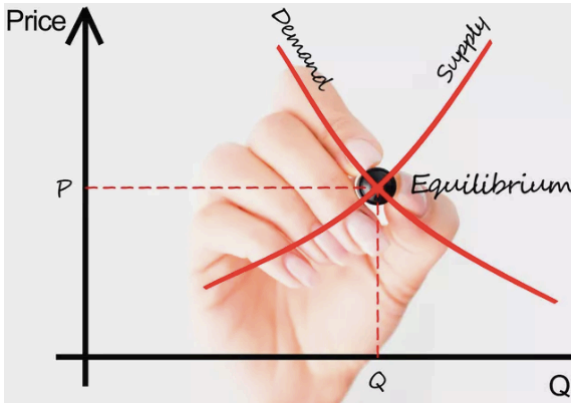
ECONOMICS Lecture 17
Market Equilibrium & Welfare

Dedicated to Alfred Marshall

Biwei Chen

Topics

- Demand and Supply
- Market Equilibrium
- Market Welfare
- Price System

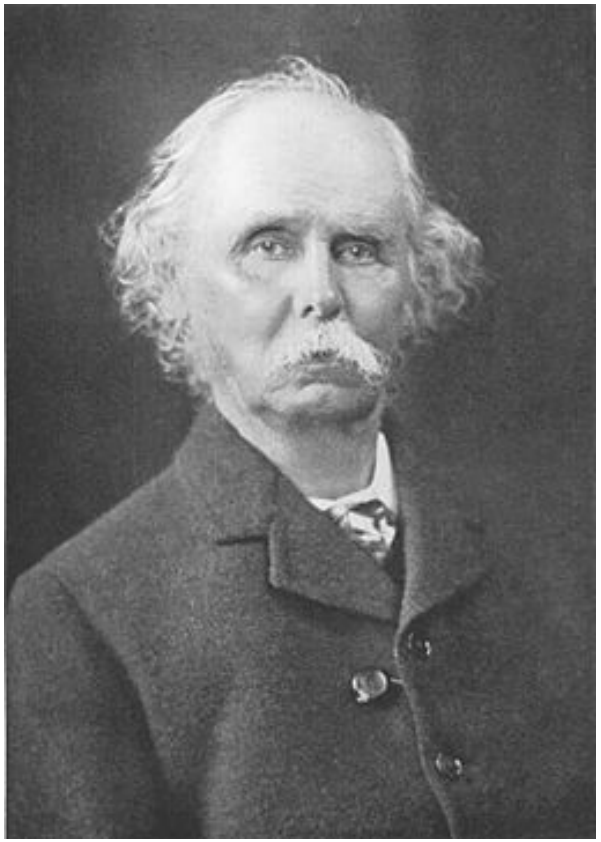


This lecture explains why prices change and how prices are determined. The market equilibrium model serves as a fundamental tool in understanding and predicting market conditions. The model is further applied to measuring market welfare.

https://www.thoughtco.com/overview-of-the-demand-curve-1146962

Alfred Marshall (1842-1924)

Alfred Marshall was the dominant figure in British economics (itself dominant in world economics) from about 1890 until his death in 1924. His specialty was microeconomics—the study of individual markets and industries, as opposed to the study of the whole economy. **In his most important book, Principles of Economics, Marshall emphasized that the price and output of a good are determined by both supply and demand: the two curves are like scissor blades that intersect at equilibrium.** Modern economists trying to understand why the price of a good changes still start by looking for factors that may have shifted demand or supply, an approach they owe to Marshall.

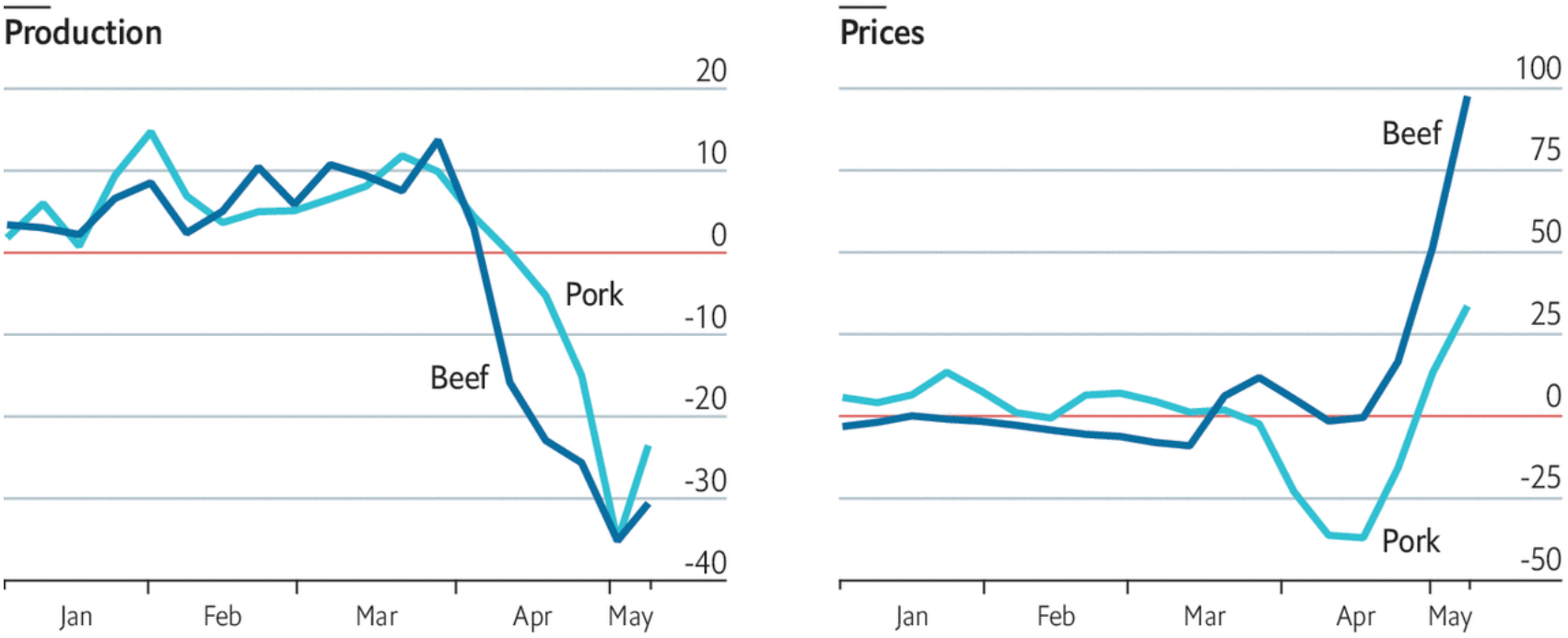


https://www.econlib.org/library/Enc/bios/Marshall.html

U.S. Meat Prices during COVID-19

Prime cuts

United States, meat industry, 2020, % change on a year earlier

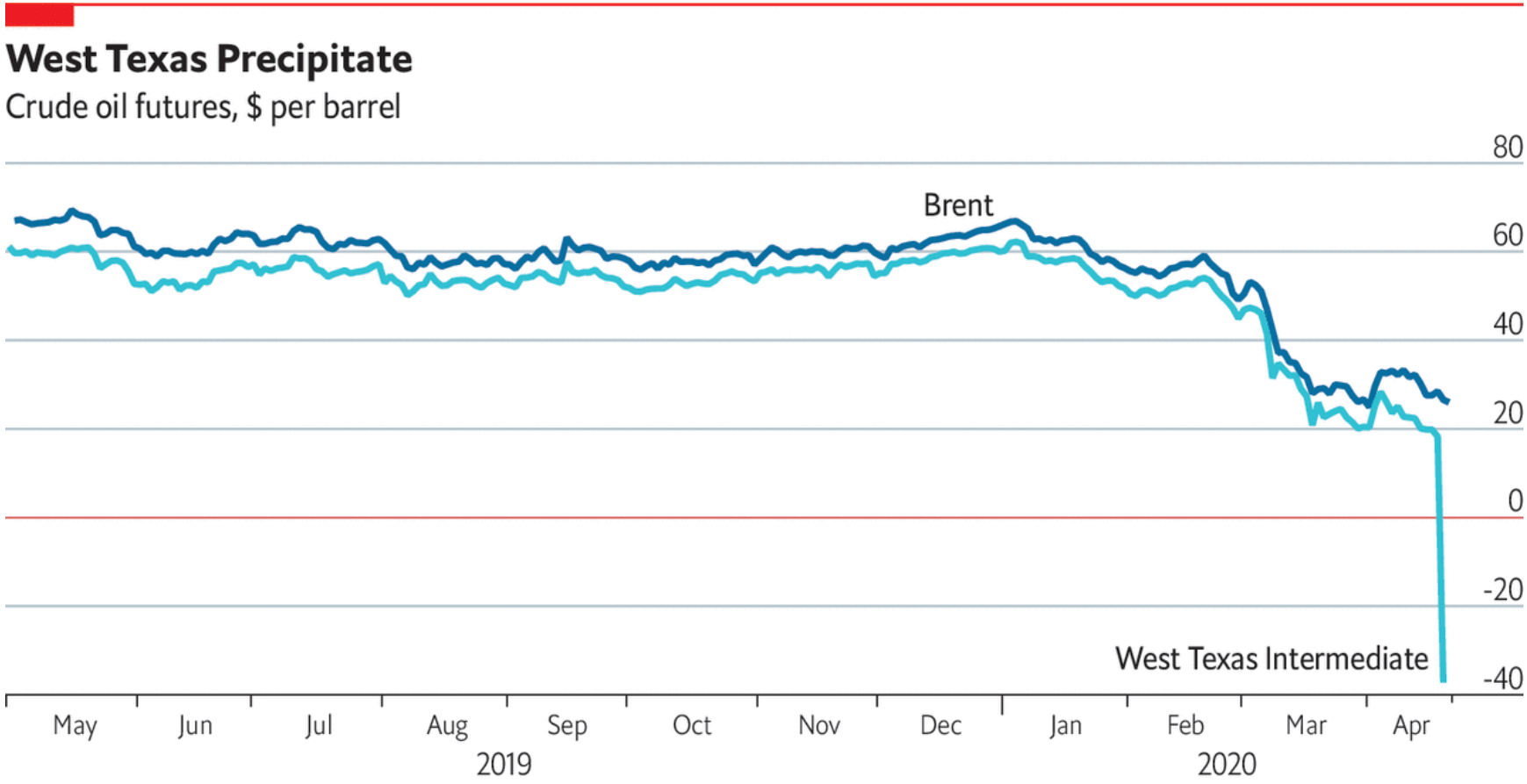


Sources: USDA; CoBank

The Economist

www.economist.com/graphic-detail/2020/05/13/the-spread-of-covid-has-caused-a-surge-in-american-meat-prices

U.S. Crude Oil Price Through Zero



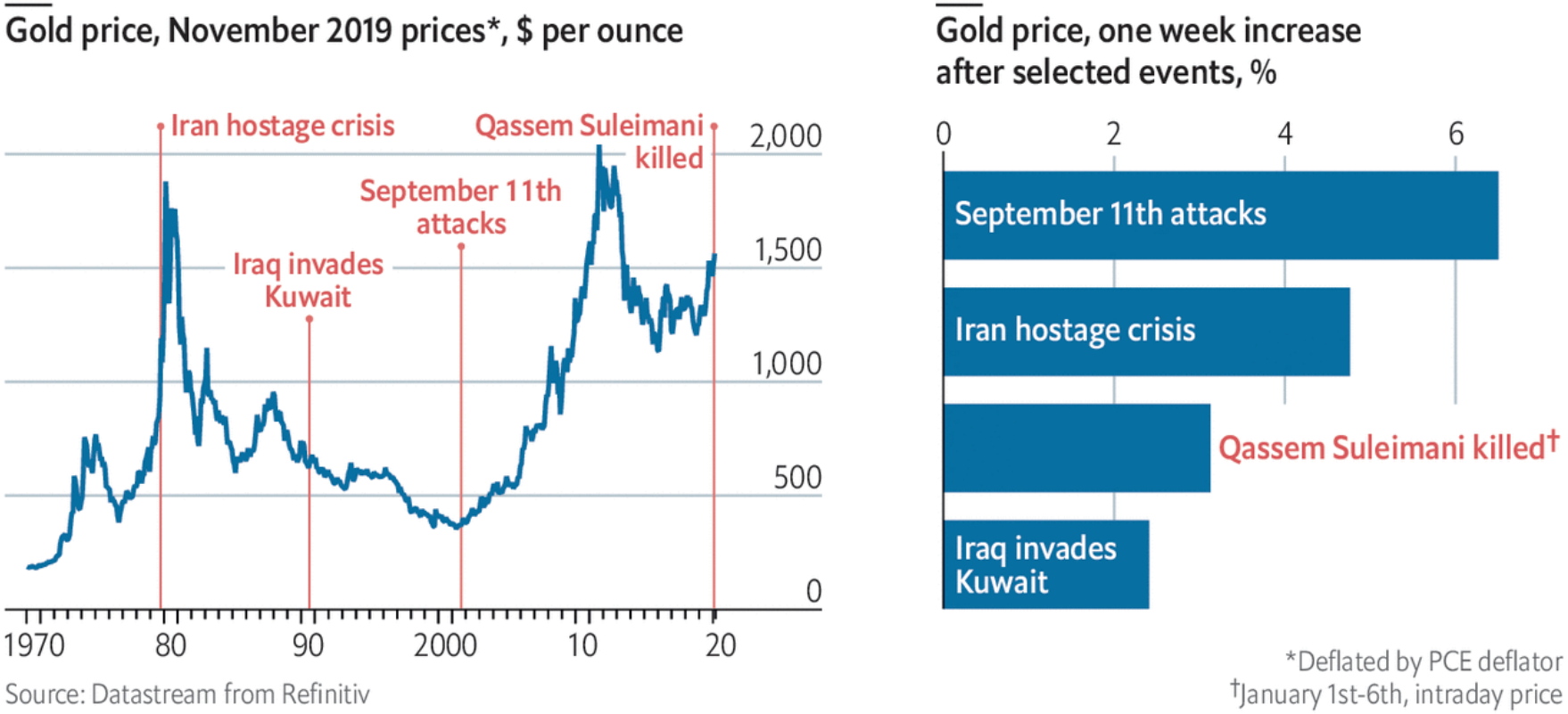
Source: Datastream from Refinitiv

The Economist

https://www.economist.com/graphic-detail/2020/04/19/american-crude-oil-has-fallen-to-less-than-nothing

