased.

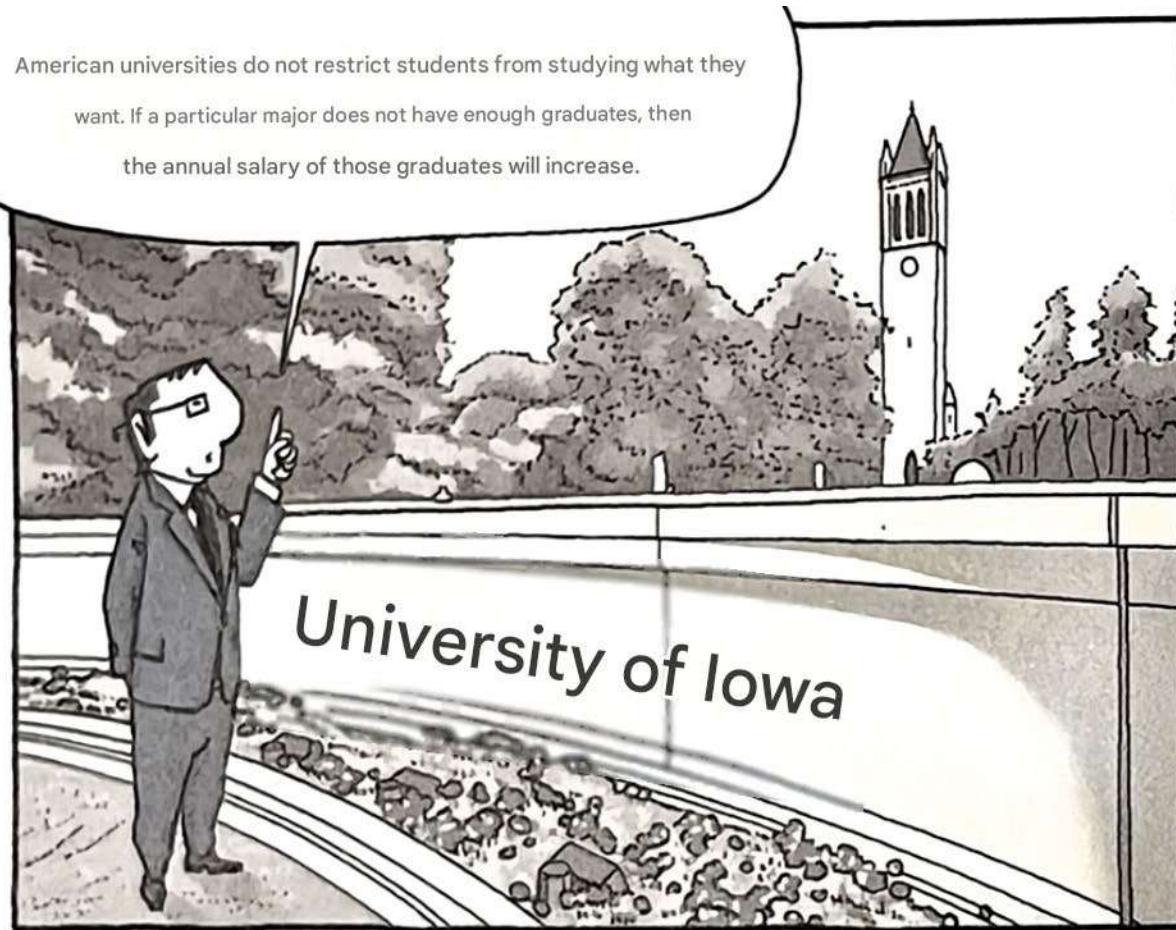
For ordinary commodities, supply  
will eventually meet demand and  
stabilize the market.

However, real estate prices may fluctuate because its supply is less elastic than demand.

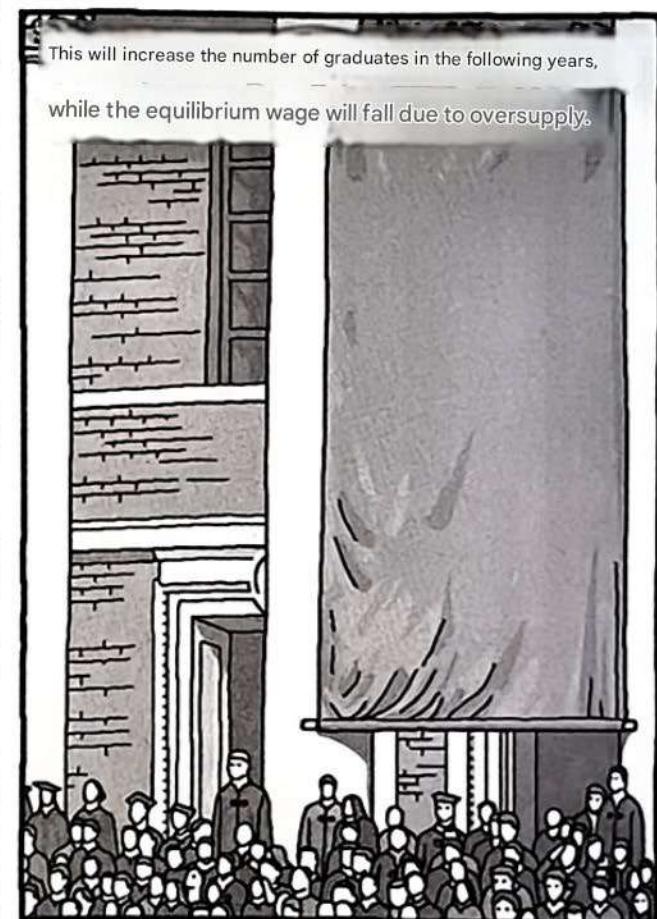


# Cobweb Theorem

American universities do not restrict students from studying what they want. If a particular major does not have enough graduates, then the annual salary of those graduates will increase.



This will increase the number of graduates in the following years, while the equilibrium wage will fall due to oversupply.



# Cobweb Theorem

Then, this major became unpopular.

In the United States, the supply and demand relationship  
in certain industries tends to reverse every eight years.

This phenomenon can also be explained  
using the cobweb theorem.

# SUMMARY



- The Law of Supply states that an increase in price will lead to an increase in the quantity supplied.  
The **price elasticity of supply** measures how much the quantity supplied responds to a change in price.

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

# SUMMARY

$$\text{Price elasticity} = \frac{20\%}{10\%} = 2$$

- For example, a 10% increase in the price of ice cream causes the quantity supplied to increase by 20%. In this case, the price elasticity of supply is calculated as follows:
- When the elasticity is greater than 1, supply is considered elastic, meaning the change in quantity supplied is proportionally larger than the change in price. Conversely, when the elasticity is less than 1 and the quantity supplied changes less than the price, supply is considered inelastic. If the elasticity is exactly 1, meaning the percentage change in quantity supplied equals the percentage change in price, then in this case, the supply is said to have unit elasticity.

# Chapter 7: Elasticity and Its Applications

- Demand elasticity
- Supply elasticity
- **Three applications of supply, demand, and elasticity**

# Is it good for agriculture, and also good for individual farmers?

Is it good for agriculture,  
and also good for  
individual farmers?

Imagine yourself as a wheat farmer in Kansas.

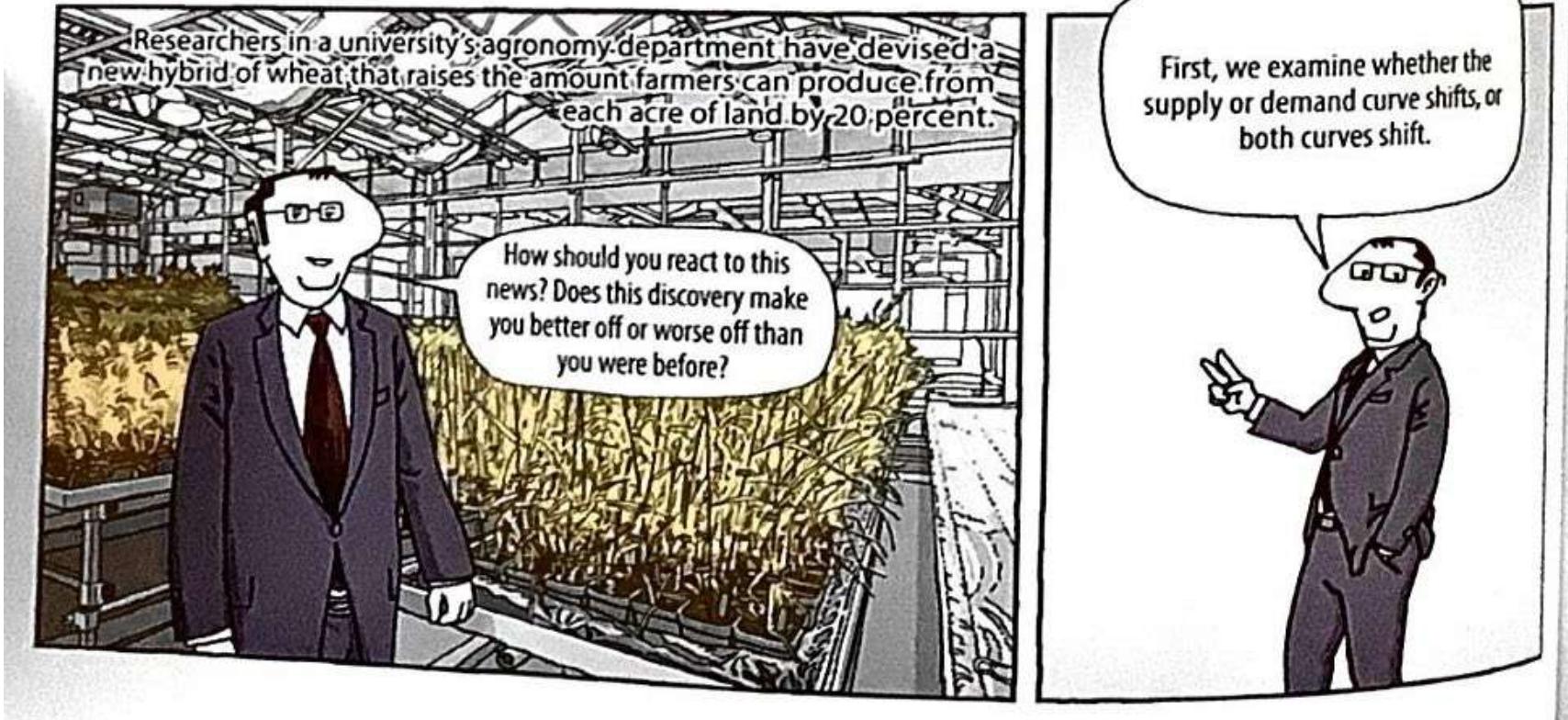


You want to earn more  
income; how can you  
achieve this goal?

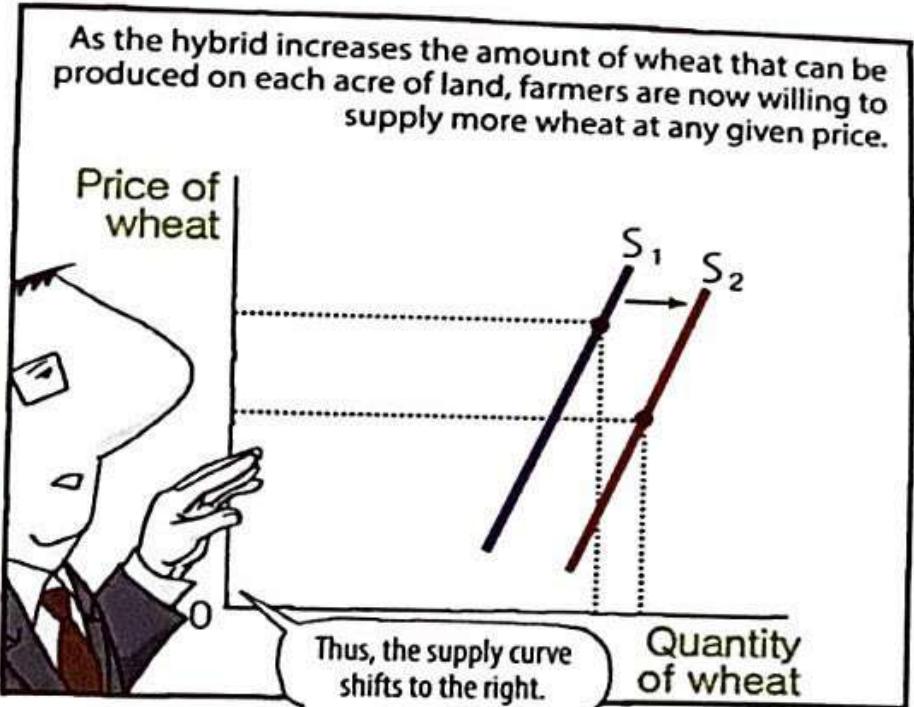
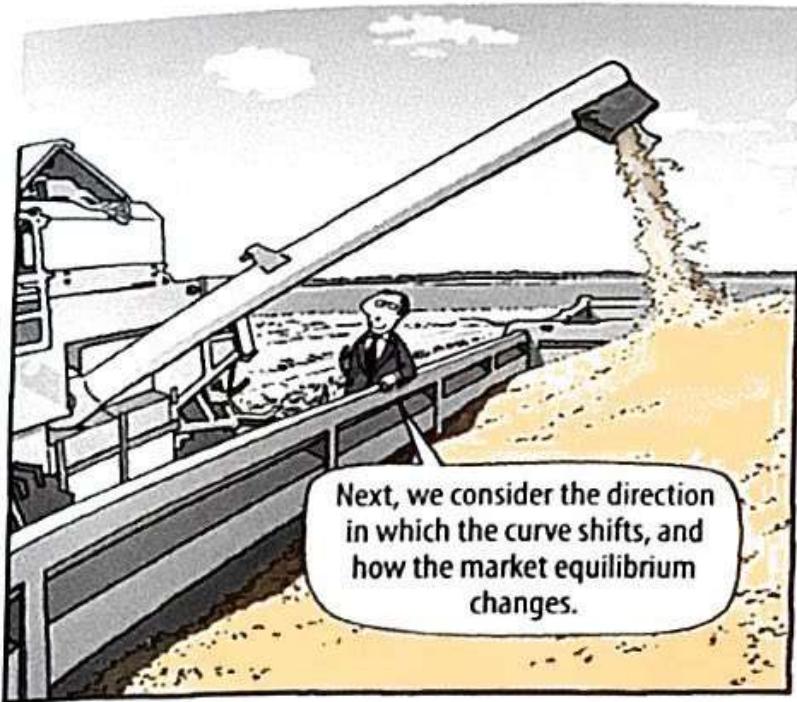
# Is it good for agriculture, and also good for individual farmers?



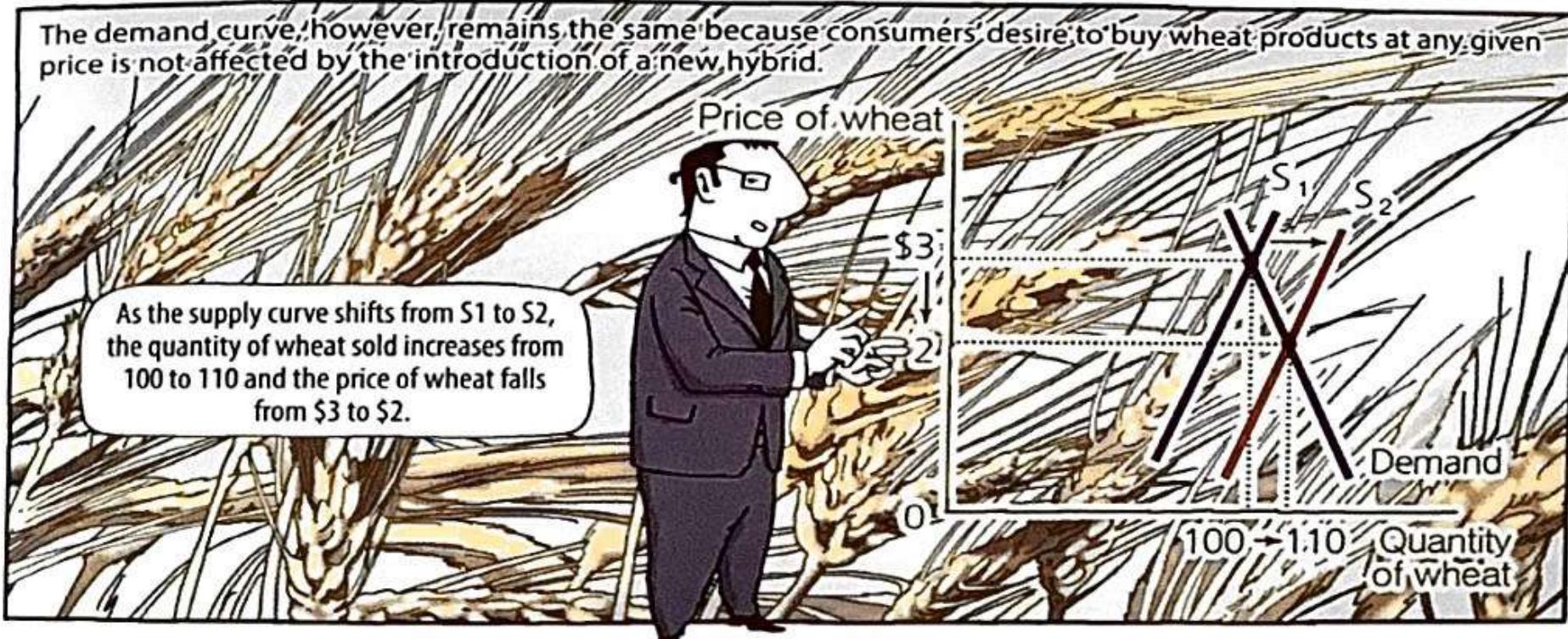
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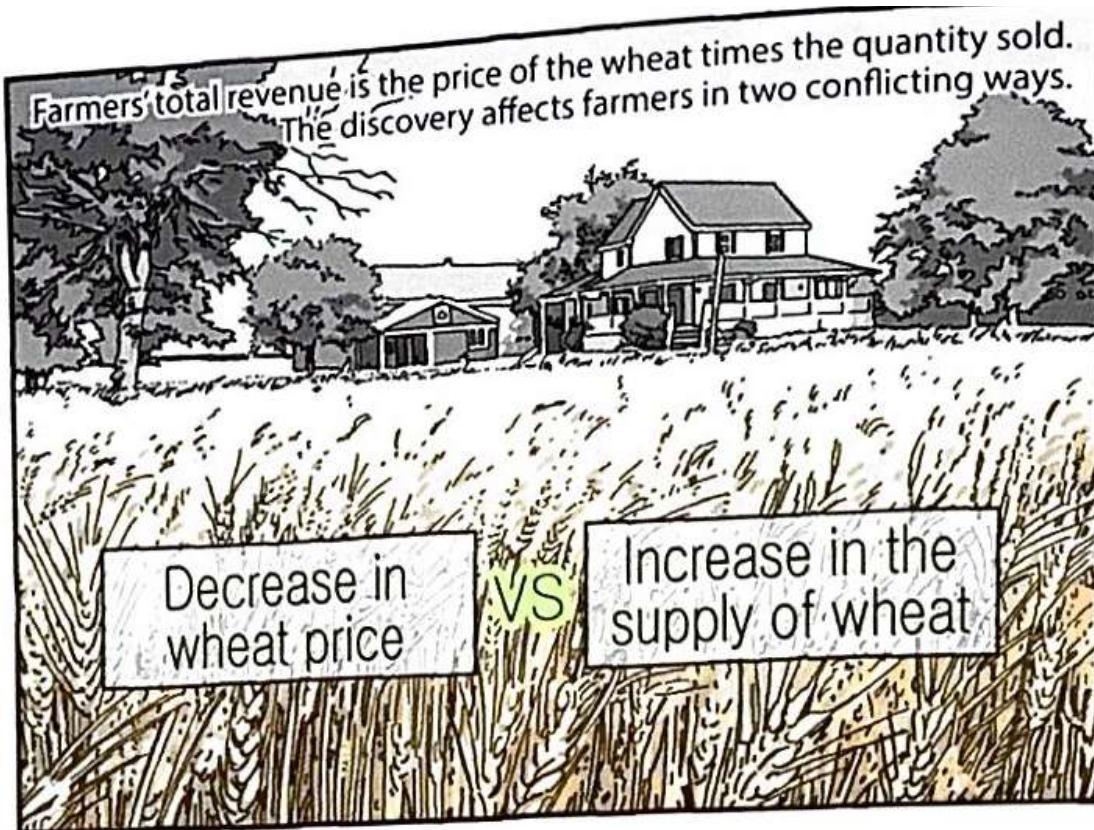
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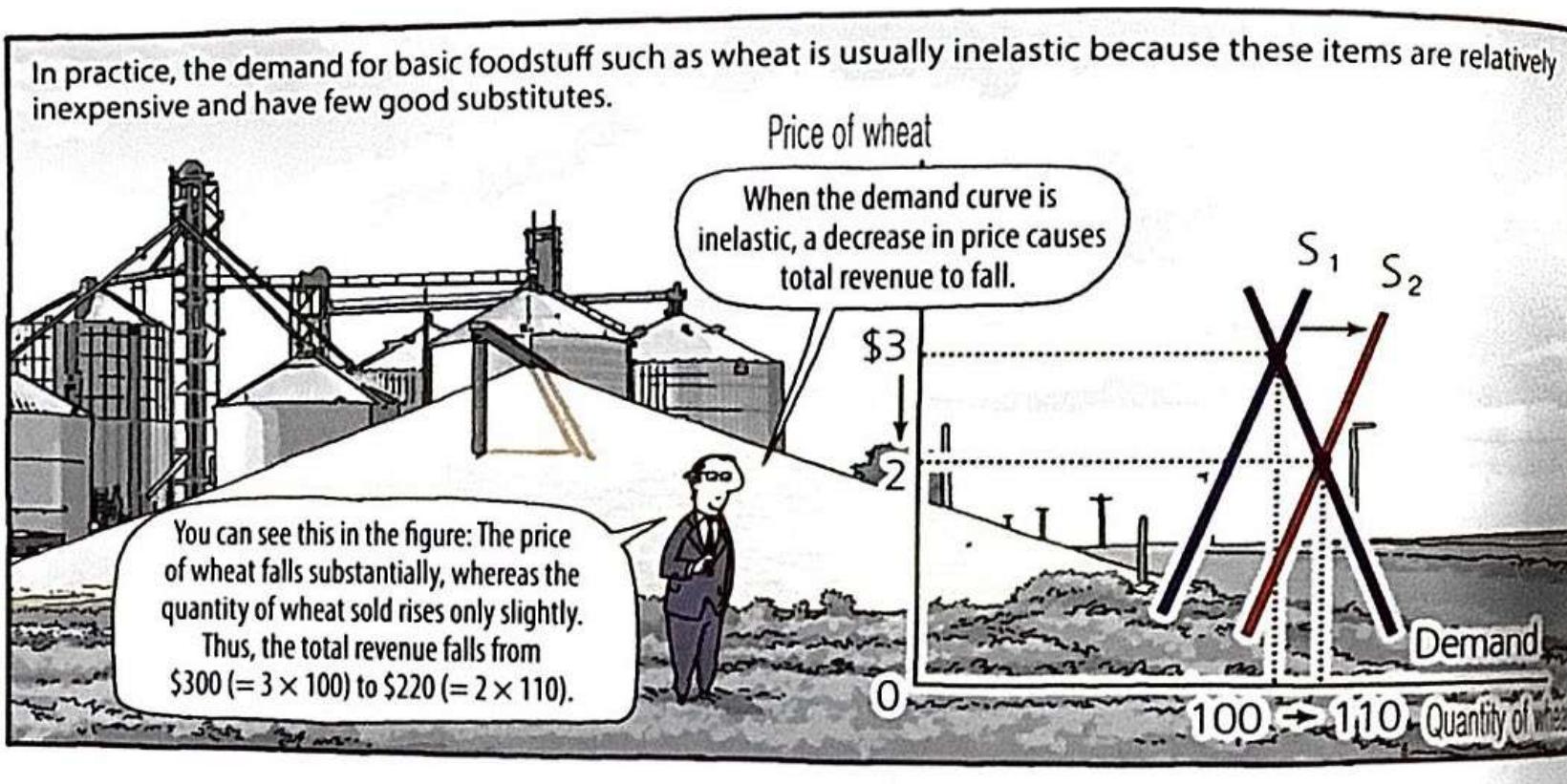
# Is it good for agriculture, and also good for individual farmers?



The hybrid allows farmers to produce more wheat, but the price of wheat falls as the quantity supplied increases. Eventually, the total revenue depends on the elasticity of demand.