Gold Price & Geopolitical Risk

Volatile elements

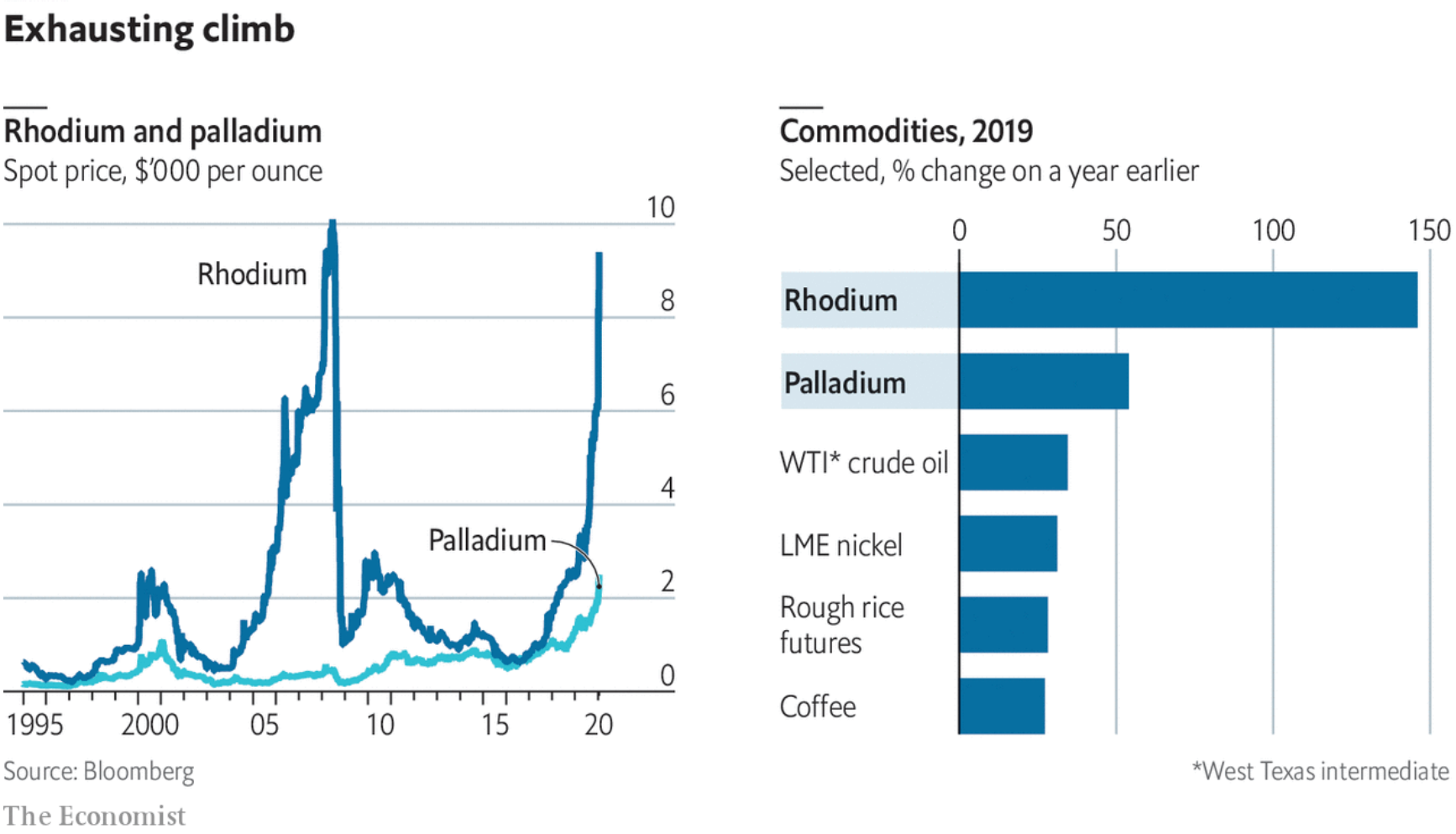


The Economist

NOBODY REALLY understands gold prices, and I don't pretend to understand them either. –Ben Bernanke.

https://www.economist.com/graphic-detail/2020/01/06/the-killing-of-qassem-suleimani-sends-gold-to-a-seven-year-high

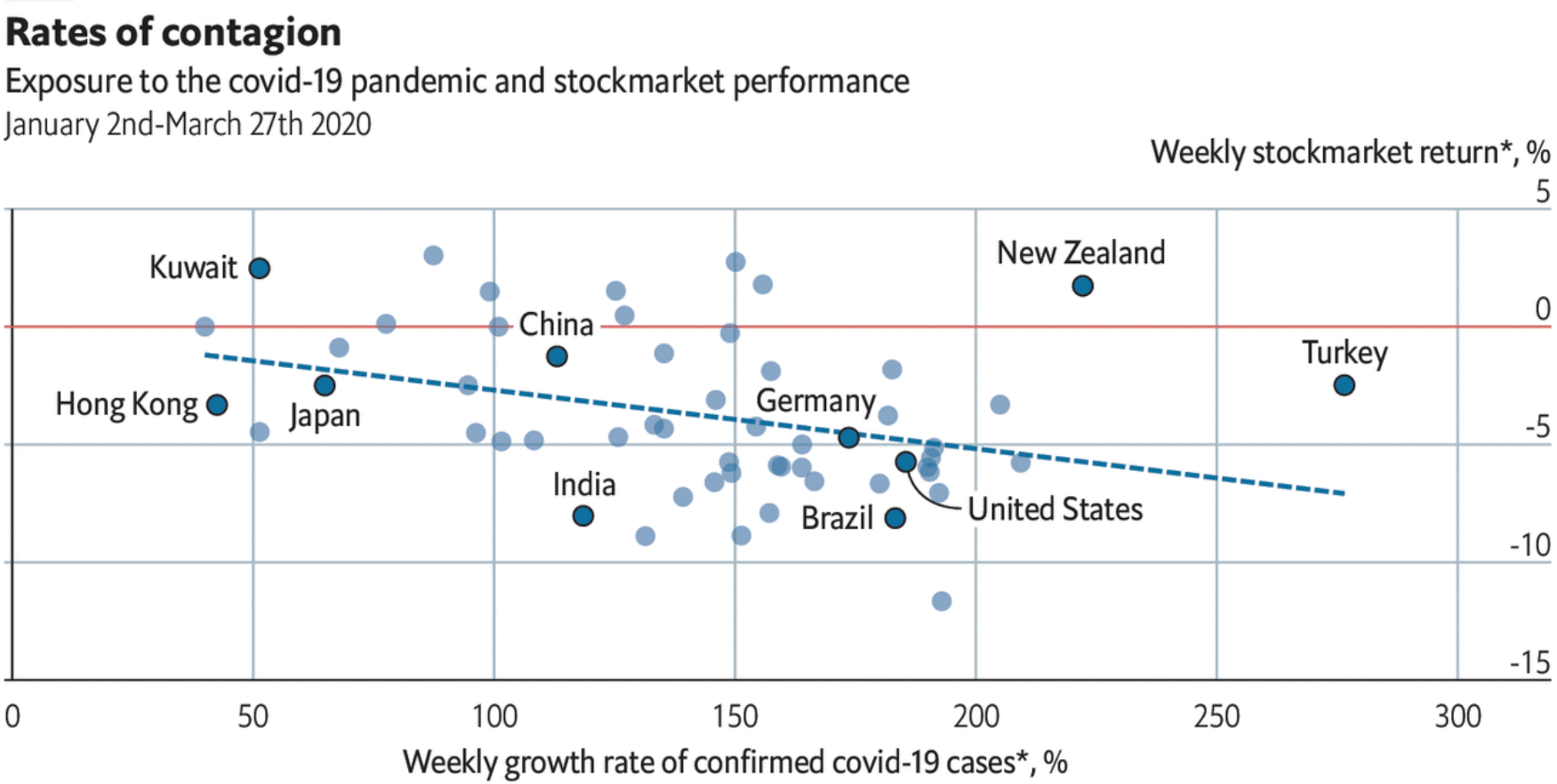
Rhodium Price: 11 Year High



Rhodium is used to curb emissions from car exhausts, the metal is six times pricier than gold.

https://www.economist.com/graphic-detail/2020/01/21/the-price-of-rhodium-reaches-an-11-year-high

Stock Returns During COVID-19



https://www.economist.com/graphic-detail/2020/04/28/which-companies-are-most-immune-to-the-pandemic

Of the Natural and Market Price of Commodities

The actual price at which any commodity is commonly sold is called its market price. It may either be above, or below, or exactly the same with its natural price. The market price of every particular commodity is regulated by the proportion between the quantity which is actually brought to market, and the demand of those who are willing to pay the natural price of the commodity, or the whole value of the rent, labour, and profit, which must be paid in order to bring it thither.

A public mourning raises the price of black cloth and augments the profits of the merchants who possess any considerable quantity of it.

Adam Smith, Wealth of Nations, VII

http://oll.libertyfund.org/title/237

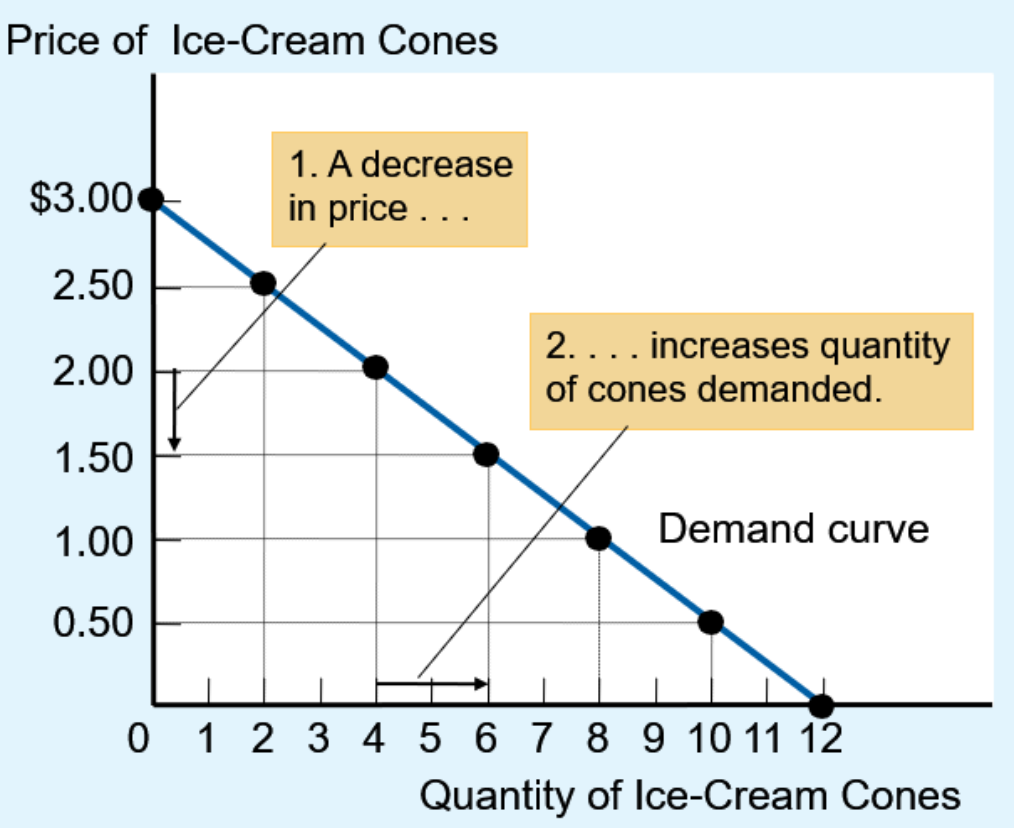
The Law of Demand

- The law of demand: all else equal, the quantity demanded is inversely related to price of a product.
- What is the difference between quantity demanded Q_d and demand D?
- The demand factors:
  1. Household income (inferior v.s. normal goods)
  2. Prices of related goods (substitutes v.s. complements)
  3. Weather, fashion, or social belief
  4. Population and market scope
  5. Government tax or subsidy
  6. Market expectations

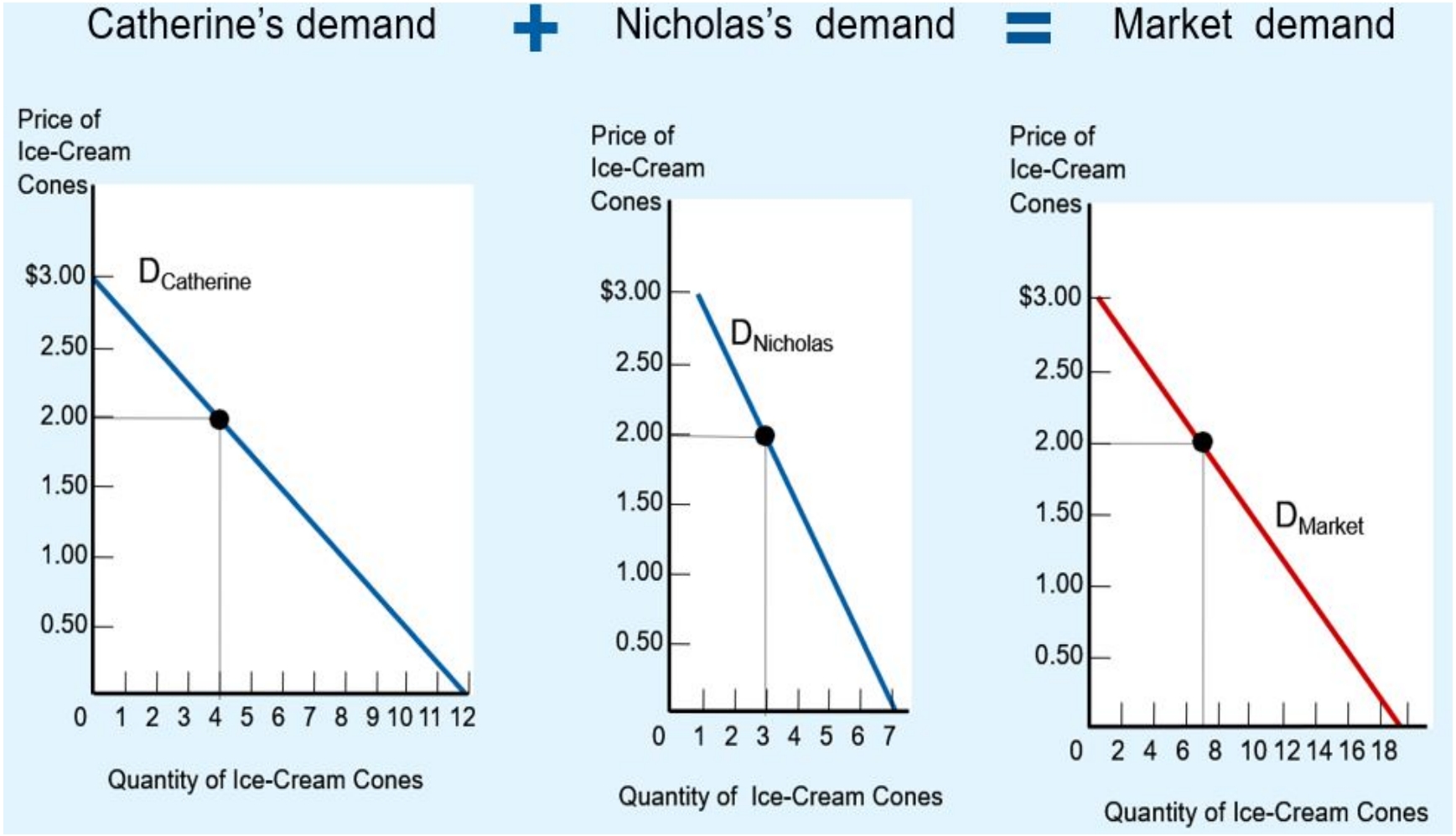
Individual Demand Schedule

Price of Ice-Cream Cone	Quantity of Cones Demanded
$0.00	12 cones
0.50	10
1.00	8
1.50	6
2.00	4
2.50	2
3.00	0

The demand schedule is a table that shows the quantity demanded at each price. Because a lower price increases the quantity demanded, the demand curve slopes downward.

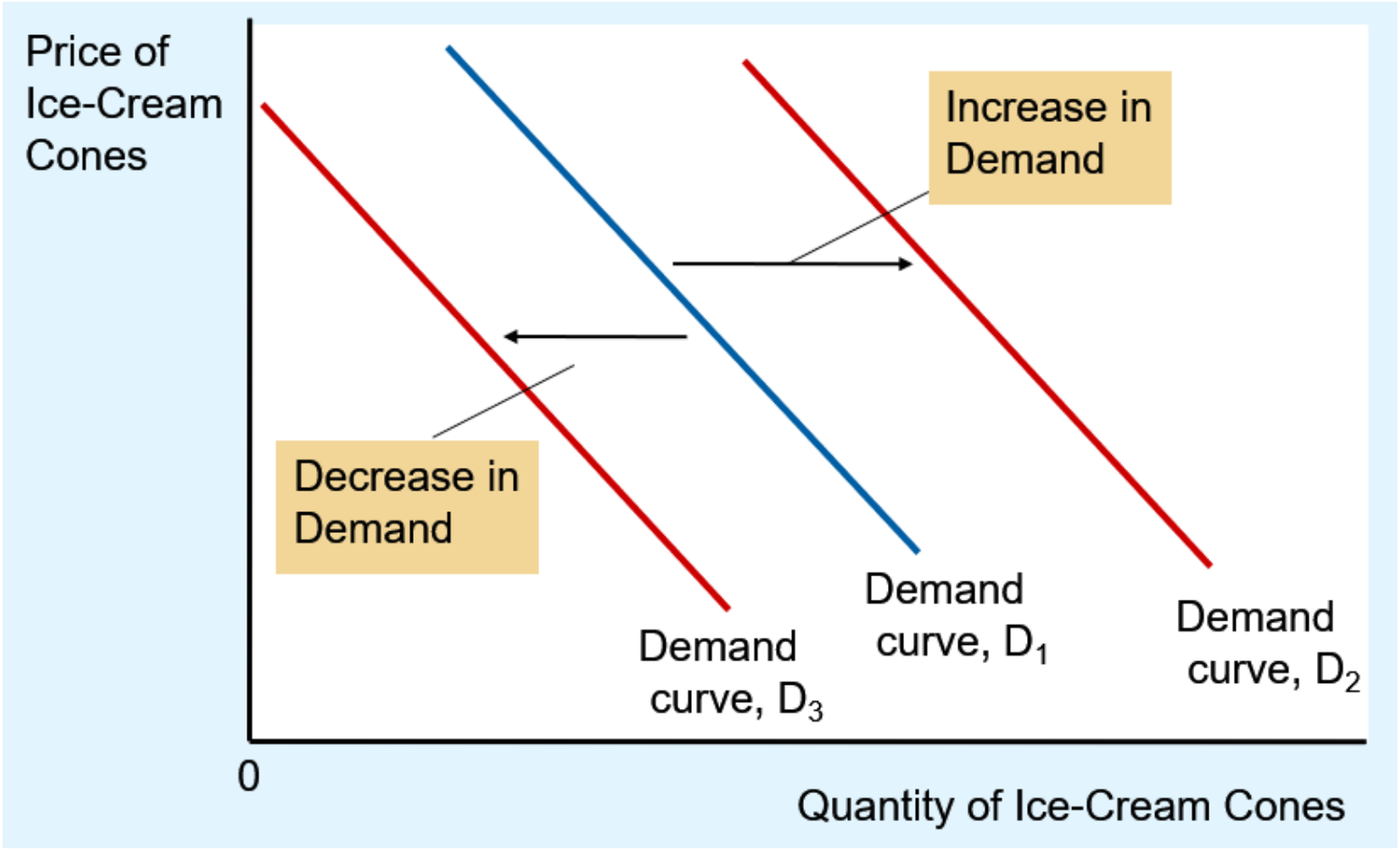


Market Demand Curve: Derivation



N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Demand Curve Driving Factors



A change that raises the quantity that buyers wish to purchase at any given price shifts the demand curve to the right.

A change that lowers the quantity that buyers wish to purchase at any given price shifts the demand curve to the left.

N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Demand Factors

Variable	A change in this variable
Price of the good itself	Represents a movement along the demand curve
Disposable income	Shifts the demand curve
Prices of related goods	Shifts the demand curve
Public policies	Shifts the demand curve
Expectations	Shifts the demand curve
Number of buyers	Shifts the demand curve

- This table lists the variables that affect how much of any good consumers choose to buy.
- Notice the special role that the price of the good plays: A change in the good's price represents a movement along the demand curve, whereas a change in one of the other variables shifts the demand curve.

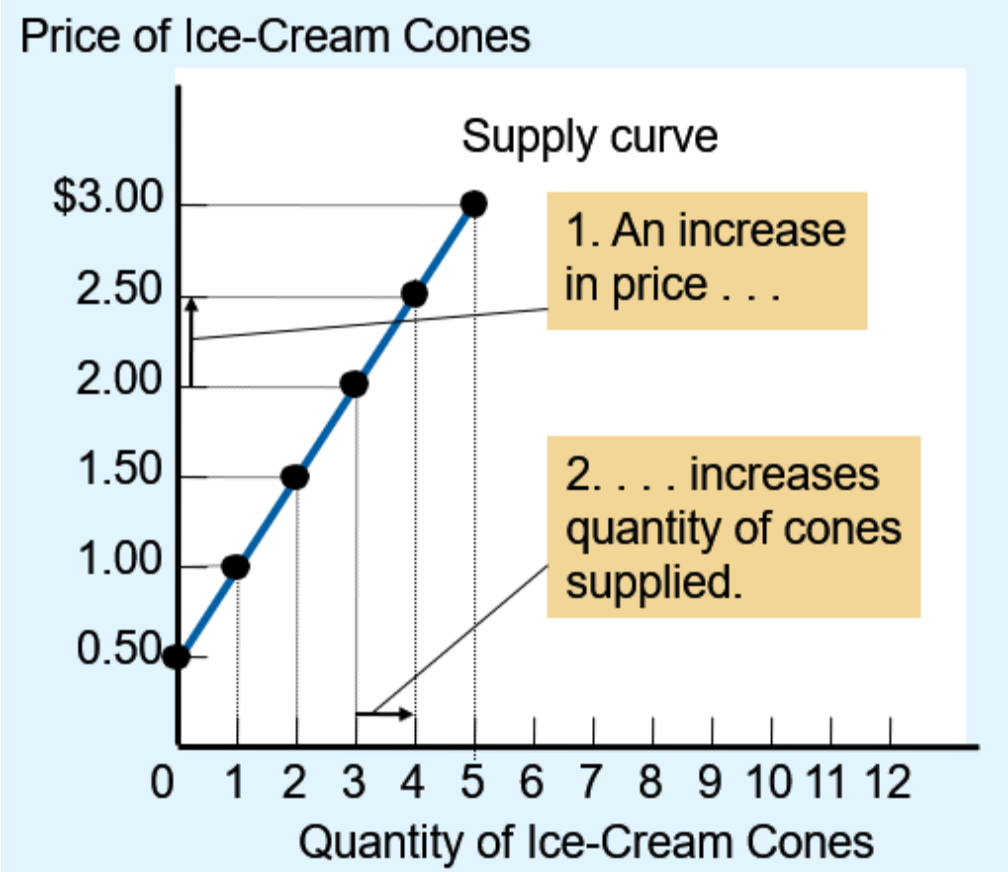
The Law of Supply

- The law of supply: all else equal, the quantity supplied is positively related to price.
- The firm's decision is based on MC=MR, the rising part of the marginal cost is therefore its supply curve.
- The supply shifters:
  1. Production factor costs (wage, energy, inputs)
  2. Production technology (AI, information, data analysis)
  3. Weather conditions on agricultural products
  4. Competitors and product uniqueness
  5. Time horizon and expectations
  6. Government tax or subsidy

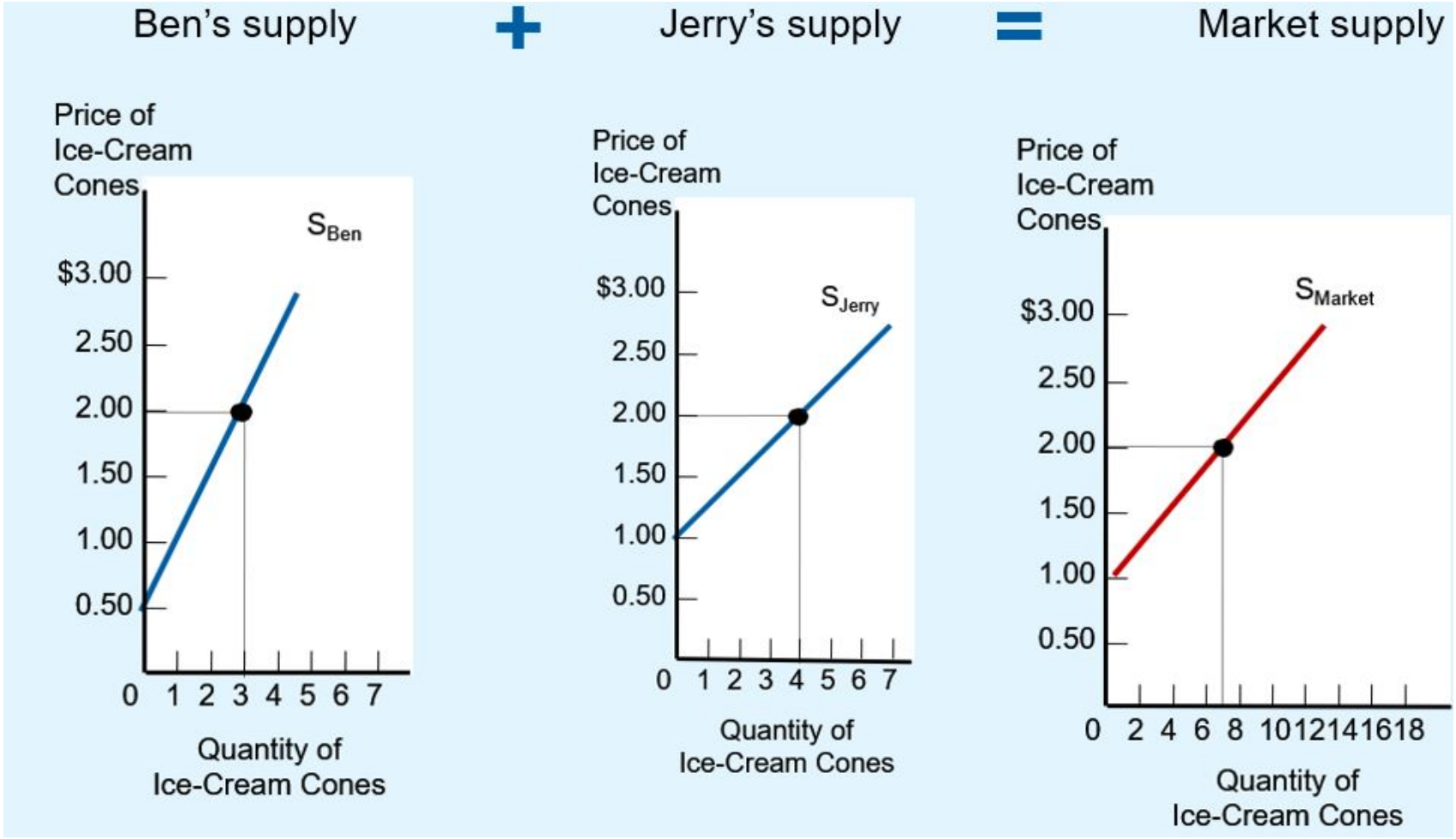
Individual Supply Schedule

Price of Ice-cream Cone	Quantity Of Cones Supplied
$0.00	0 cones
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5

The supply schedule is a table that shows the quantity supplied at each price. Because a higher price increases the quantity supplied, the supply curve slopes upward.

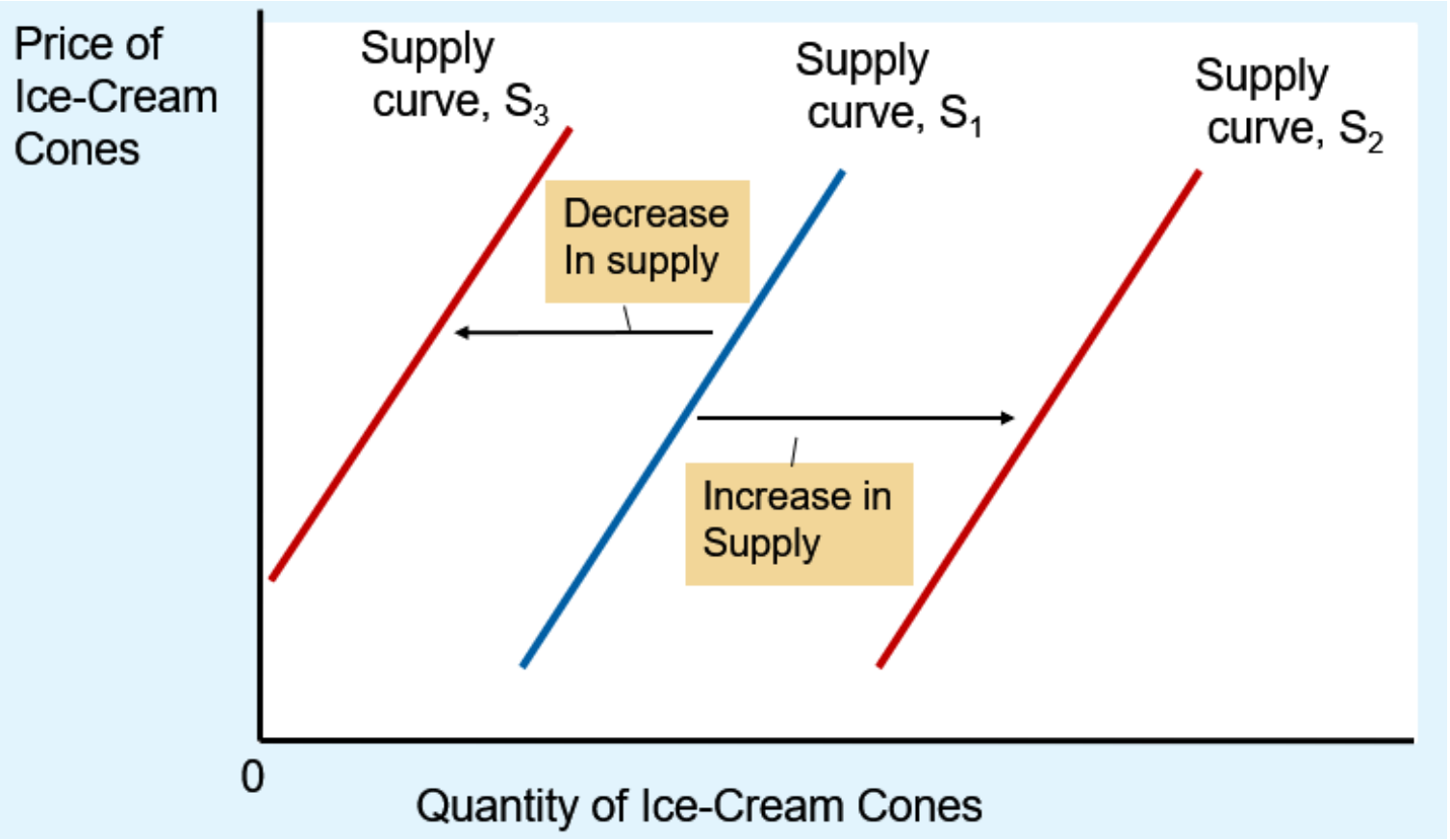


Market Supply Curve: Derivation



N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Supply Curve Driving Factors



Any change that raises the quantity that sellers wish to produce at any given price shifts the supply curve to the right.