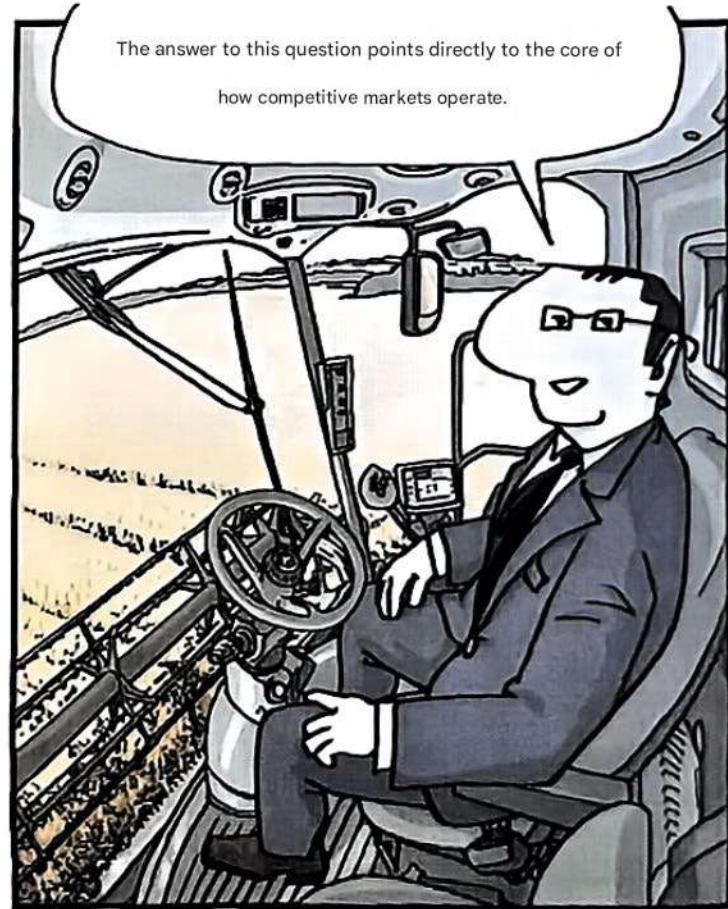
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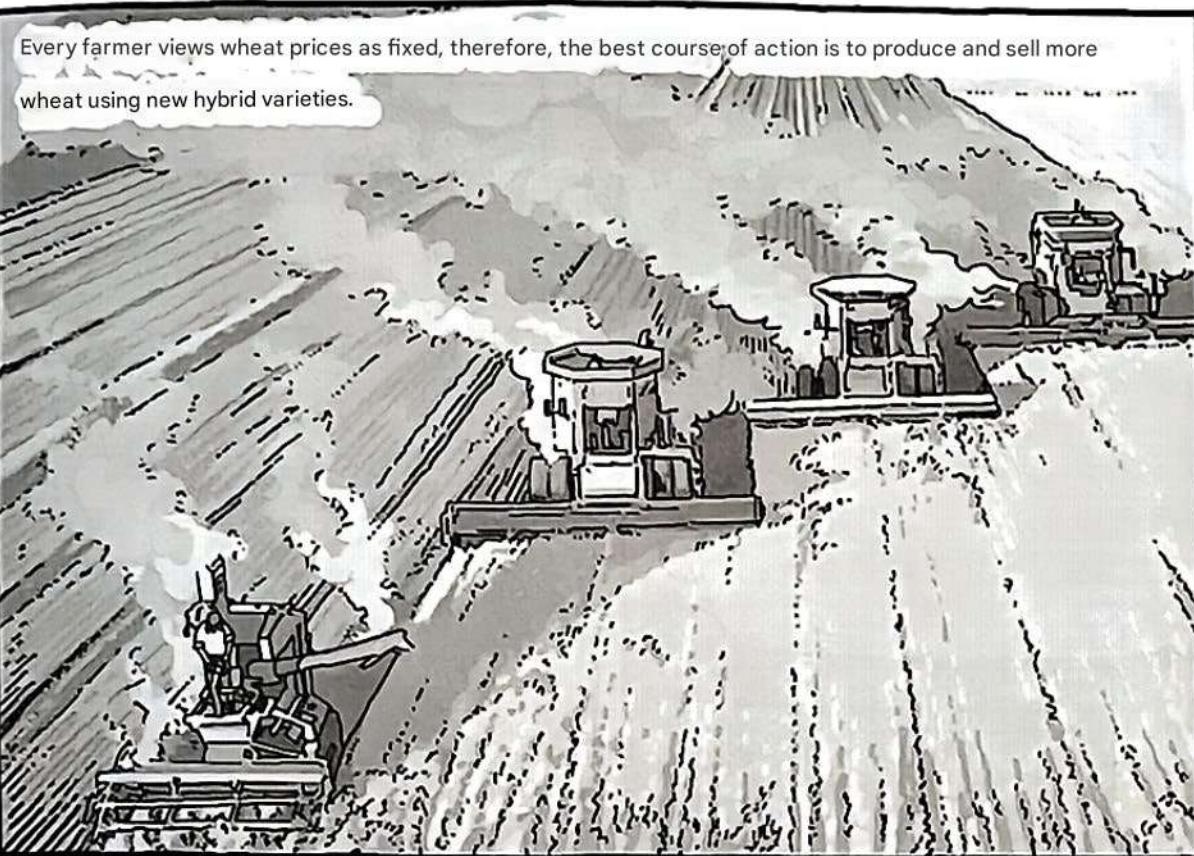
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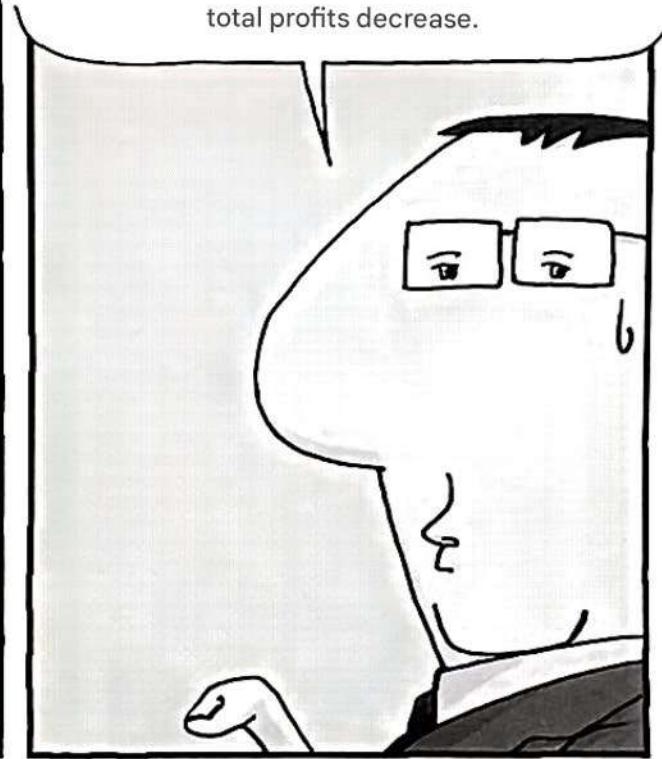
The answer to this question points directly to the core of how competitive markets operate.



# Is it good for agriculture, and also good for individual farmers?



However, when all farmers do this, the supply of wheat increases, the price decreases, and total profits decrease.

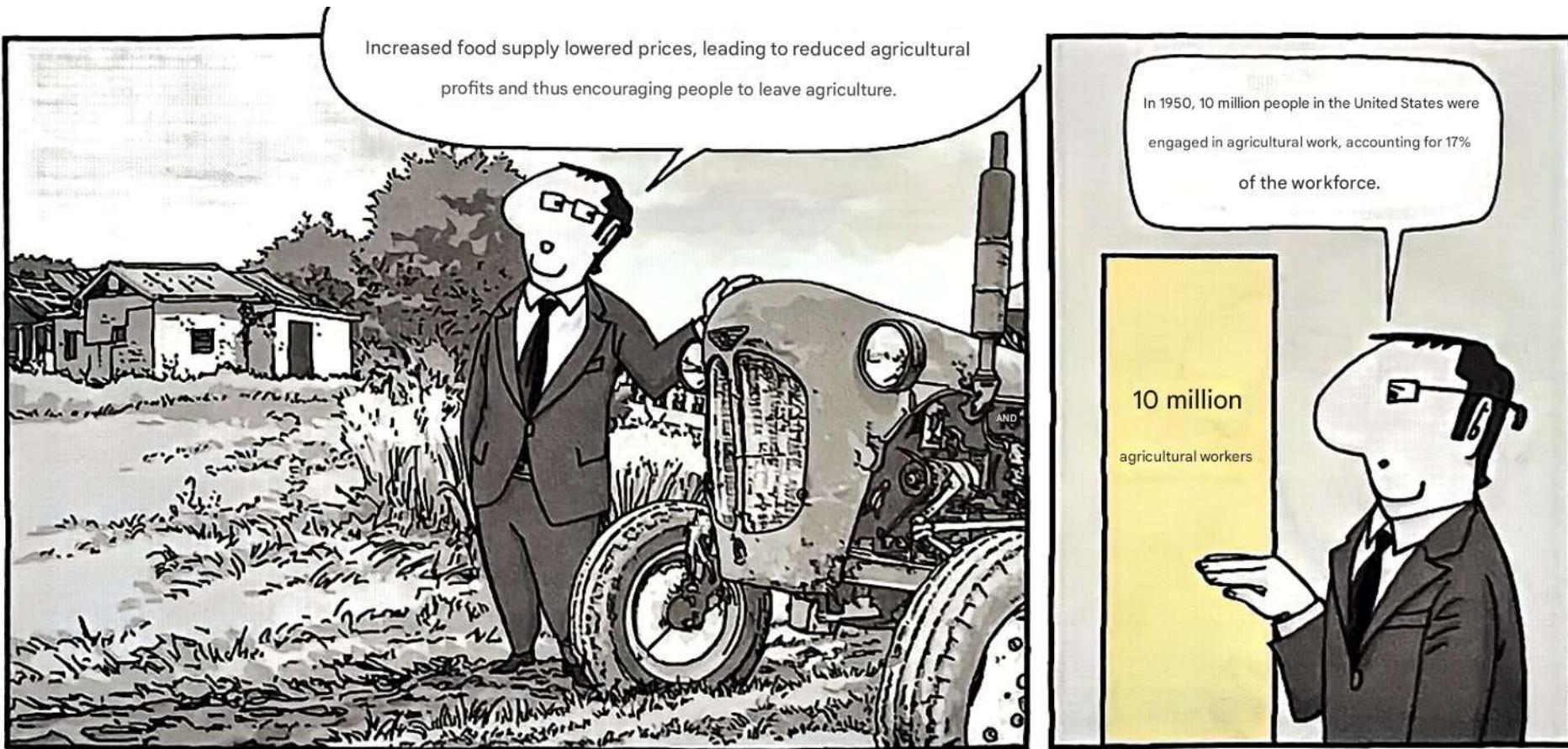


# Is it good for agriculture, and also good for individual farmers?

This example helps to explain a major change in the U.S. economy over the past century.



# Is it good for agriculture, and also good for individual farmers?



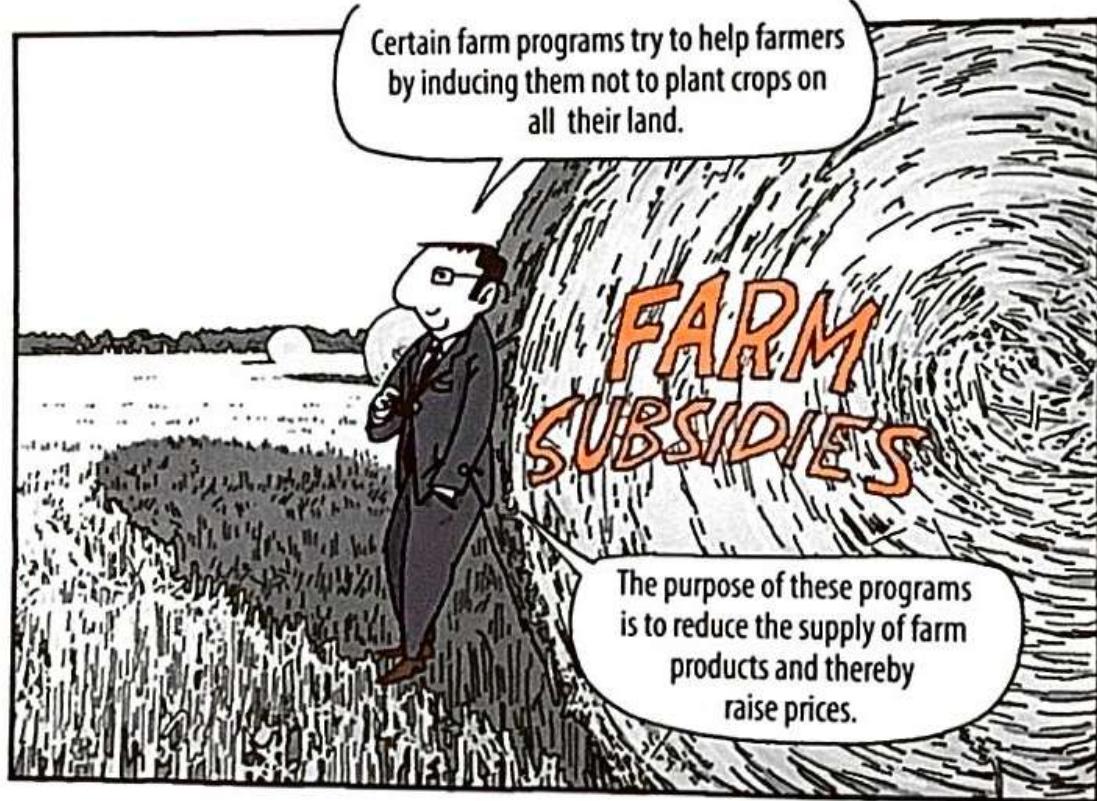
# Is it good for agriculture, and also good for individual farmers?



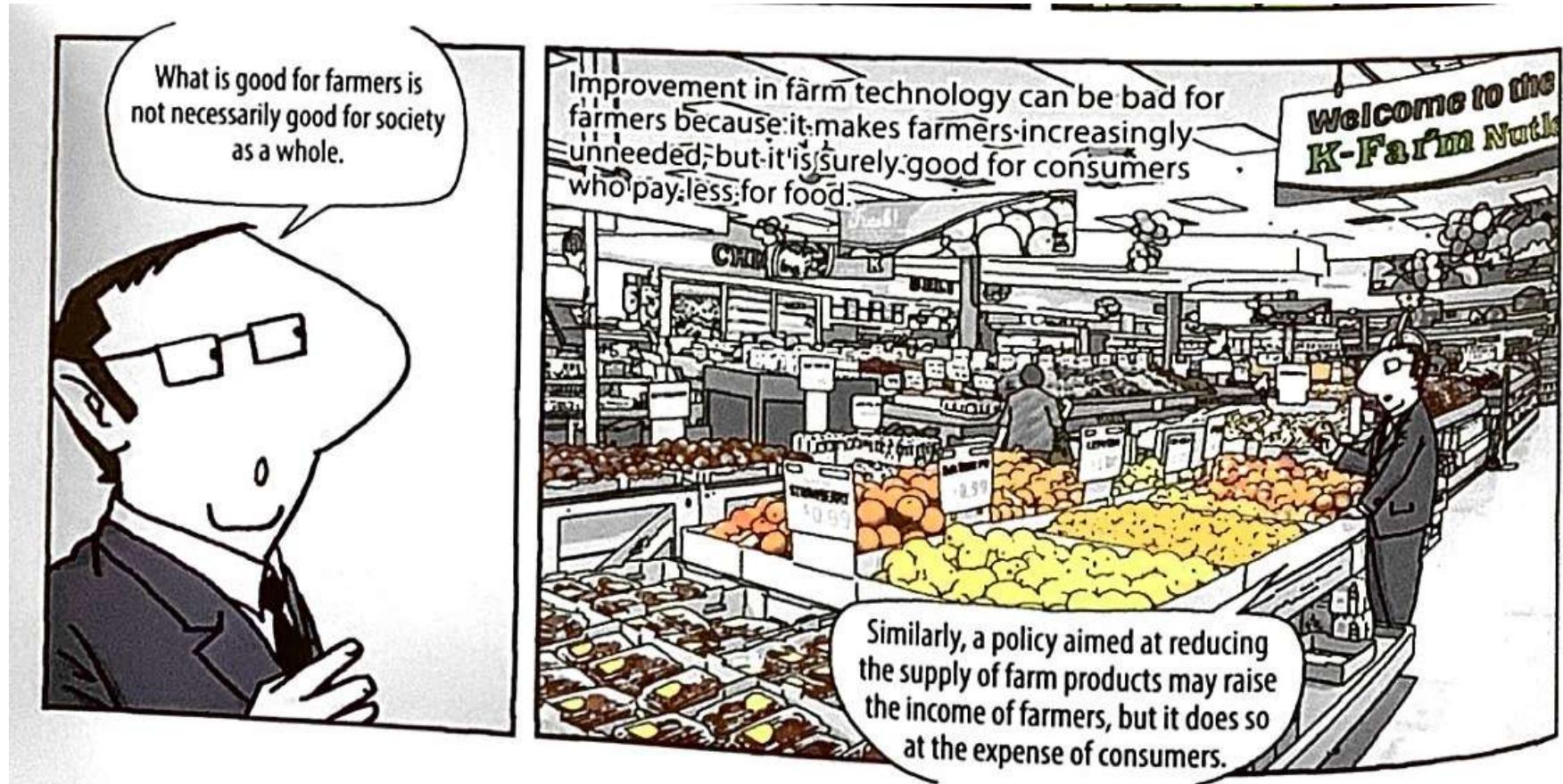
This analysis of agricultural product markets also helps explain seemingly paradoxical public policies.



## Is it good for agriculture, and also good for individual farmers?

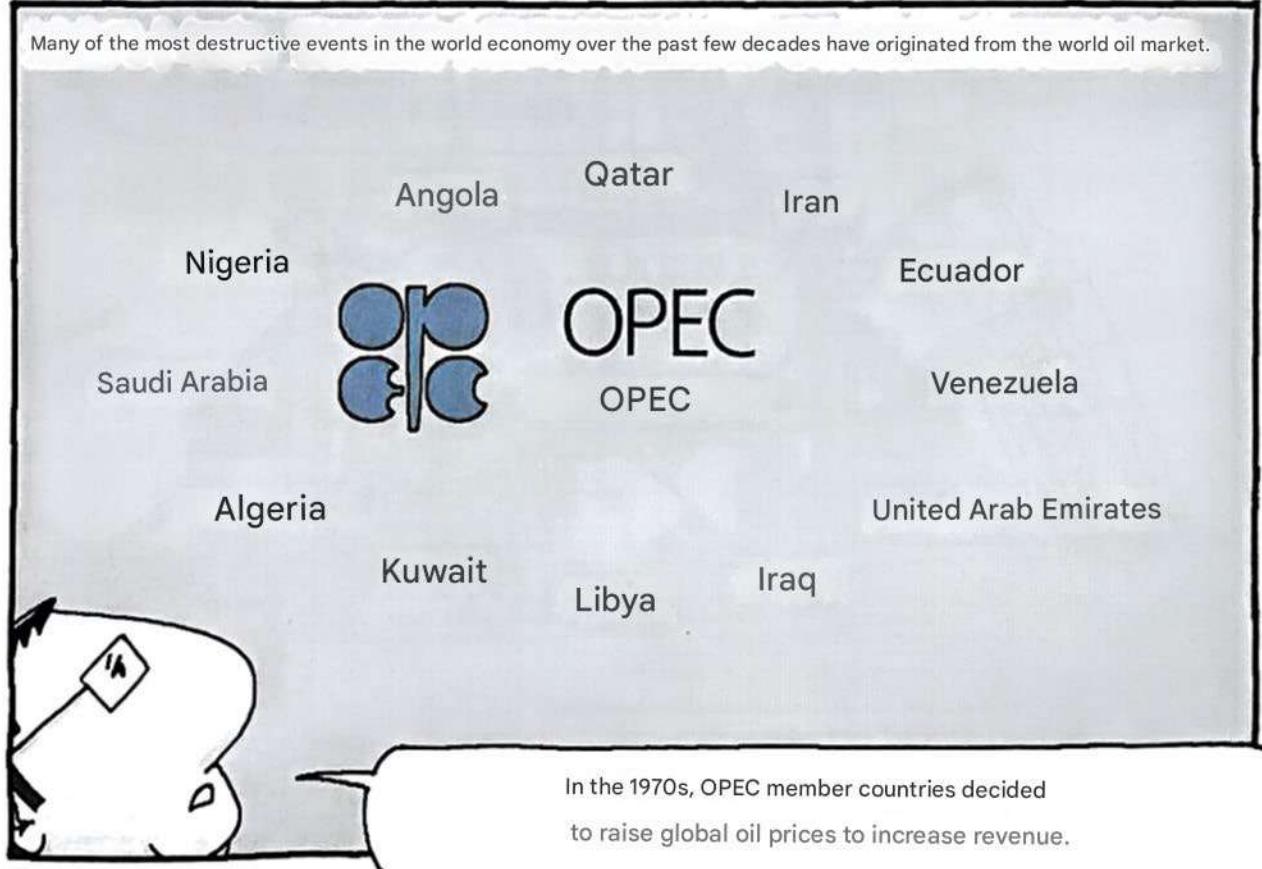


## Is it good for agriculture, and also good for individual farmers?



# Why can't OPEC maintain high oil prices?

Why can't  
OPEC maintain  
high oil  
prices?



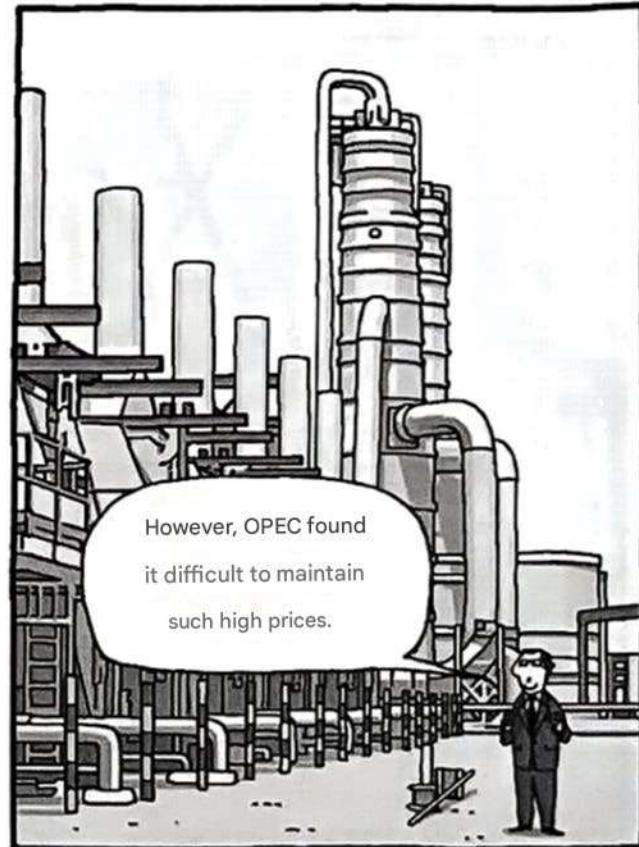
# Why can't OPEC maintain high oil prices?

These countries collectively reduced oil supply, and oil prices rose by more than 50% in 1973-1974.

A few years later, OPEC repeated the same tactic, and oil prices nearly doubled between 1979 and 1981.