Any change that lowers the quantity that sellers wish to produce at any given price shifts the supply curve to the left.

N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Supply Determinants & Factors

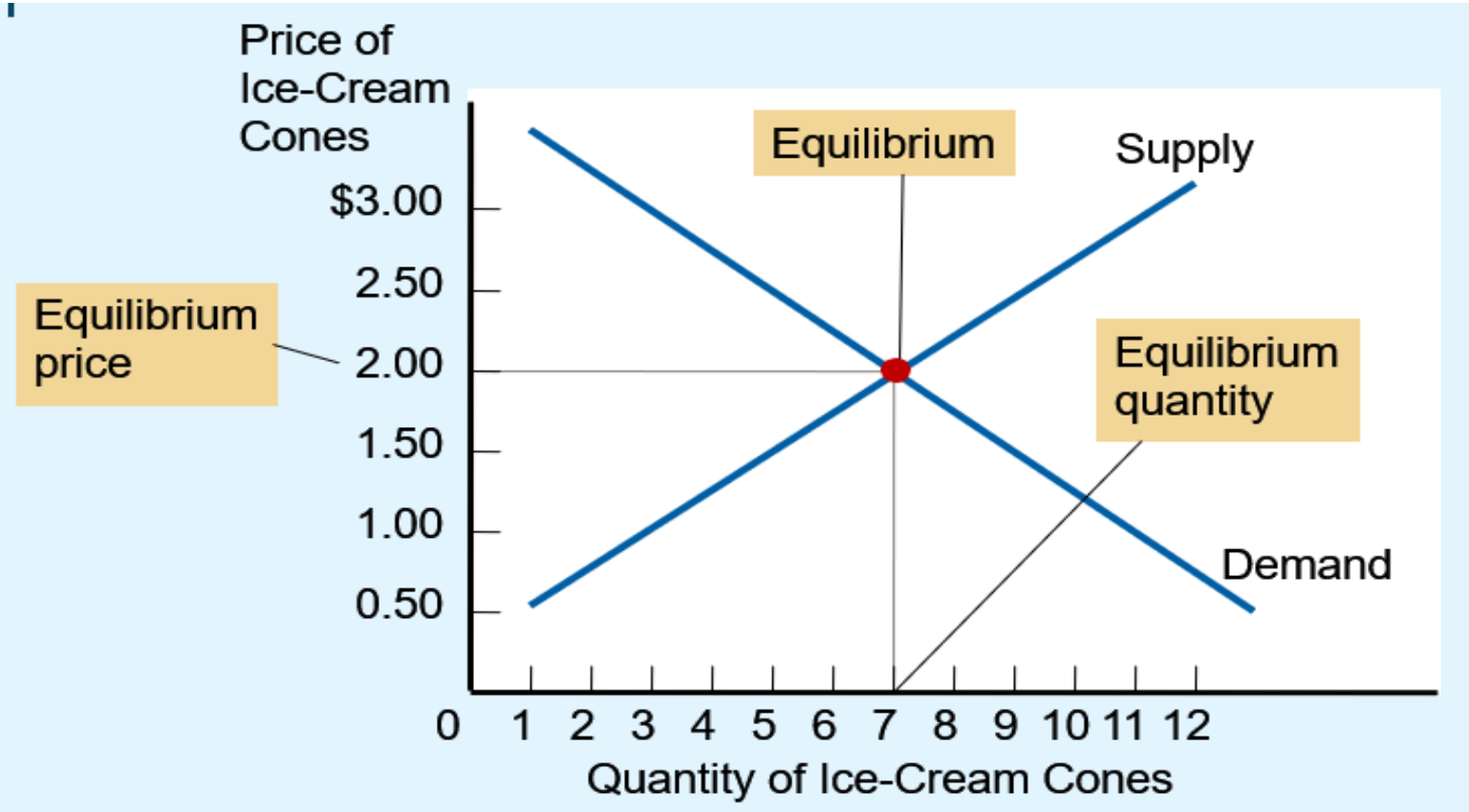
Variable	A change in this variable
Price of the good itself	Represents a movement along the supply curve
Input prices	Shifts the supply curve
Technology	Shifts the supply curve
Expectations	Shifts the supply curve
Public policies	Shifts the supply curve
Number of sellers	Shifts the supply curve

This table lists the variables that affect how much of any good producers choose to sell. Notice the special role that the price of the good plays: A change in the good's price represents a movement along the supply curve, whereas a change in one of the other variables shifts the supply curve.

The Market Equilibrium

- Combining the laws of supply and demand, we develop the classic demand and supply model.
- Only two variables are of our interest: the price and the quantity, determined by the forces of market competition.
- **Market Equilibrium** is a combination of price and quantity being bought and sold at a given point in time.
- Graphically, it is the intersection of the demand and supply.
- Changes in demand and supply conditions will shift either demand or supply or both curves to a new location and form a new equilibrium—a new price and quantity.

Equilibrium of Demand and Supply

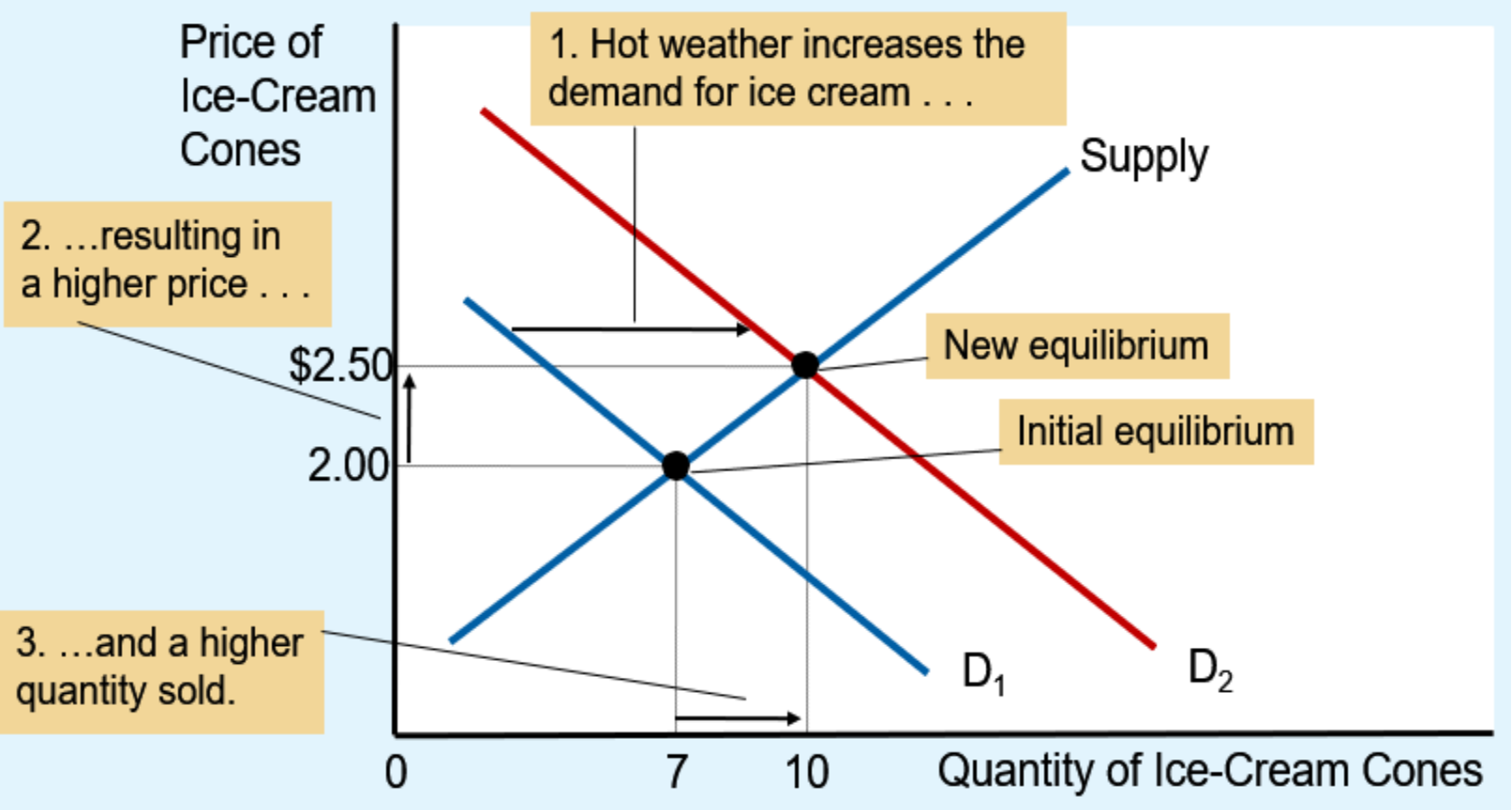


- The equilibrium is found where the supply and demand curves intersect. At the equilibrium price, the quantity supplied equals the quantity demanded.
- Here the equilibrium price is $2.00: At this price, 7 ice-cream cones are supplied and 7 ice-cream cones are demanded.

The Demand and Supply Model

- The mathematics for the demand and supply model consists of two equations (linear or nonlinear). For instance,
- The demand equation: $P=a-b*Q_D$ or $Q_D=a/b-P/b$
- The supply equation: $P=c+d*Q_S$ or $Q_S=-c/d+P/d$
- The solution is the equilibrium: E(Q, P)
- Example: $P=10-Q_D$ and $P=4+Q_S$, what is the E?
- What would happen to market equilibrium if $P=12-Q_D$ because household income rises from 10 to 12?
- What would happen to market equilibrium if $P=6+Q_S$ because corporate tax rises from 4 to 6?

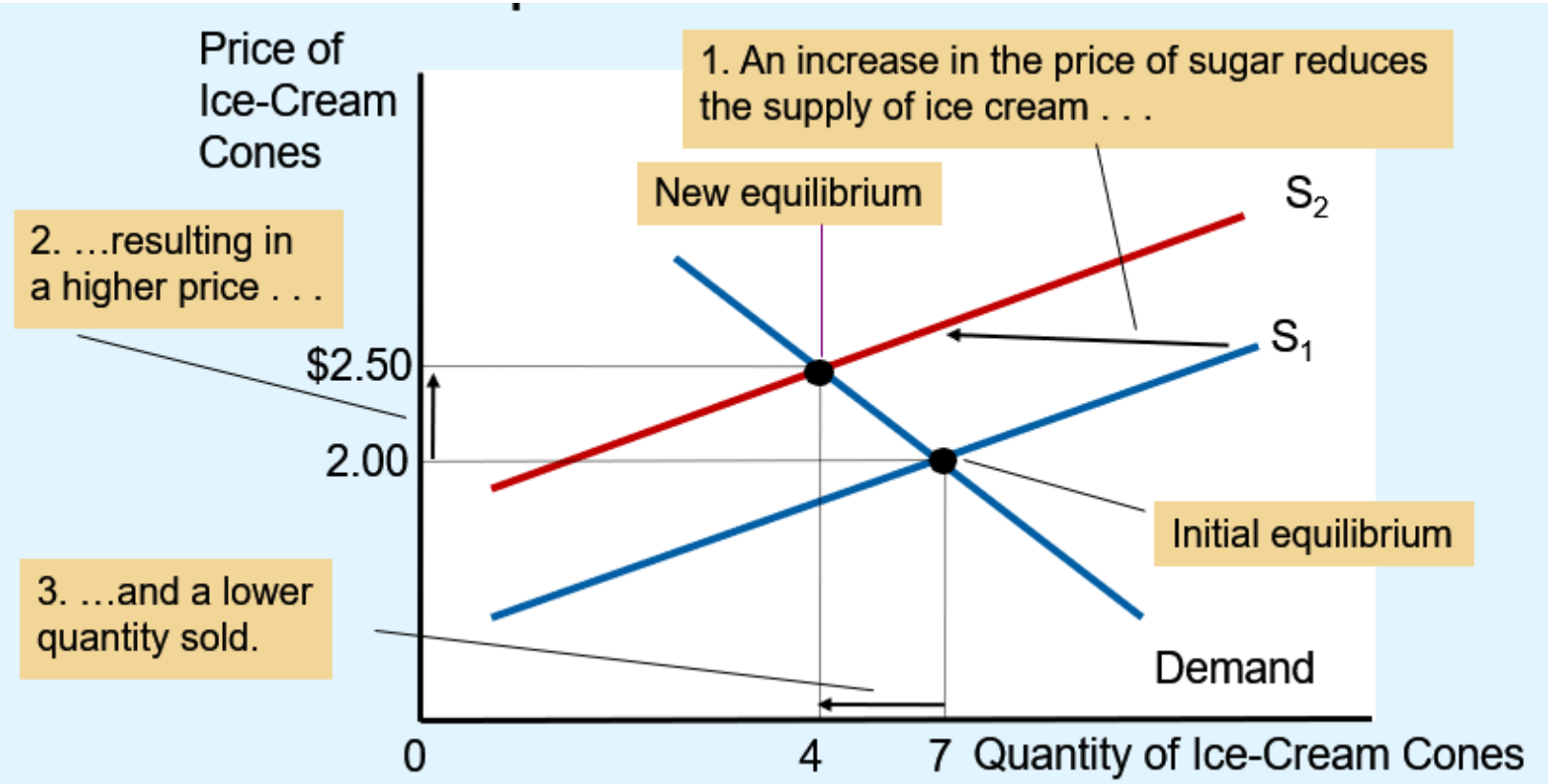
Demand Effect on Price and Quantity Change



Holding supply constant, higher demand will lead to higher price and quantity bought and sold.