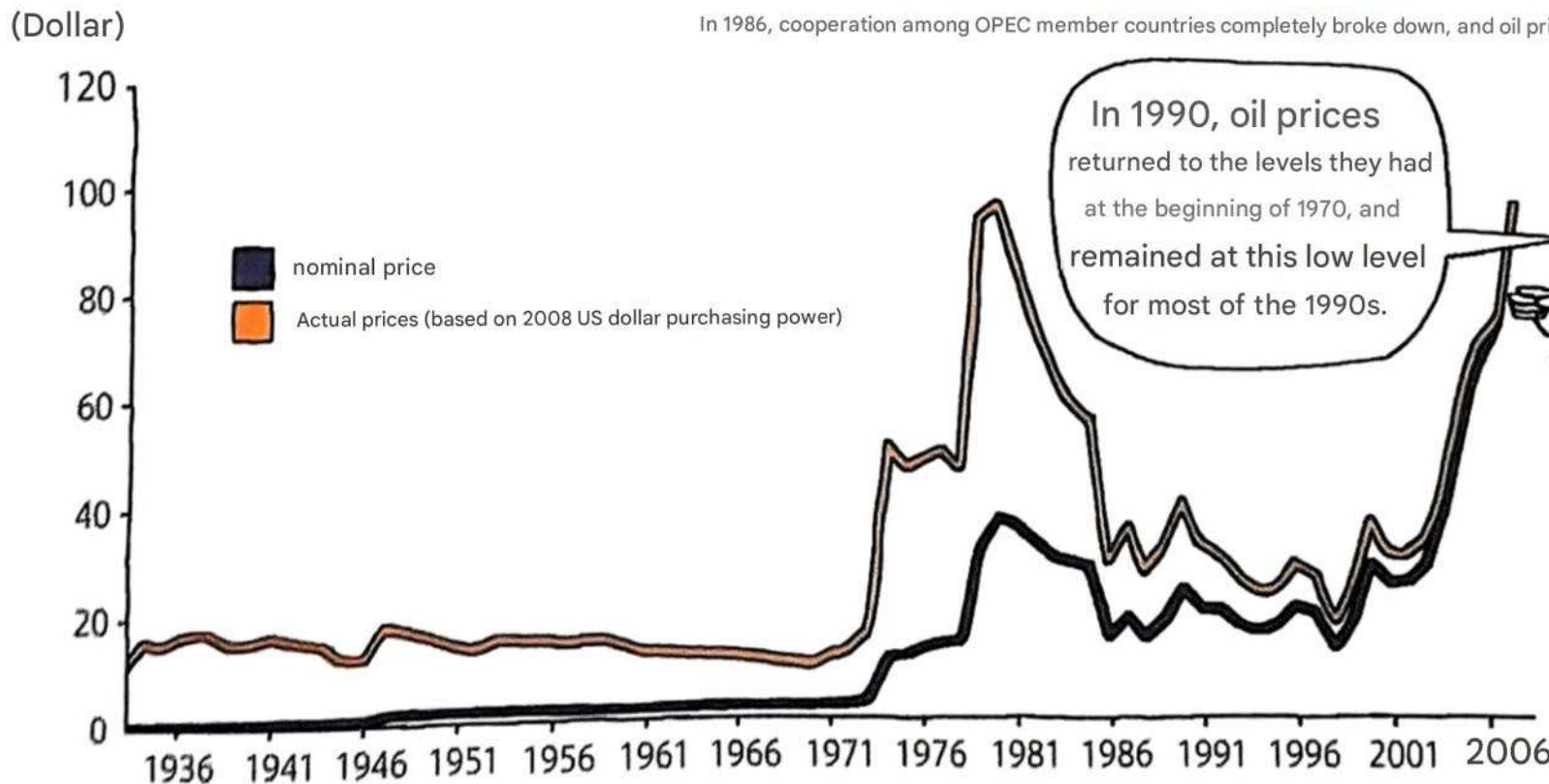


However, OPEC found it difficult to maintain such high prices.

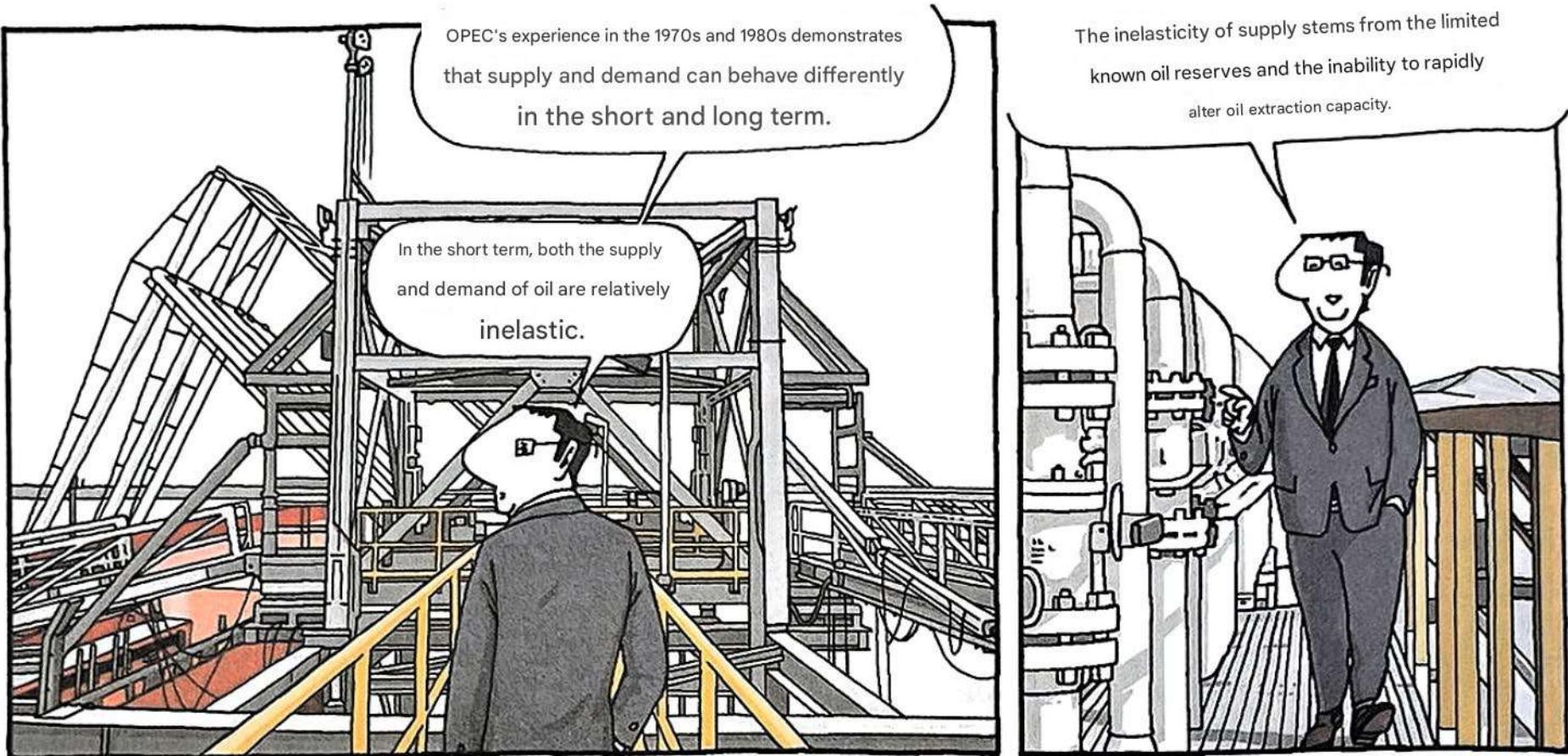


# Why can't OPEC maintain high oil prices?

From 1982 to 1985, oil prices steadily declined by about 10% annually. Not long after, discontent and chaos spread again among OPEC member countries.

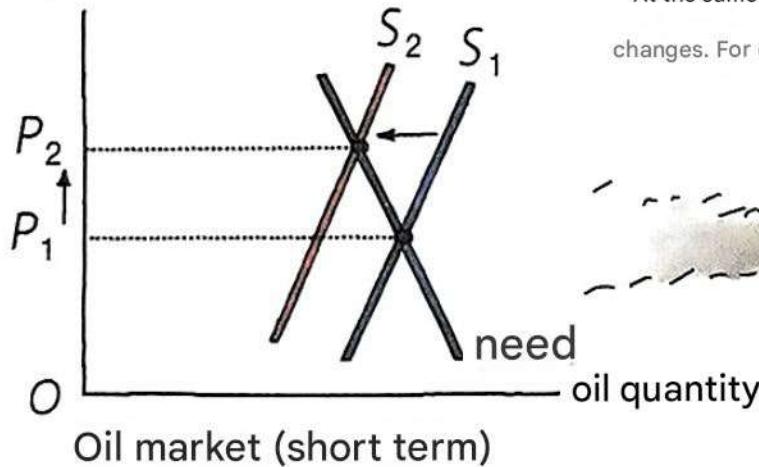


# Why can't OPEC maintain high oil prices?

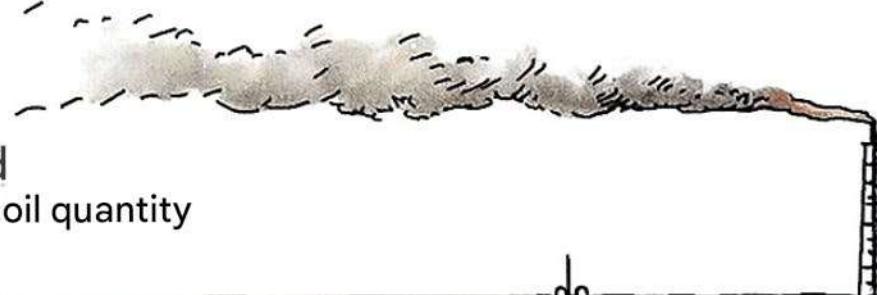


# Why can't OPEC maintain high oil prices?

oil price



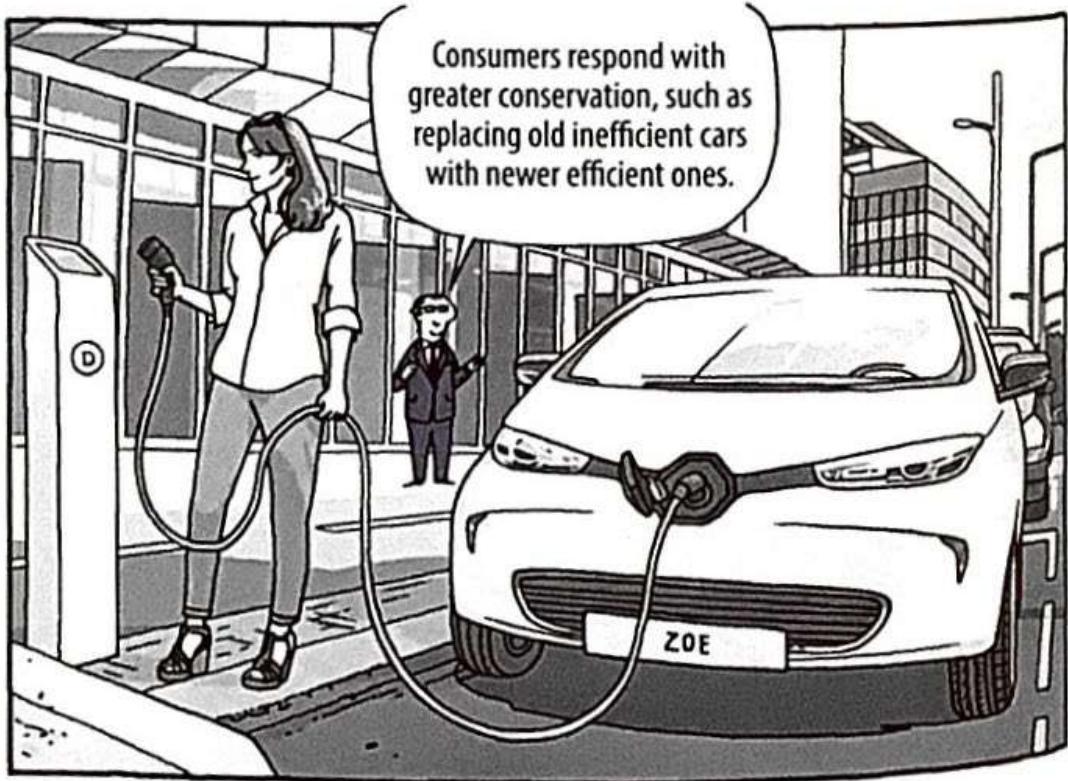
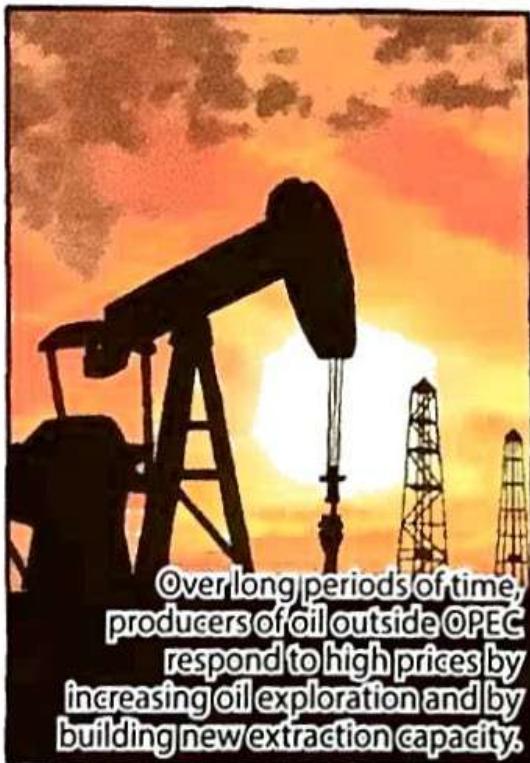
At the same time, the demand for oil is inelastic because purchasing habits do not immediately react to price changes. For example, drivers of large, fuel-intensive vehicles will continue to buy gasoline at higher prices.



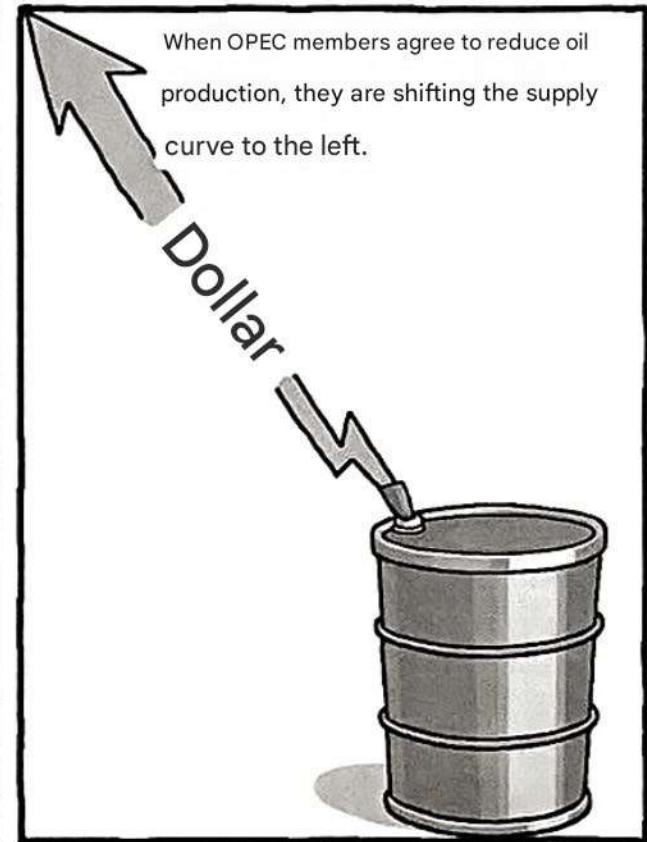
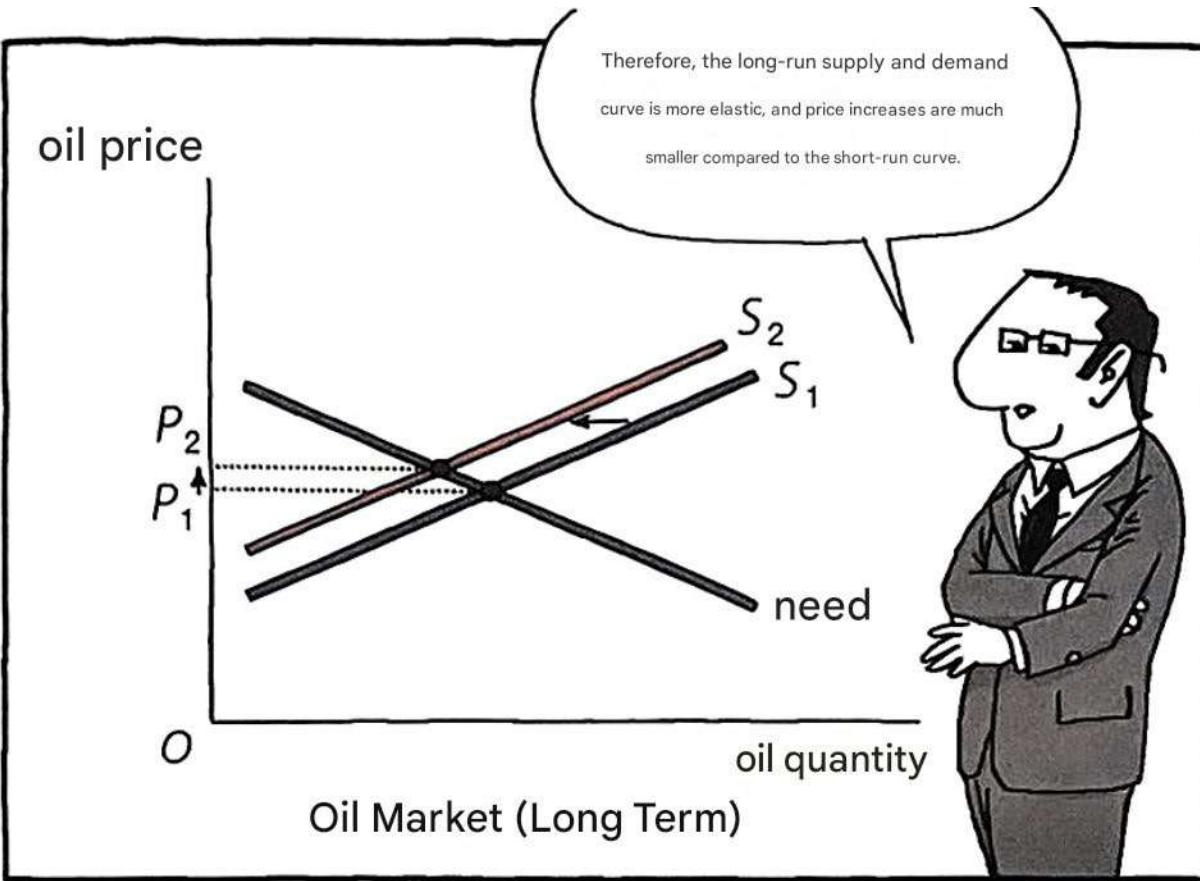
Oil market (short term)

When the oil supply decreases from  $S_2$  to  $S_1$ , the price rises sharply from  $P_1$  to  $P_2$ .

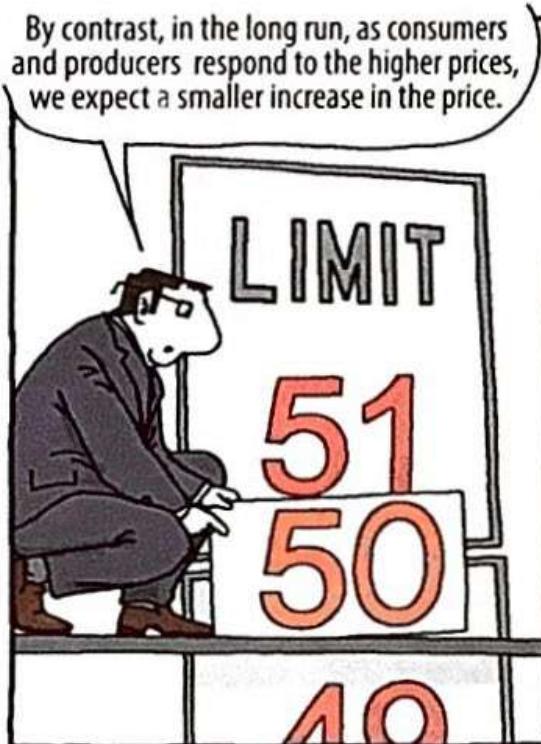
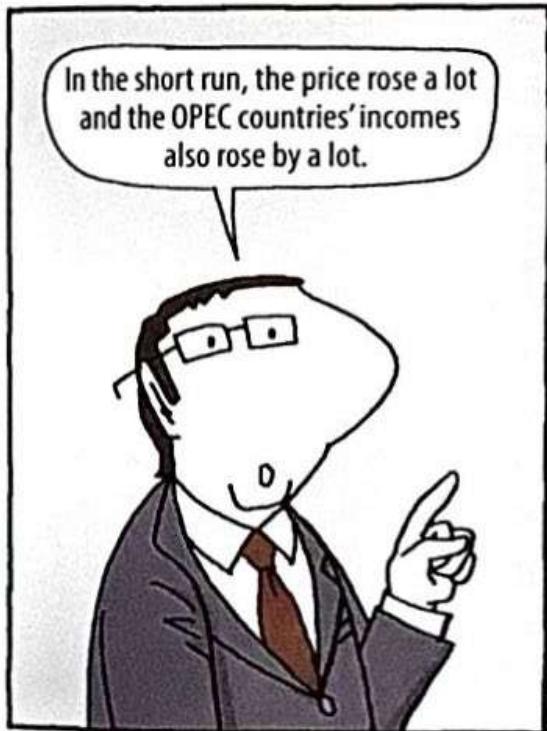
# Why can't OPEC maintain high oil prices?