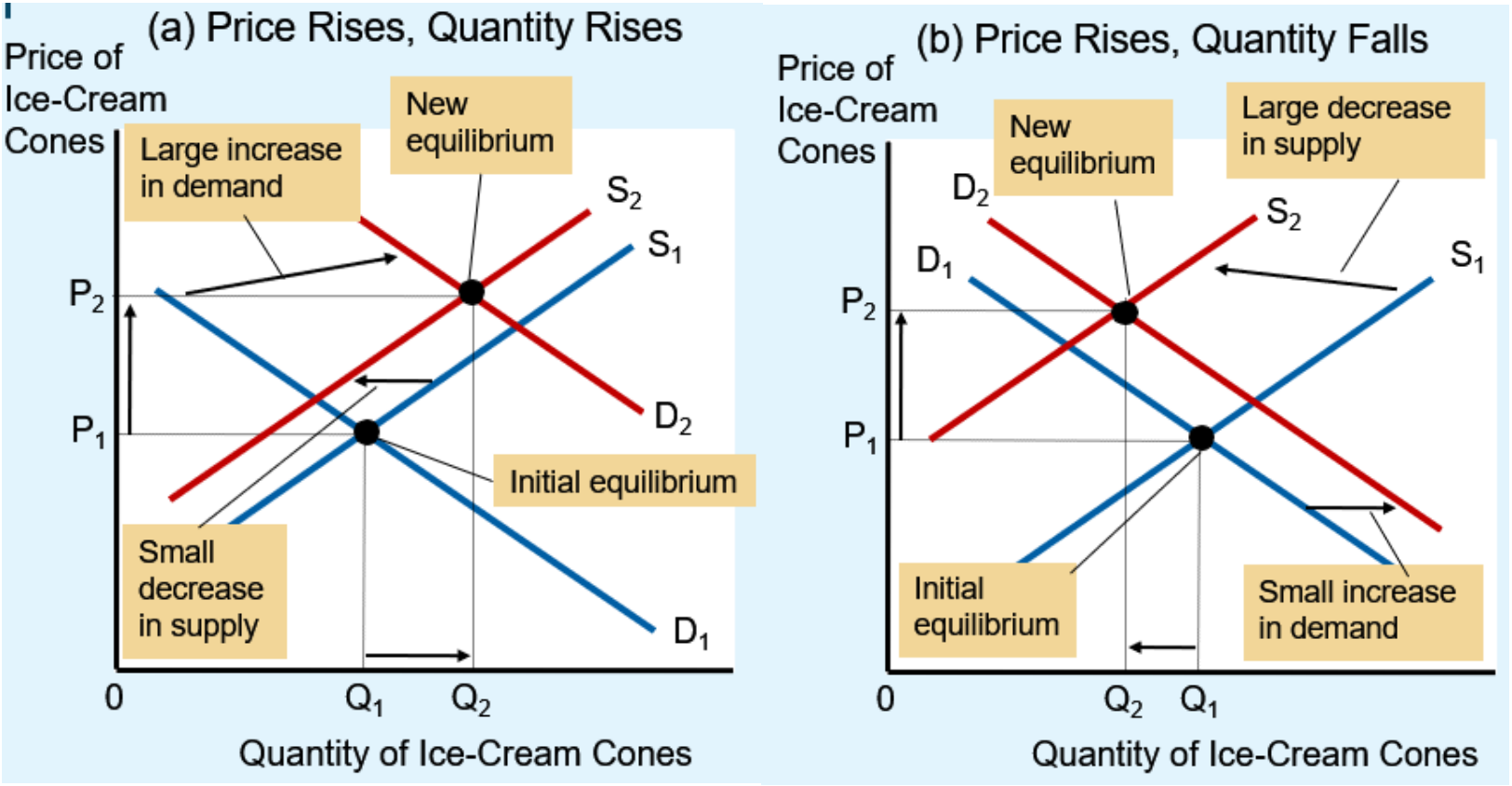
N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Supply Effect on Price and Quantity Change



Holding demand constant, lower supply will lead to higher price and less quantity bought and sold.

Demand and Supply Move Together



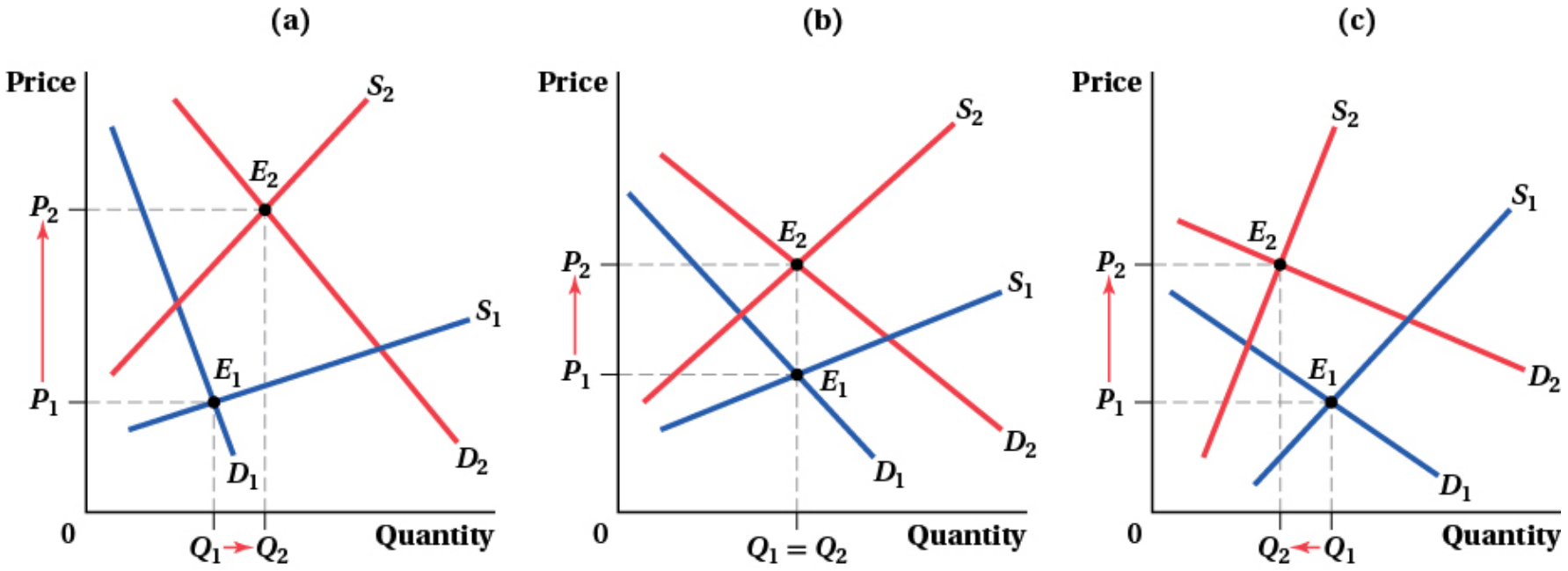
Here we observe a simultaneous increase in demand and decrease in supply.
In panel (a), the equilibrium price rises from P_1 to P_2, and the equilibrium quantity rises from Q_1 to Q_2 (demand curve influenced the Q more significantly than the supply curve)
In panel (b), the equilibrium price again rises from P1 to P2, but the equilibrium quantity falls from Q_1 to Q_2 (supply curve influenced the Q more strongly than the demand curve).

Demand and Supply Analysis

	No Change in Supply	An Increase in Supply	A Decrease in Supply
No Change in Demand	P same; Q same	P down; Q up	P up; Q down
An Increase in Demand	P up; Q up	P ambiguous; Q up	P up; Q ambiguous
A Decrease in Demand	P down; Q down	P down; Q ambiguous	P ambiguous; Q down

- Increasing D derives up P and Q; Decreasing S drives up P but not Q.
- In the case of P and Q rise, demand movement dominates supply movement;
- In the case of rising P but falling Q, supply movement dominates demand movement.

Market Equilibrium Uncertainty



When Both Curves Shift, the Direction of Either Price or Quantity Will Be Ambiguous. The new equilibrium depends on the relative movements of both curves whichever dominates the other.

Steps to Analyze Market Equilibrium

- Graph the initial equilibrium: E_0 (Q_0, P_0)
- Event analysis: identify demand or/and supply factors?
- Pin down the direction of effects: positive or negative?
- Roughly estimate the magnitude of the curve movement
- Draw the movement of the curves in the graph: D or S?
- Graph the new equilibrium: E_1 (Q_1, $P_{1)}$
- Make comparisons: Q_1 v.s. Q_0 and P_1 v.s. P_0

Market equilibrium is the solution in the demand and supply model. It is not a fact. When demand and supply conditions vary, market equilibrium will change accordingly.

Oil Prices: Now vs 160 Years Ago

Spot the pattern

Real crude oil price*, $ per barrel

Sources: BP; *The Economist*

*2020 prices, deflated by US CPI

The Economist

https://www.economist.com/graphic-detail/2020/04/27/oil-and-commodity-prices-are-where-they-were-160-years-ago

THE FACTS BEHIND OIL PRICES

GLOBAL DEMAND

In an interconnected global marketplace, demand and supply fundamentals are quickly factored into prices for commodities like crude oil. For example, weak demand from large oil consumers like China, coupled with growing supplies, can mean decreased oil prices. Stronger demand can make prices go up.

OPEC

Because OPEC cartel controls a significant share of oil production, crude oil prices can fluctuate depending on where the organization sets its output levels.

TAXES

Government policies can impact fuel prices through taxes, subsidies and surcharges, which can range from 15 percent per gallon in parts of the U.S. to 60 percent in some European countries.

CURRENCY FLUCTUATIONS

Oil is priced in U.S. dollars so, when it fluctuates, it may affect the demand for dollar denominated commodities. It affects every other nation's consumption of crude oil. A strong dollar means oil is more expensive for overseas markets, whereas a weak dollar equates to stronger overseas purchasing power.

CHANGING SUPPLY LANDSCAPE

Advancements in drilling technology have resulted in massive increases in domestic production of crude oil. During 2014, the U.S. reached the highest level of crude oil production since 1986 making it the third-largest oil-producing country in the world, close behind Russia and Saudi Arabia.

LOGISTICS AND INFRASTRUCTURE

On the heels of the U.S. oil boom, U.S. refining inputs have increased dramatically. The U.S. is now a net exporter of refined petroleum products. Government policy allows for U.S. gasoline and other refined products to be exported, while the export of U.S. crude is restricted.

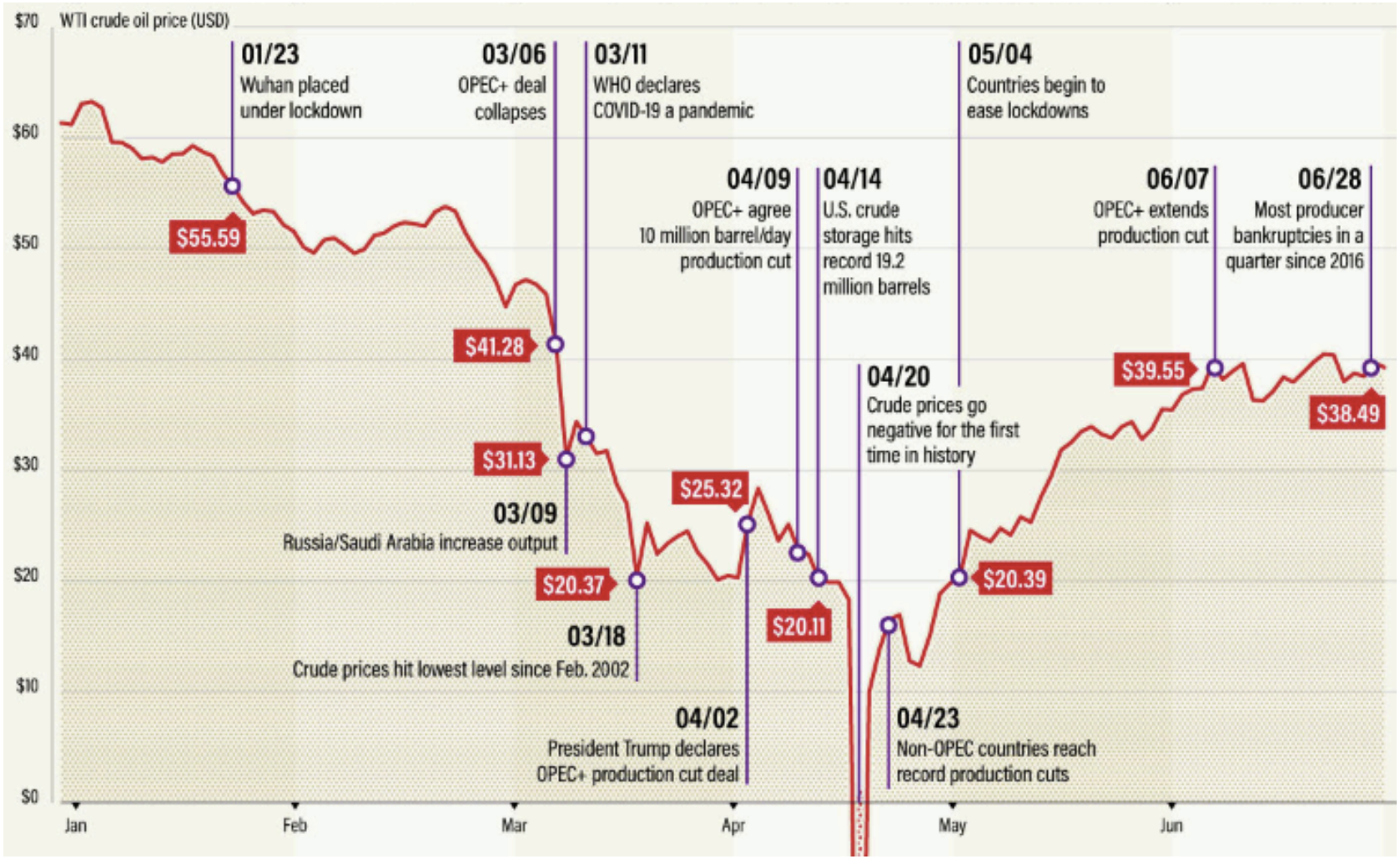
GEOPOLITICAL CONFLICTS

Ongoing conflict in the Middle East could potentially disrupt supply and cause prices to increase. Some conflicts, such as the recent clashes between Russia and Ukraine, can result in government sanctions that further restrict supplies and affect energy prices.

ENVIRONMENTAL POLICIES

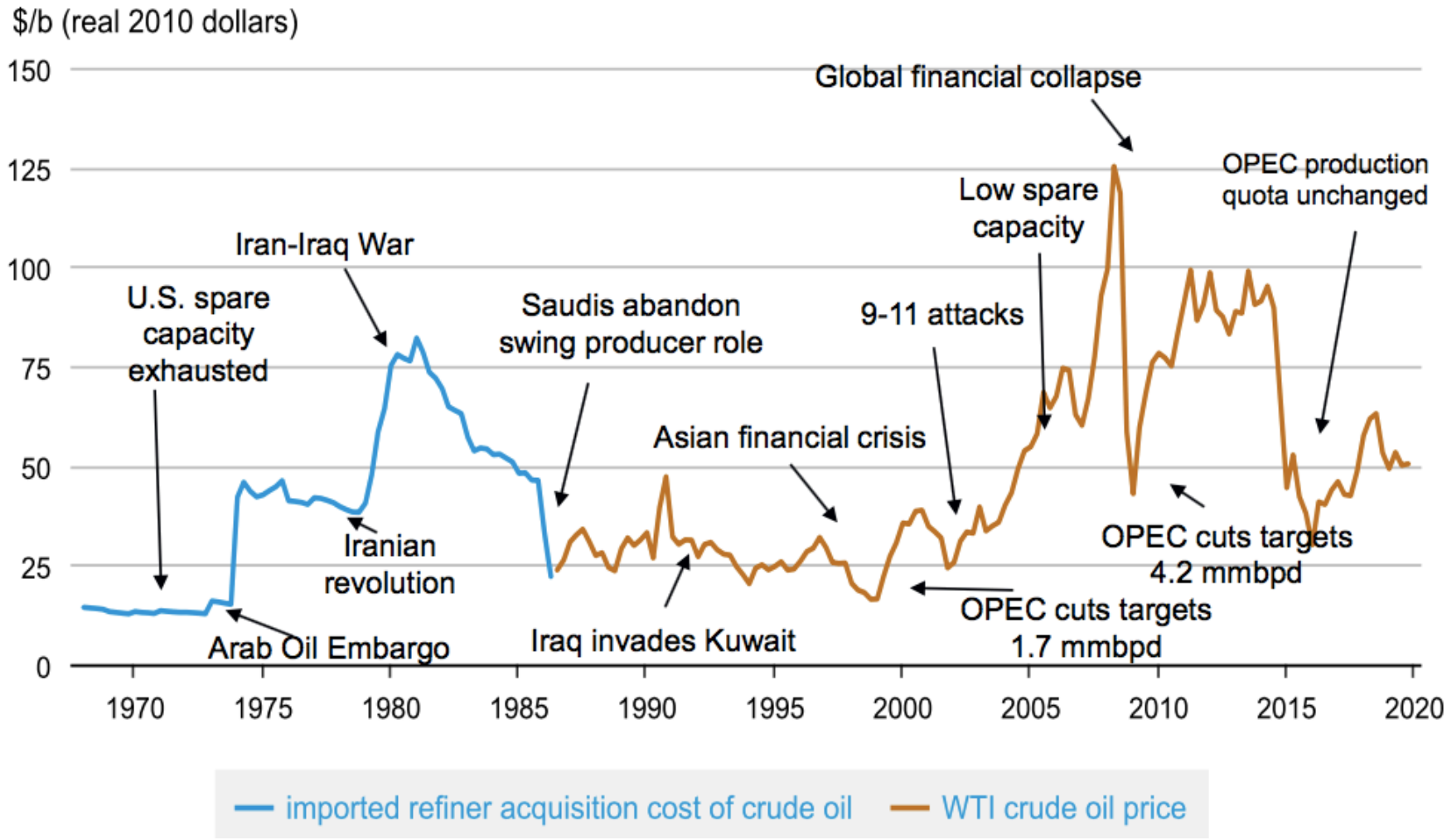
Regulations that either restrict the production of oil or impede its flow can affect prices.

Crude Oil Prices: 2020.01-2020.06

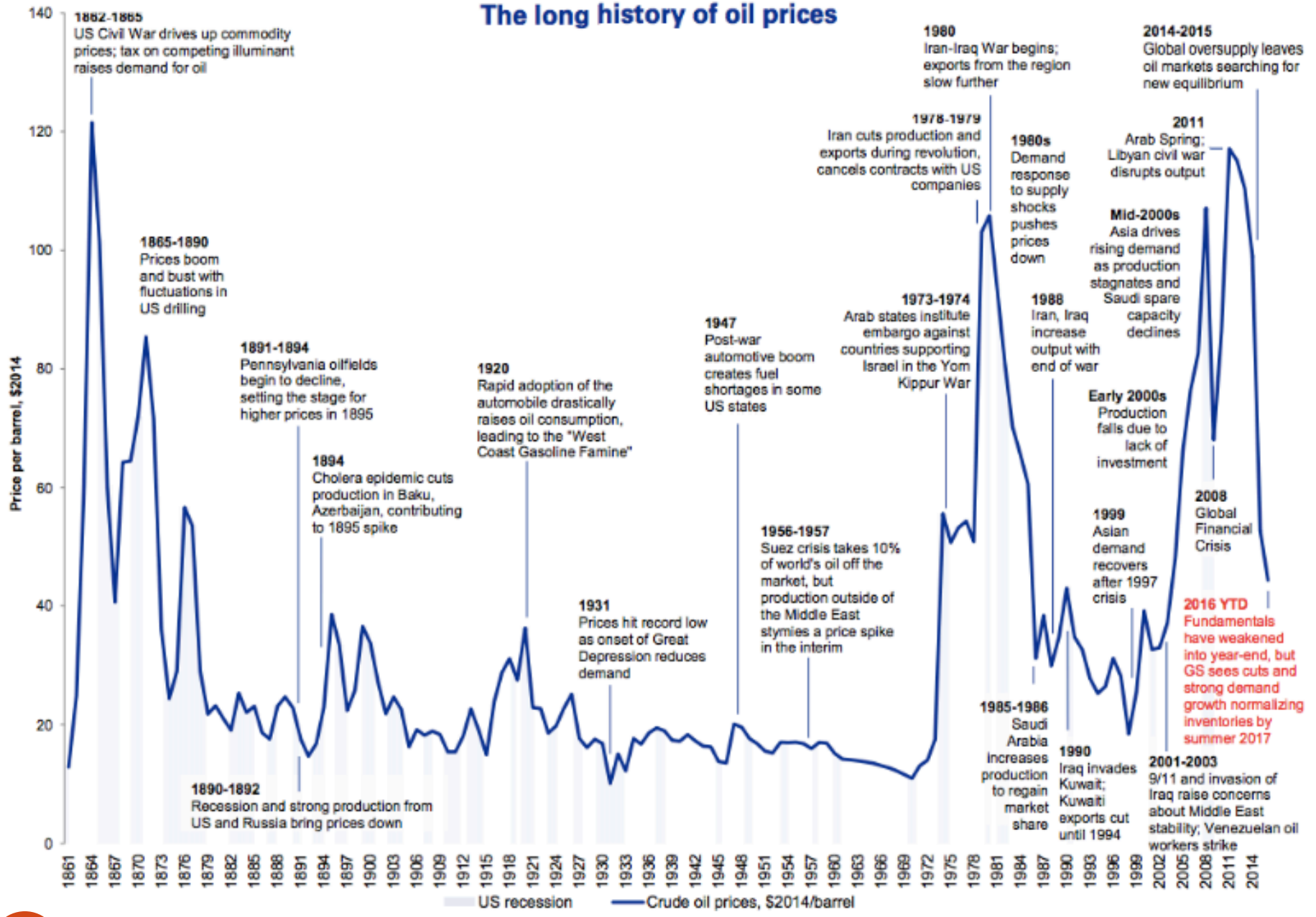


https://www.visualcapitalist.com/tracking-the-growing-wave-of-oil-gas-bankruptcies-in-2020/

Crude Oil Prices: 1970-2020



U.S. Energy Information Administration *Independent Statistics & Analysis* www.eia.gov



https://www.weforum.org/agenda/2016/12/155-years-of-oil-prices-in-one-chart/

Stock Price Fluctuation

- Stock market is one of the most exciting place for investors because the stock prices fluctuate minute by minute, determining their profits and losses in real time.
- Consider the stock price for any listed company. What factors have affected its fluctuations? Let's google or yahoo finance!
- Steps to analyze these changes:

  1) initial price and quantity;

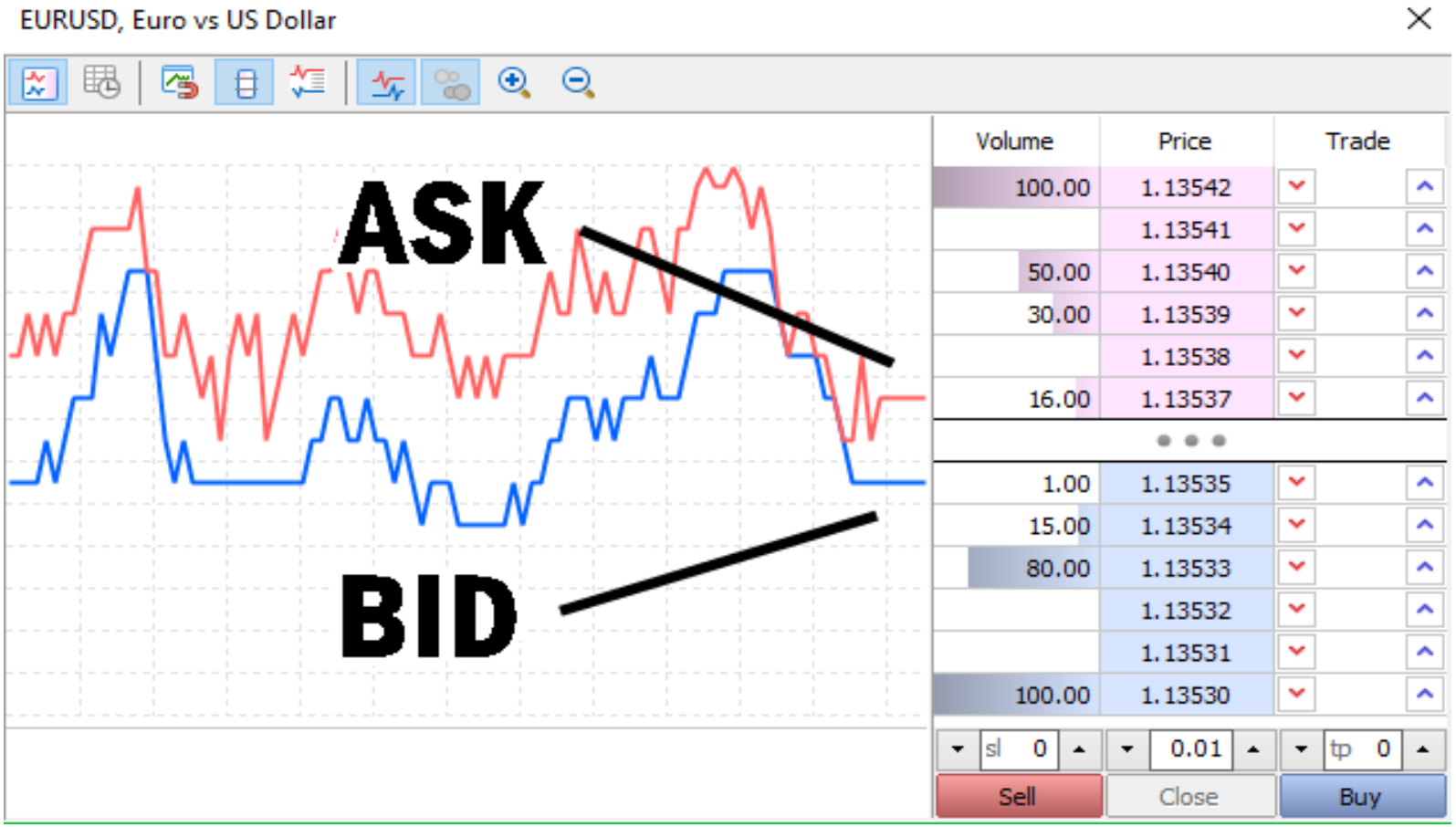
  2) new information arrival;

  3) demand and supply responses, positive or negative;

  4) compare the initial and new equilibrium for P and Q.

https://finance.yahoo.com

Trading Prices & Market Liquidity



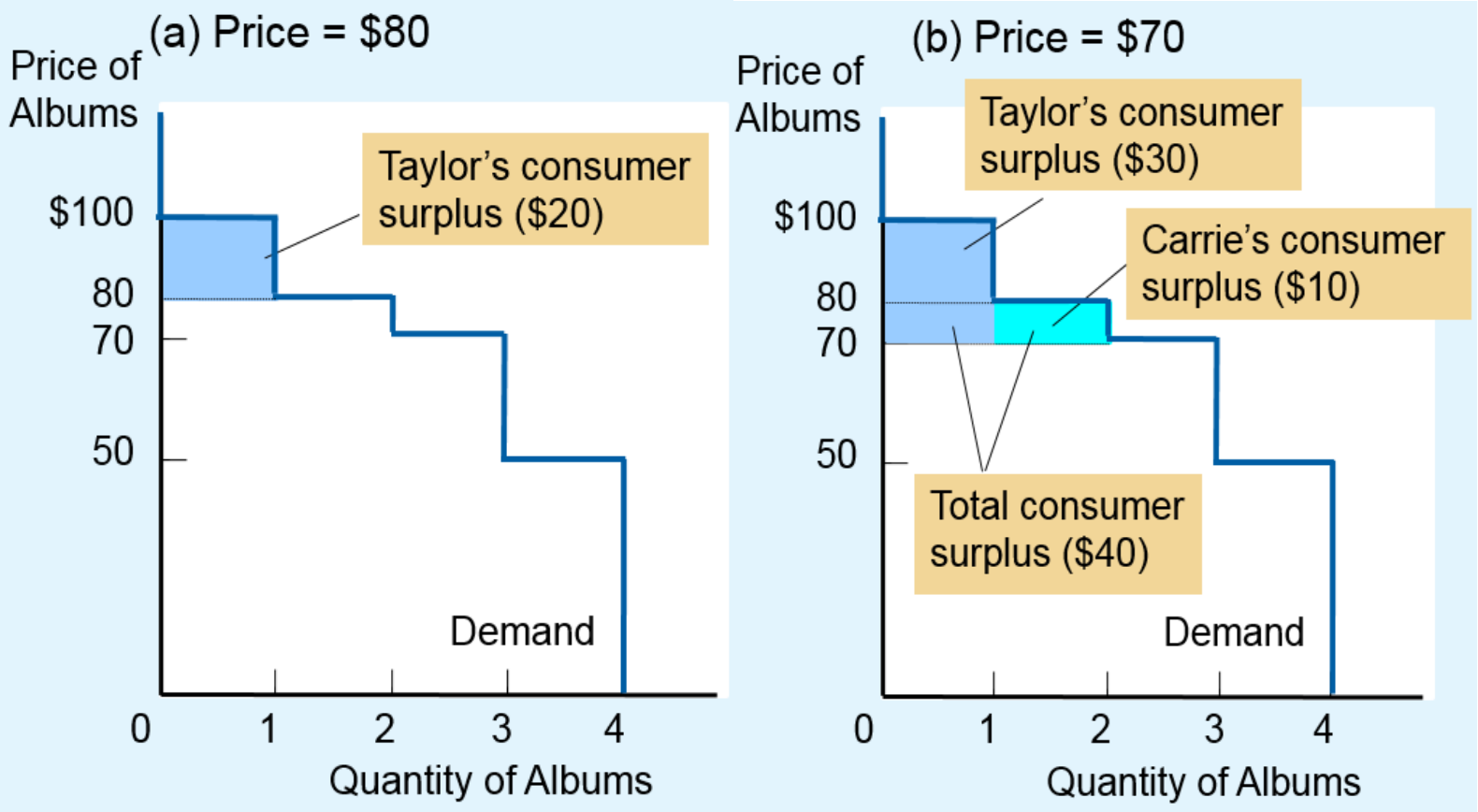
A bid-ask spread is the amount by which the ask price exceeds the bid price for an asset in the market. The bid-ask spread is essentially the difference between the highest price that a buyer is willing to pay for an asset and the lowest price that a seller is willing to accept. An individual looking to sell will receive the bid price while one looking to buy will pay the ask price. Via quoting and matching, a transaction is fulfilled.