# Why can't OPEC maintain high oil prices?

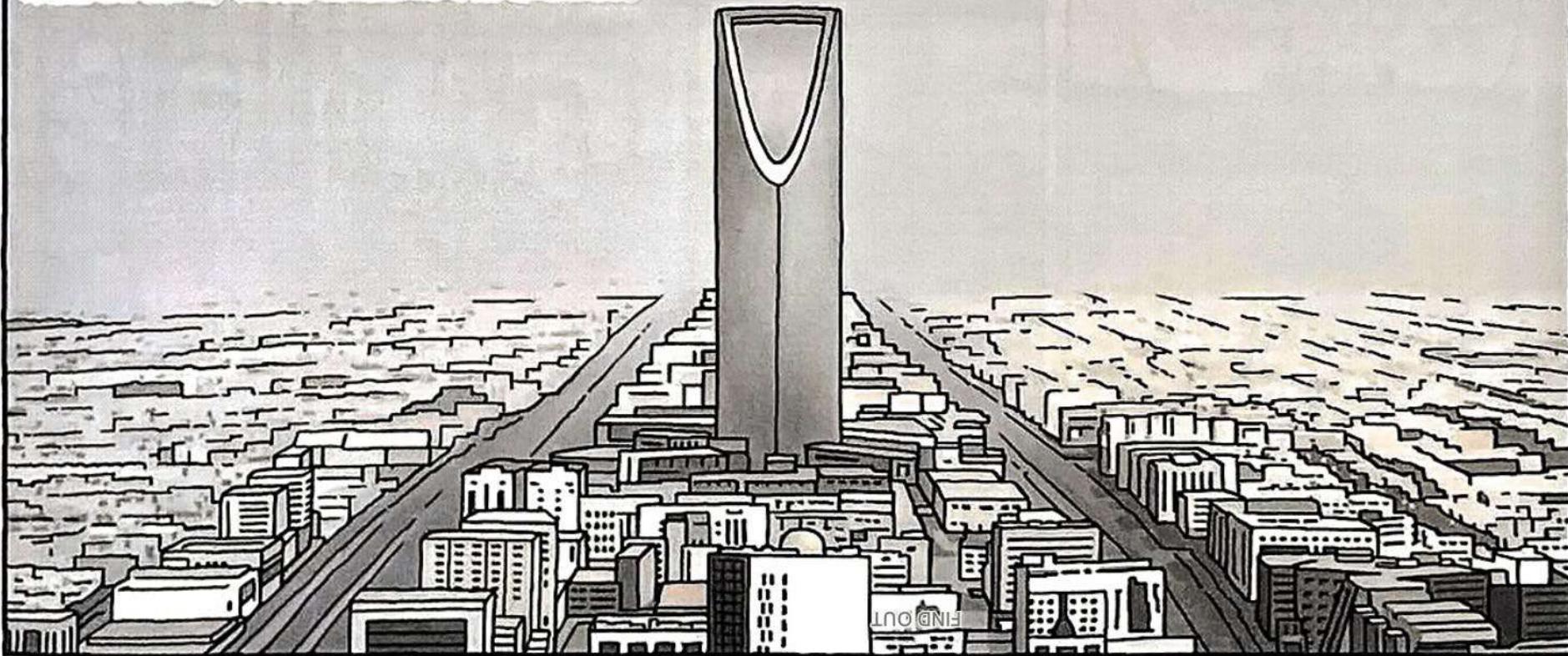


# Why can't OPEC maintain high oil prices?



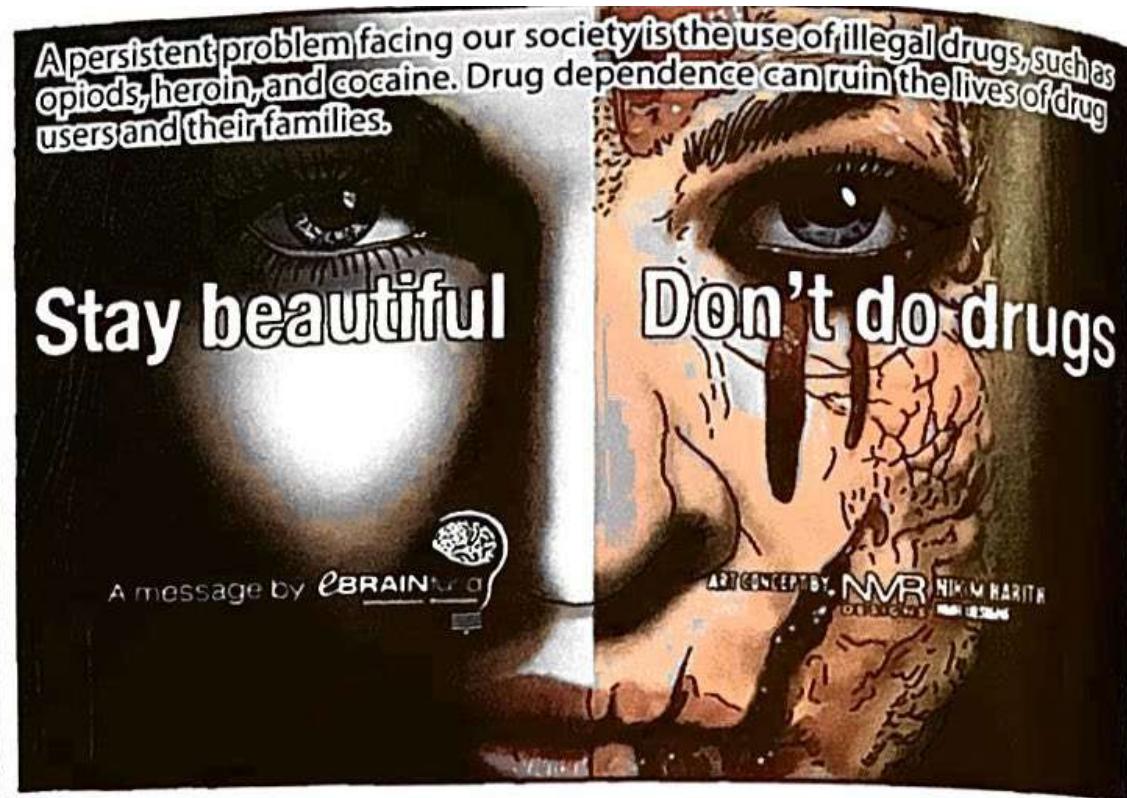
# Why can't OPEC maintain high oil prices?

OPEC understands that raising prices in the short term is easier than in the long term.



## Has drug control increased or decreased drug-related crimes?

Does Drug  
Interdiction Increase  
or Decrease  
Drug-Related  
Crimes?

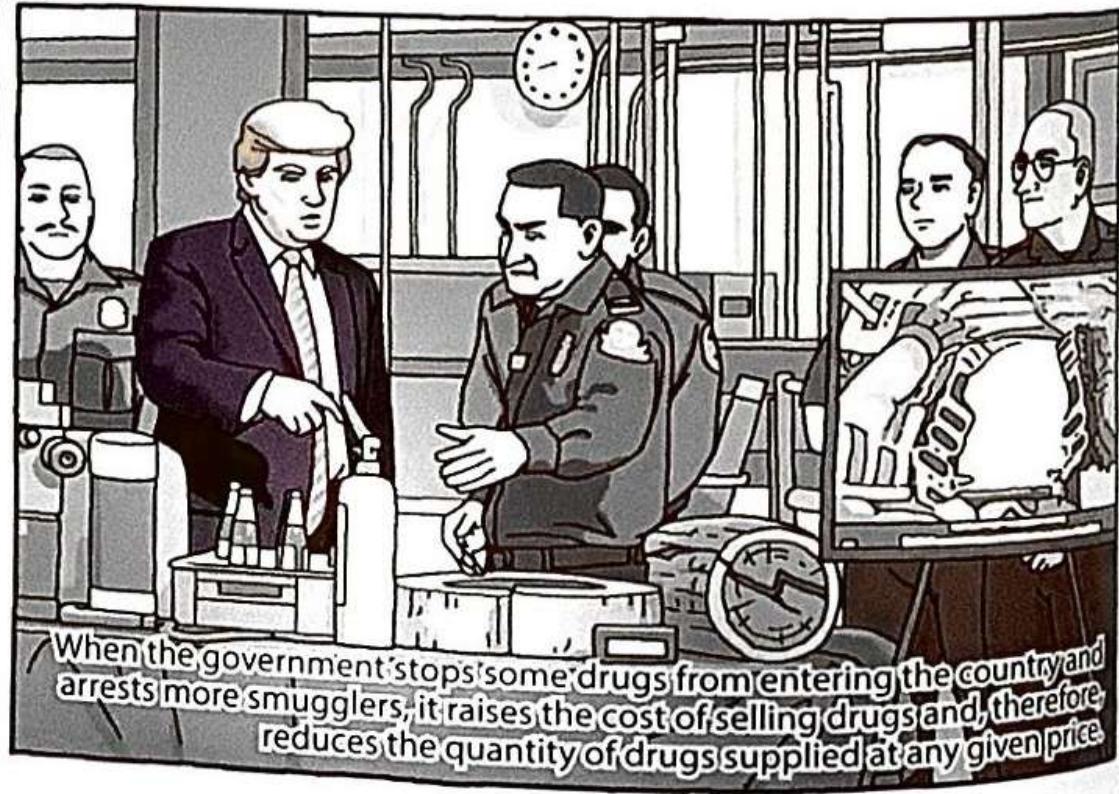


## Has drug control increased or decreased drug-related crimes?

In addition, drug addicts often commit robbery or other violent crimes to obtain the money needed to maintain their drug habit.



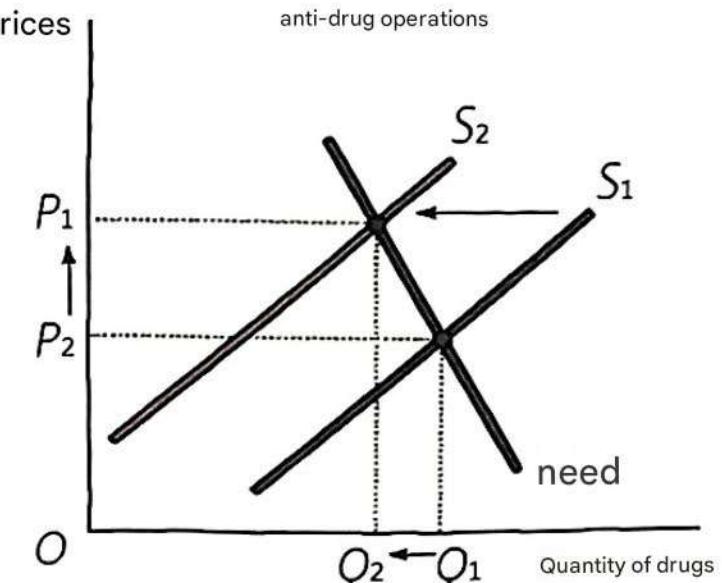
## Has drug control increased or decreased drug-related crimes?



# Has drug control increased or decreased drug-related crimes?

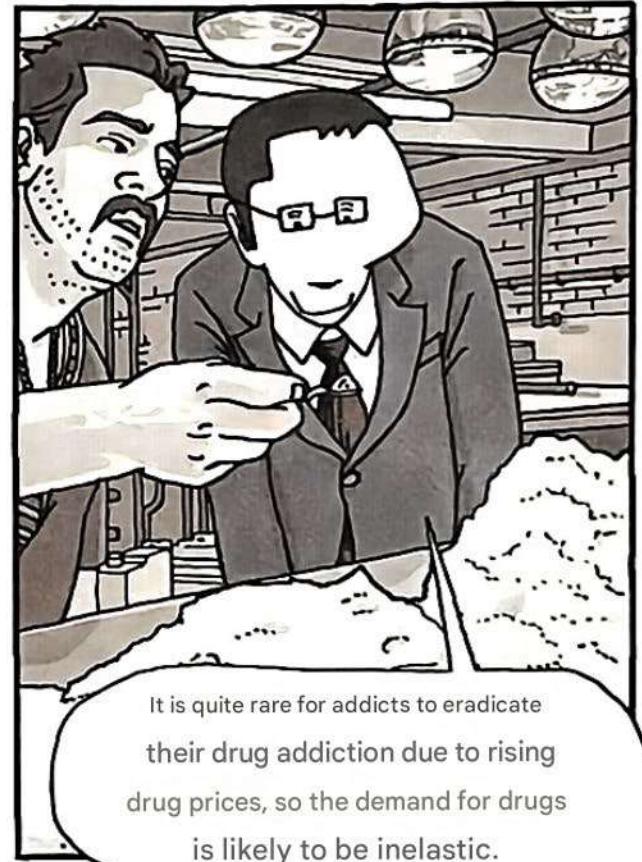
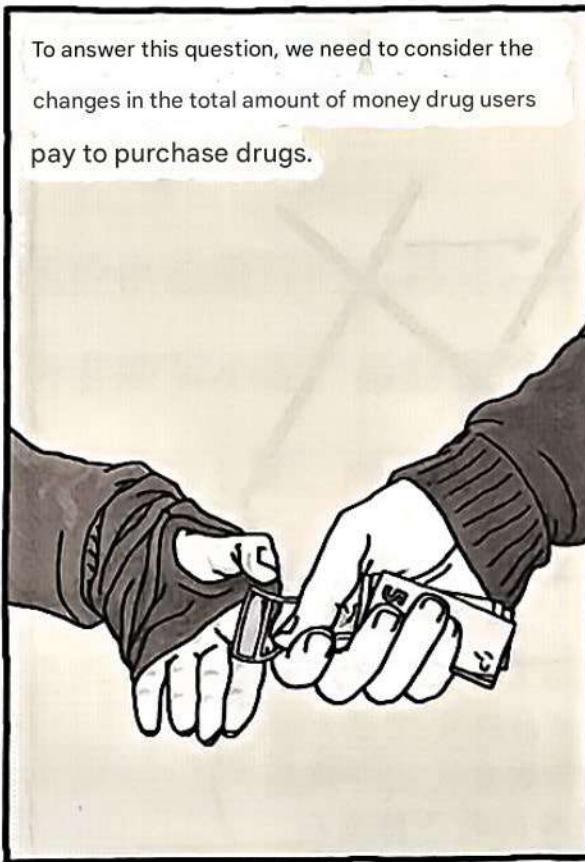
However, the demand for drugs—that is, the quantity that buyers would want to purchase at any given price level—has not changed.

In other words, the supply curve shifts from  $S_2$  to  $S_1$ , while the demand curve remains unchanged.

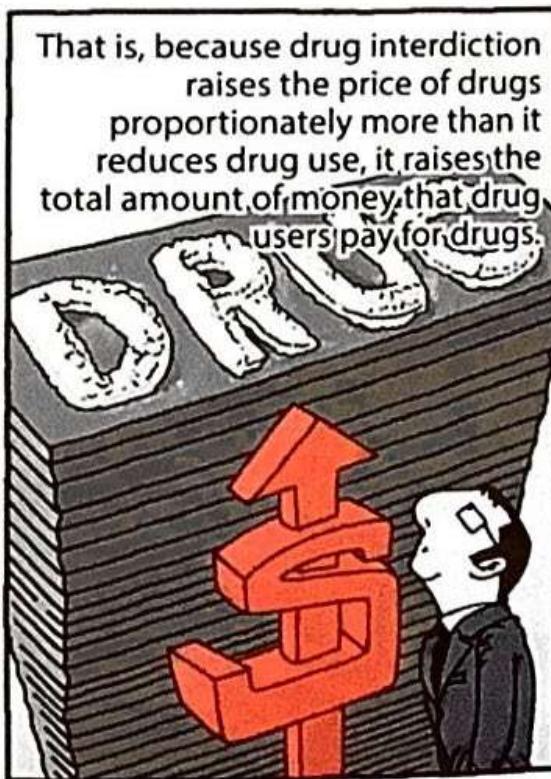
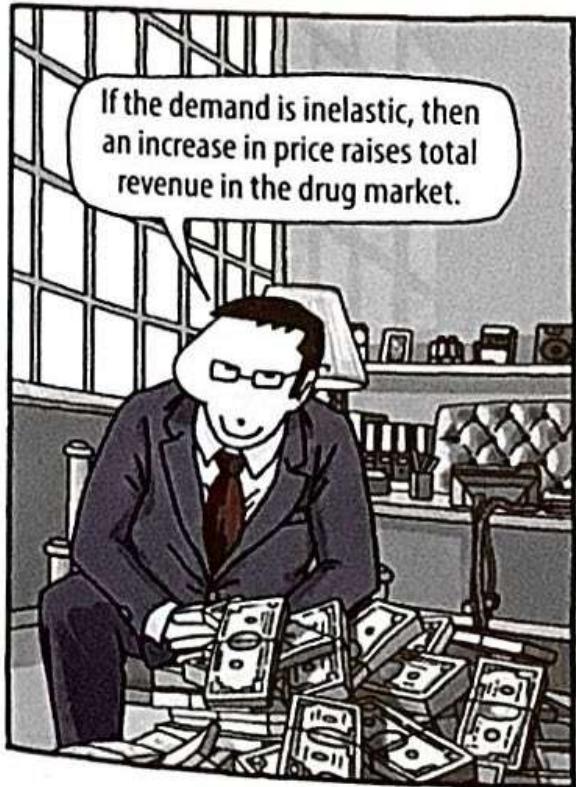


The equilibrium price of drugs rises from  $P_1$  to  $P_2$ , while the equilibrium quantity decreases from  $Q_1$  to  $Q_2$ . Therefore, the decrease in the equilibrium quantity indicates that anti-drug efforts have indeed reduced drug use.