https://www.trading-fuer-anfaenger.de/bid-ask/

Measuring Market Welfare

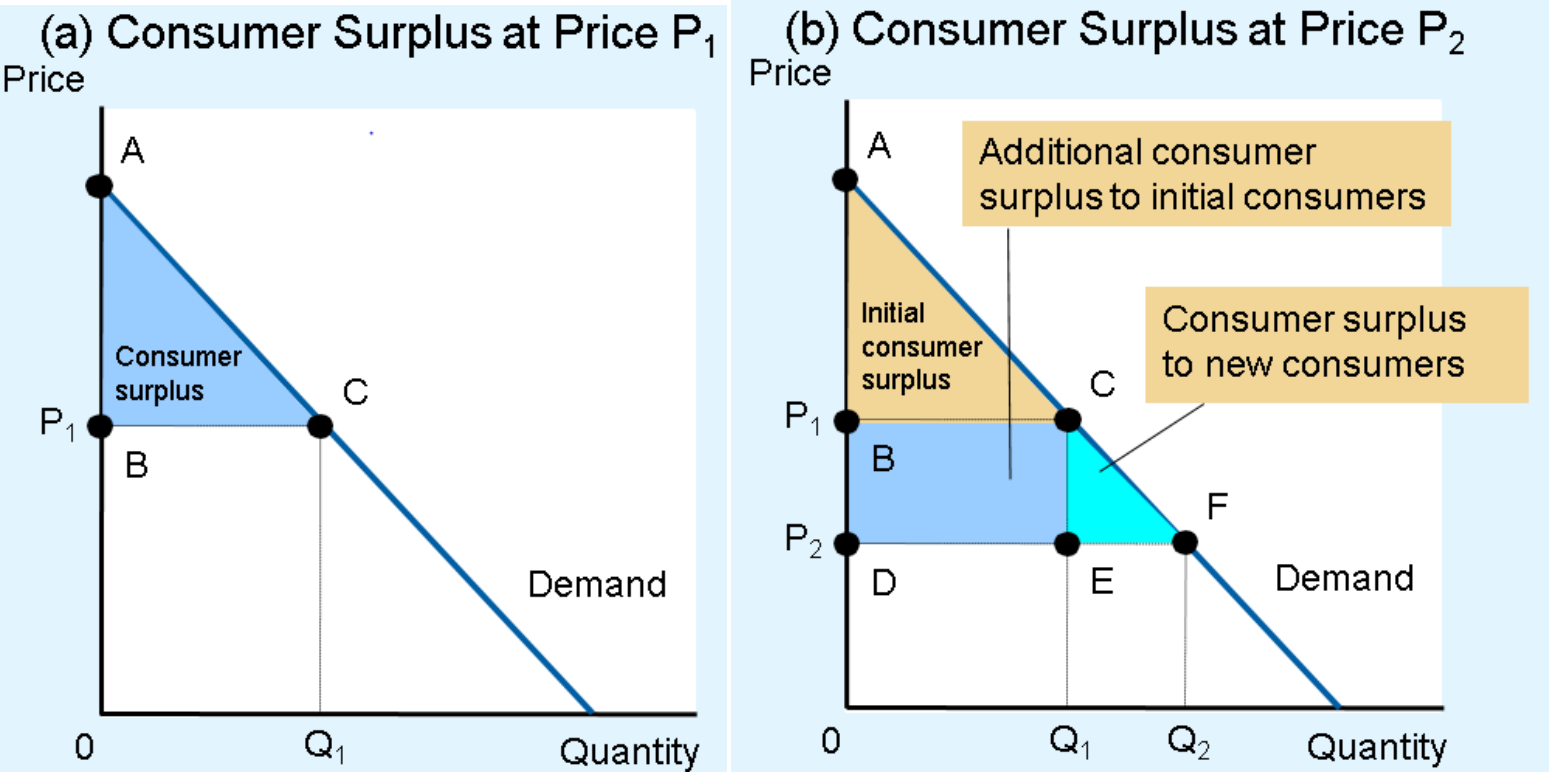
- In any voluntary market exchange, buyers and sellers reach an agreement that benefits both parties.
- How do economists measure and quantify these benefit?
- The demand and supply model provides a basis.
- Recall the lecture on value and exchange. There are two useful concepts developed by Adam Smith: use value & exchange value.
- For the buyer, the buying condition is use value greater than exchange value. The buyer gains the difference between the use value and exchange value.
- For the seller, the selling condition is exchange value greater than use value. The seller gains the difference between the exchange value and use value.

Measuring Consumer Surplus



- In panel (a), the price of the good is $80 and the consumer surplus is $20.
- In panel (b), the price of the good is $70 and the consumer surplus is $40.

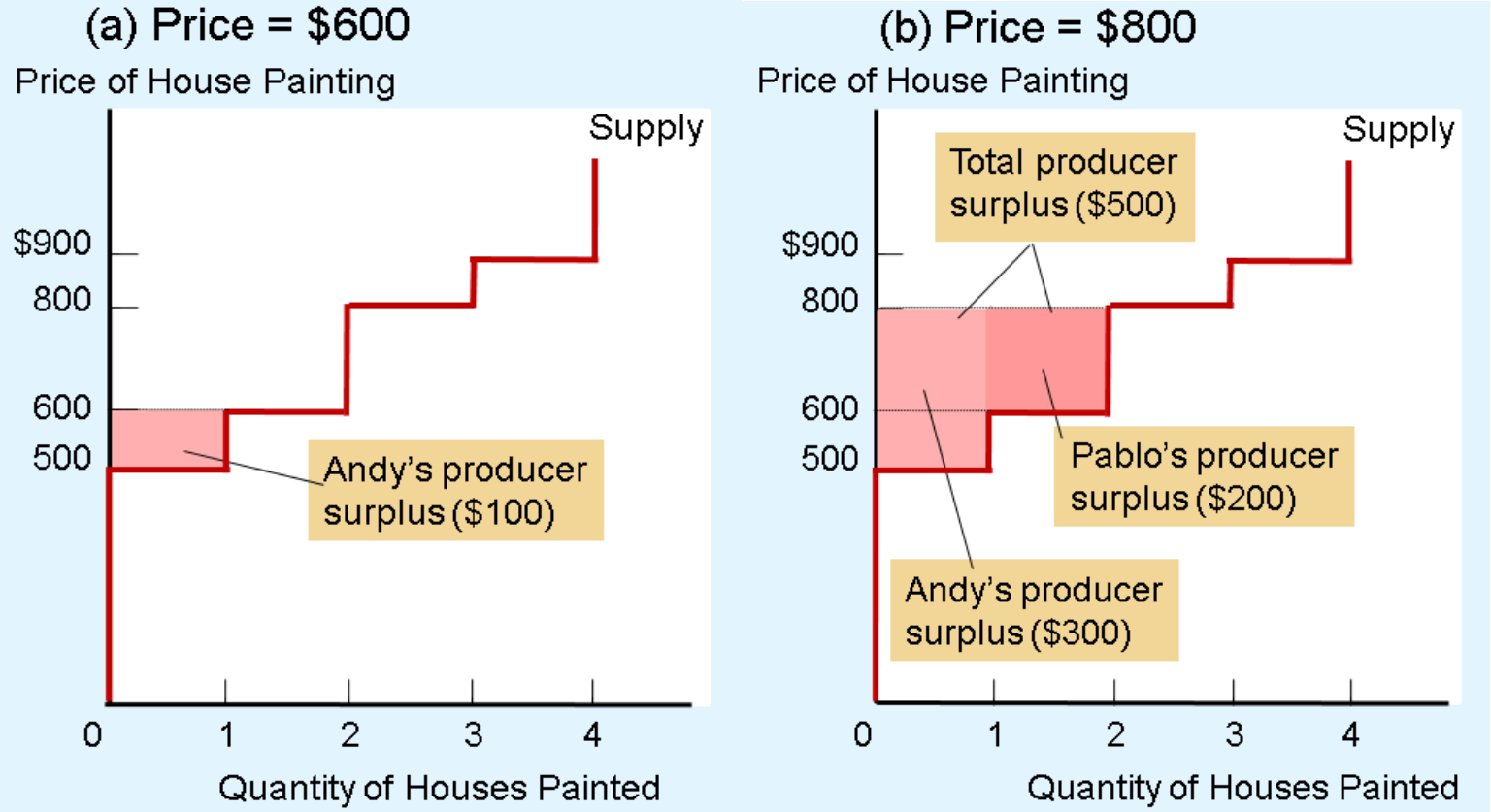
Market Price and Consumer Surplus



Consumer Surplus=UV-EV is the difference between a consumer's marginal use value (reservation price) and the exchange value (actual price). Consumer surplus is the area below demand curve and above market price (ABC). It increases as the price goes down.

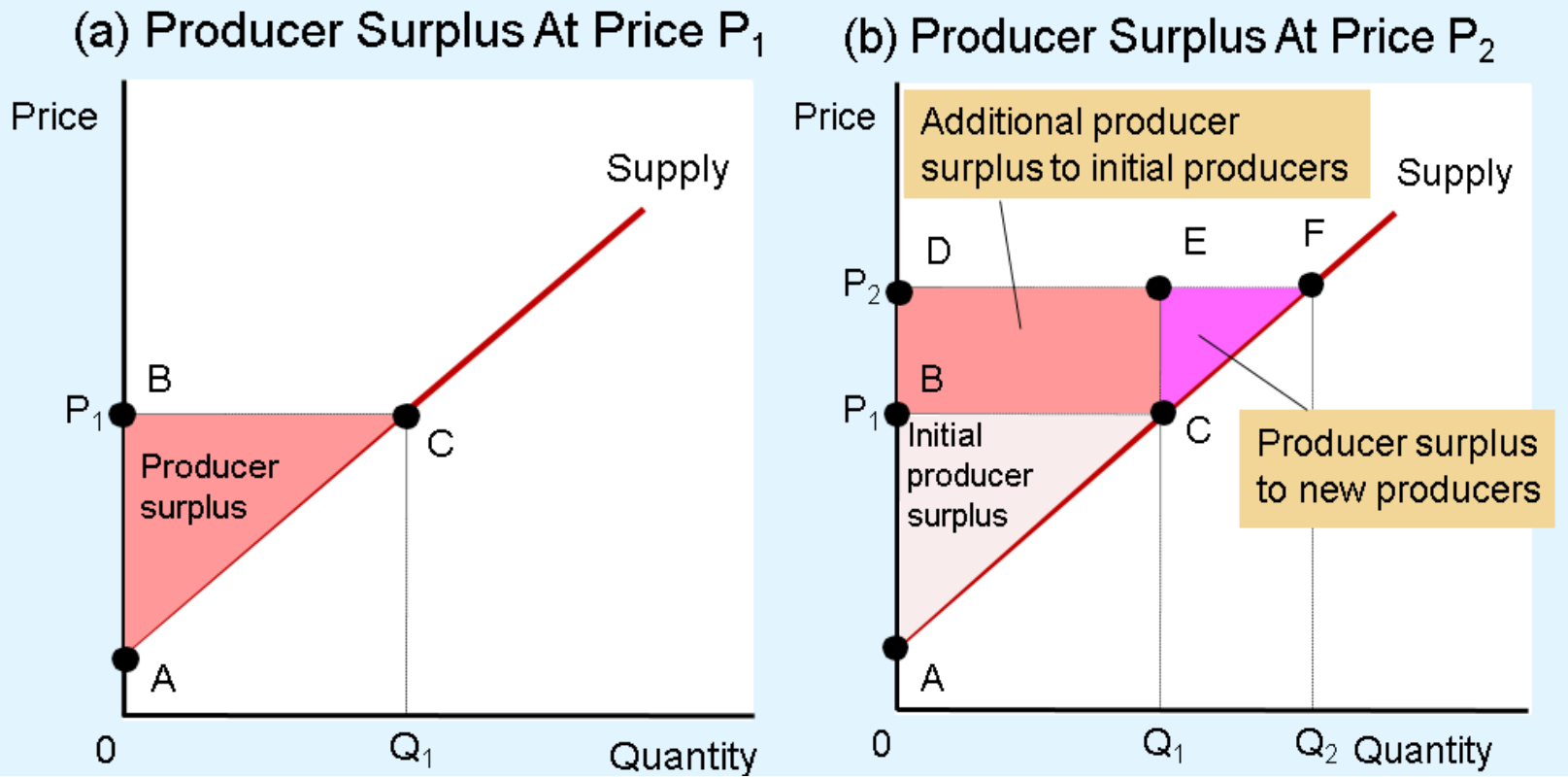
N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Measuring Producer Surplus



- In panel (a), the price of the good is $600 and the producer surplus is $100.
- In panel (b), the price of the good is $800 and the producer surplus is $500.

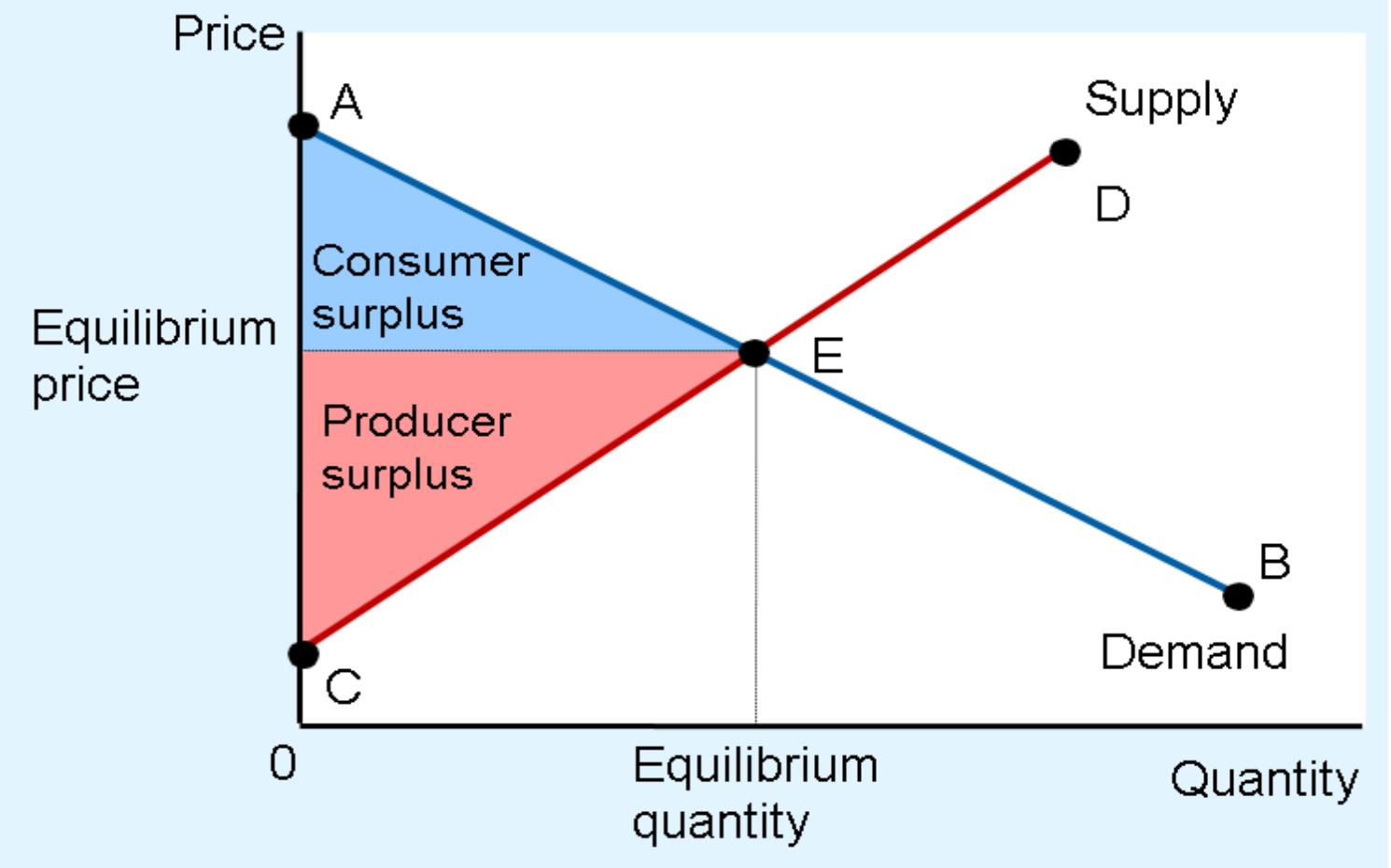
Market Price and Producer Surplus



Producer Surplus PS=EV-UV is the difference between exchange value (market price) and the producer's use value (minimum price willing to sell or opportunity cost). Producer surplus is the area above supply curve and below market price. It increases as price goes up.

N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

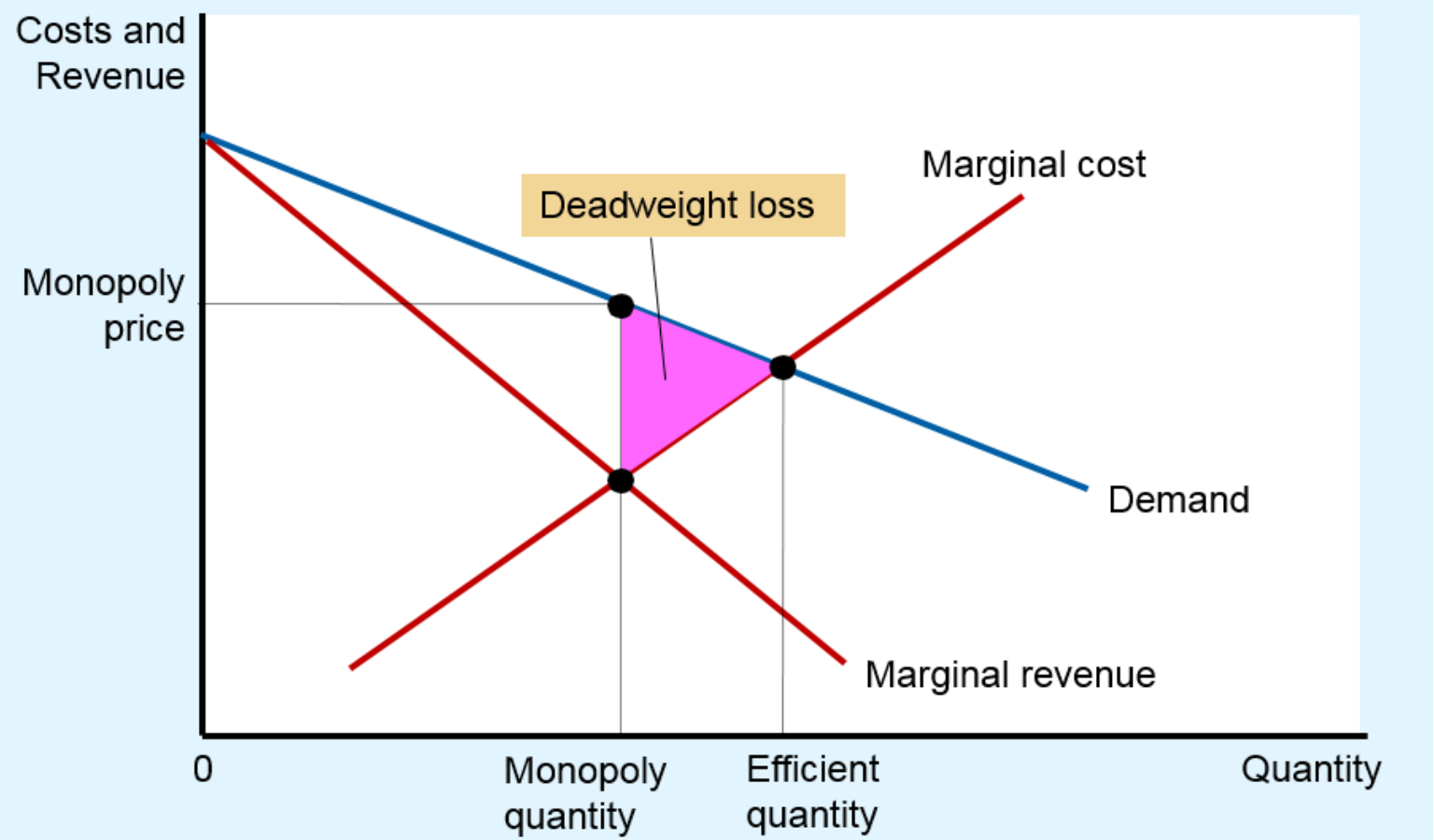
Market Equilibrium and Welfare



- In equilibrium, the total surplus=consumer surplus + producer surplus
- In equilibrium, market welfare is maximized.

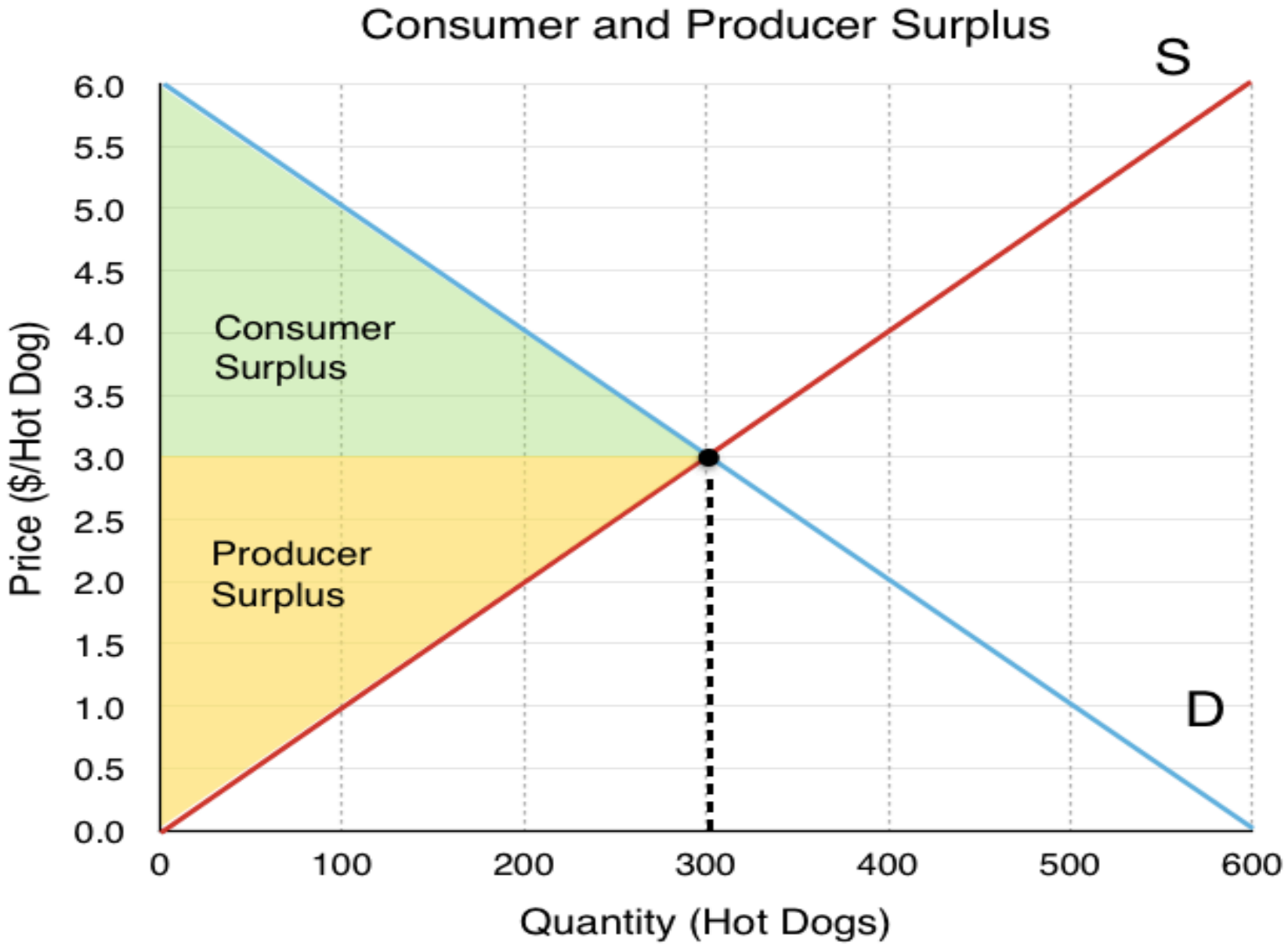
N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

Monopoly and Deadweight Loss



A monopoly sets a P>MC, not all consumers who value the good at more than its cost. Thus, the Q produced by a monopoly is below the socially efficient level. The deadweight loss is shown by the area of the pink triangle. Compared with the competitive market equilibrium, a monopoly extracts an extra amount surplus of $(P_m - P_c)*Q_m$ from the consumers.

N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.


Consumer and Producer Surplus
S
D
Consumer Surplus
Producer Surplus
Price ($/Hot Dog)
Quantity (Hot Dogs)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
100
200
300
400
500
600

Market Information & Price System

We must look at the price system as such a mechanism for communicating information if we want to understand its real function … The most significant fact about this system is the economy with which it operates, or how little the individual participants need to know in order to be able to take the right action.

Friedrich Hayek (1945) The Use of Knowledge in Society

Responding to prices in this way doesn't produce heaven on earth. But it does encourage millions of people to interact peacefully with each other in ways that are mutually beneficial. No person, no council, no committee, no congress, no parliament plans this successful overall economic outcome. And that's a beautiful picture, one that shows that we can have economic prosperity without giving enormous power to government officials—officials who, being human, will always be tempted to abuse such power.

Donald Boudreaux (2014) The Essential Hayek

Property Right & Price Efficiency

- With each private-property owner seeking only the highest returns on the use of his or her property, an overall economic order is brought about as each owner directs his property toward those uses that pay the highest prices.
- Similarly, consumers seeking only to get as much satisfaction as they can from spending their income avoid inefficient suppliers (whose prices are relatively high) and patronize efficient suppliers (whose prices are relatively low).
- Inefficient suppliers either increase their efficiency or switch to other lines of production. Efficiency is improved and a complex pattern of productive uses of resources emerges spontaneously.

Price System & Spontaneous Order

- And because this unintended, spontaneous outcome emerges from the self-interested actions of owners of private property, each of these owners is made better off.
- No one is forced to do business with those whom he'd prefer to avoid, and—being free to take advantage of any and all existing opportunities—each person chooses those available opportunities that improve his lot in life by the greatest degree.
- One of Hayek's deepest insights is that the signals received by private-property owners on how best to use their property come chiefly in the form of prices—the prices of some options relative to the prices of others.
- The idea resonates with Adam Smith's "invisible hands."

References

[1] N. Mankiw, Principles of Microeconomics, 8th edition. Cengage.

[2] Pindyck & Rubinfeld, Microeconomics, 9th edition. Pearson.

[3] Demand https://www.econlib.org/library/Enc/Demand.html

[4] Supply https://www.econlib.org/library/Enc/Supply.html

[5] 155 years of oil prices - in one chart

https://www.weforum.org/agenda/2016/12/155-years-of-oil-prices-in-one-chart/

[6] Behind the Signs: Factors That Affect Gasoline Prices
https://www.stlouisfed.org/publications/inside-the-vault/spring-2015/behind-the-signs

[7] The Economist Explain - Why are racing pigeons so expensive?

https://www.economist.com/the-economist-explains/2019/03/27/why-are-racing-pigeons-so-expensive

[8] Top 14 Contributions of Alfred Marshall to Economics

http://www.economicsdiscussion.net/economics-2/alfred-marshall/top-14-contributions-of-alfred-marshall-to-economics/21044

[9] MRU Principles of Microeconomics – Market Equilibrium

https://mru.org/courses/principles-economics-microeconomics/equilibrium-supply-demand

[10] MRU Principles of Microeconomics – The Price System

https://mru.org/courses/principles-economics-microeconomics/price-system-definition-invisible-hand

Videos

20200416 How the Oil Bust Could Reshape Global Markets | WSJ 4:17
https://www.youtube.com/watch?v=1m2o7biBk9U

20200225 Here's What Drives The Price Of Oil | CNBC 4:51
https://www.youtube.com/watch?v=rOWlLDVr6eA

201902 Why College Is So Expensive In America | CNBC 18:04
https://www.youtube.com/watch?v=aWJ0OaojfiA

201706 Why is Hong Kong housing so expensive? | CNBC 3:59
https://www.youtube.com/watch?v=QYhU54I4KS8

202003 What Is Rhodium, and What Is Rhodium Used for? | 2:23
https://www.usmoneyreserve.com/blog/what-is-rhodium/

Videos

201711 What makes art so expensive? | CNBC 4:26
https://www.youtube.com/watch?v=MGIuBJLd37I

201902 Why is Apple so expensive? | CNBC 6:13
https://www.youtube.com/watch?v=t6VYByDYg7c

201903 Why is chicken so cheap? | The Economist 6:23
https://www.youtube.com/watch?v=JiYVoHEV5hs

201905 Why is vanilla so expensive? | The Economist 5:19
https://www.youtube.com/watch?v=oguPMXcrOVY

201908 Why are music festivals so expensive? | The Economist 8:20
https://www.youtube.com/watch?v=PMfkO3Pv4VQ

201909 Why is Louis Vuitton so expensive? | CNBC 6:49
https://www.youtube.com/watch?v=GvQgXS_gtHs