## Has drug control increased or decreased drug-related crimes?



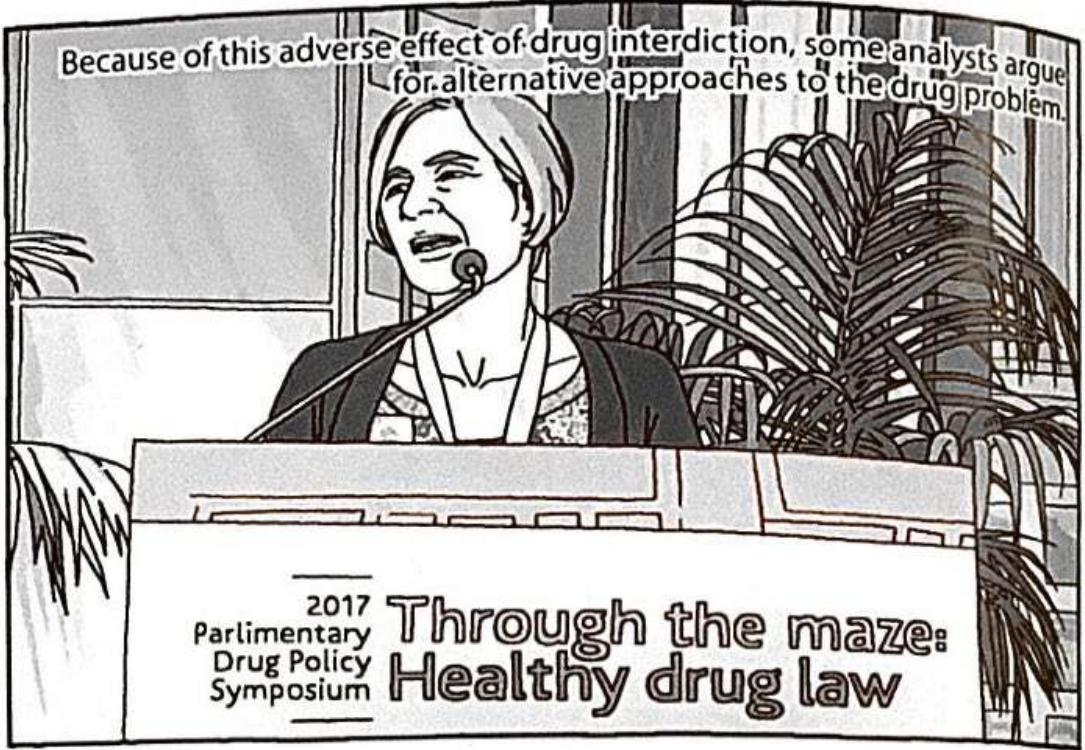
## Has drug control increased or decreased drug-related crimes?



Addicts who already had to steal to support their habits would have an even greater need for quick cash.

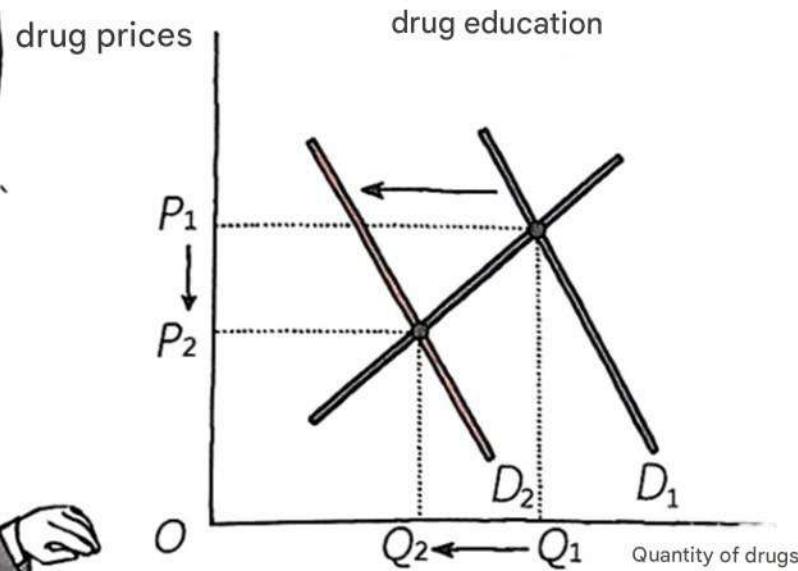


## Has drug control increased or decreased drug-related crimes?



# Has drug control increased or decreased drug-related crimes?

To address the risks of drug use, educating the public to reduce drug demand is a more effective approach.



Next, the demand curve shifts to the left from  $D$  to  $D_2$ , the equilibrium quantity decreases from  $Q$  to  $Q_2$ , and the equilibrium price decreases from  $P$  to  $P_2$ .

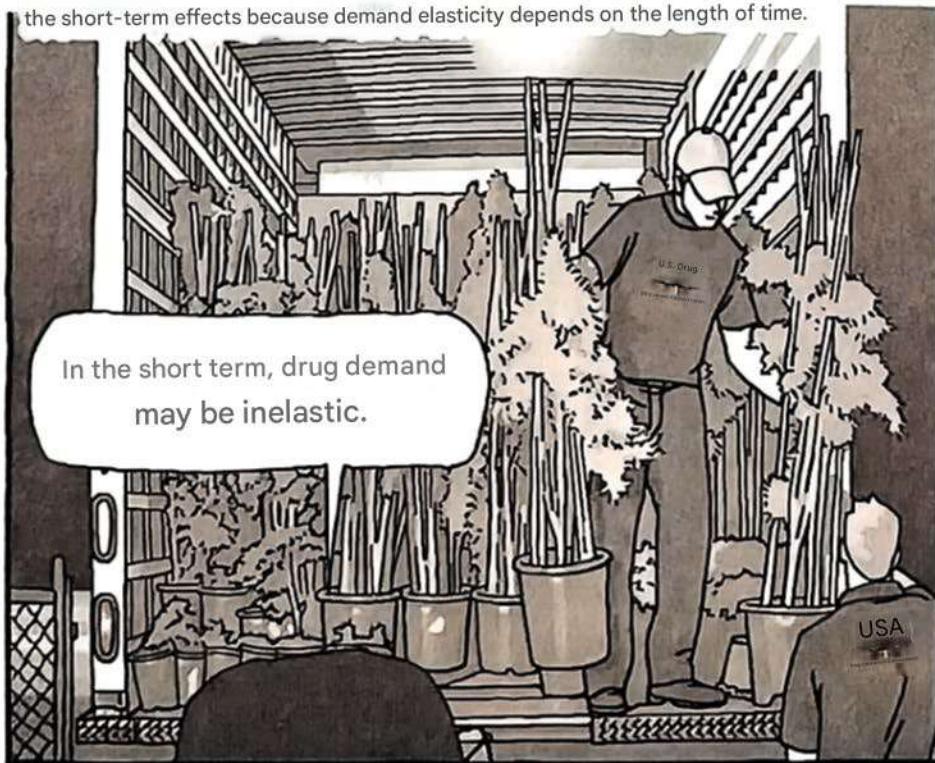
Therefore, compared with drug prohibition, drug education can reduce both drug use and drug-related crimes.



healthy  
school

# Has drug control increased or decreased drug-related crimes?

Drug control proponents might argue that the long-term effects of this policy differ from the short-term effects because demand elasticity depends on the length of time.



High prices will discourage young people from trying drugs, and over time, this will reduce the number of addicts.



# SUMMARY



- Is good news for agriculture bad news for farmers?
  - The discovery of new wheat hybrids shifts the supply curve to the right, but the demand curve remains unchanged. Therefore, at any given price level, consumer willingness to buy wheat products is unaffected. Because wheat demand is inelastic, the increase in supply is less than the decrease in price, thus reducing farmers' total revenue.

# SUMMARY



- Why couldn't OPEC, the international oil cartel, maintain high oil prices?
  - The impact of reduced oil supply on the oil market can differ in the short and long run. In the short run, both oil supply and demand are relatively inelastic. Supply is inelastic because known oil reserves and extraction capacity cannot be changed rapidly; demand is also inelastic because purchasing habits do not immediately respond to price changes. Therefore, the short-run supply and demand curves are inelastic, and when oil supply shifts to the left, it causes a sharp price increase.
  - In the long run, the situation is quite different. For a long time, oil producers outside OPEC have responded to high oil prices by increasing oil exploration and building new extraction capacity. Consumers have responded by becoming more frugal, such as replacing old, inefficient cars with new, more efficient ones. Therefore, in the long run, the oil supply and demand curves are more elastic, and changes in the supply curve result in minimal price increases.

# SUMMARY



- Does drug control increase or decrease drug-related crime?
  - When governments prevent certain drugs from entering the country and arrest smugglers, this increases the cost of drug sales, thus reducing the supply of drugs at any given price level. However, drug demand—the quantity buyers want to purchase at any given price level—remains unchanged. Addicts who quit due to rising drug prices are relatively rare, so drug demand is likely inelastic. If drug demand is inelastic, a price increase will increase the total revenue of the drug market.
- At first glance, these questions seem unrelated. However, all three questions relate to markets, and all markets are governed by the forces of supply and demand. Here, we use the versatile tools of supply, demand, and elasticity to answer these seemingly complex questions.

# 思考题

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1. A life-saving drug with no close substitutes tends to have:
  - a. low demand elasticity
  - b. high demand elasticity
  - c. low supply elasticity
  - d. high supply elasticity

## 思考题

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2. When the price of an item rises from \$8 to \$12, the quantity demanded falls from 110 units to 90 units. Using the midpoint method, the elasticity is:
- a. 1/5
  - b. 1/2
  - c. 2
  - d. 5

# 思考题

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3. A linear, downward-sloping demand curve is:
- a. inelastic
  - b. unit elastic
  - c. elastic
  - d. inelastic at some points and elastic at others

## 思考题

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4. The ability of firms to enter and exit a market over time means that in the long run,
- a. the demand curve becomes more elastic
  - b. the demand curve becomes less elastic
  - c. the supply curve becomes more elastic
  - d. the supply curve becomes less elastic

## 思考题

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5. If the supply of a good increases, the total revenue received by producers will decrease if \_\_\_\_\_.
- a. the demand curve is inelastic
  - b. the demand curve is elastic
  - c. the supply curve is inelastic
  - d. the supply curve is elastic

# 思考题

6. Last month, the price of coffee increased sharply, but its quantity sold remained unchanged. Five people each gave the following explanations. Who is correct?

Tom: Demand increased, but supply is perfectly inelastic.

Dick: Demand increased, but it is perfectly inelastic.

Harry: Demand increased, but supply decreased at the same time.

Larry: Supply decreased, but demand is unit elastic.

Mary: Supply decreased, but demand is perfectly inelastic.

a. Tom, Dick, and Harry

b. Tom, Dick, and Mary

c. Tom, Harry, and Mary

d. Dick, Harry, and Larry

e. Dick, Harry, and Mary

## 思考题

7. A February 17, 1996 report in \*The New York Times\* stated that subway ridership declined after the fare increase: “In December 1995, the first full month after the token fare increased by 25 cents to \$1.50, ridership decreased by nearly 4 million from the previous December, a drop of 4.3%.”

- (1) Use these data to estimate the price elasticity of demand for subway rides.
- (2) What happens to the Transit Authority’s revenue when fares increase?
- (3) Why might estimates of elasticity be unreliable?

## 思考题

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8. Consider public policies targeting smoking.
  - (1) Research shows that the price elasticity of demand for cigarettes is 0.4. If a pack of cigarettes currently costs \$2, and the government wants to reduce smoking by 20%, by how much should the price increase?
  - (2) If the government permanently raises cigarette prices, will this policy have a greater impact on smoking one year or five years from now?
  - (3) Research also found that the price elasticity of demand is higher for teenagers than for adults. Why is this?