

Economics

AN AMELIA WEAVER GUIDE



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1 Part One: The ‘Rational’ Consumer (get it?)

The principles of economics

Opportunity Cost lies at the heart of economics. The opportunity cost of doing something is what is given up. “There’s no such thing as a free lunch.”.

For example

1. If your friend offers you the choice between eating a croissant and an eclair, by eating the croissant you forego eating the eclair.
2. If you can choose between reading a book and watching a movie and you choose to read, your opportunity cost is your viewing of the movie.
3. If you can choose to watch a movie given that you can read a book you own for an hour and a half or pay \$9.99 to watch a movie for an hour and a half, you forego the chance to spend the money elsewhere and reading time. *Opportunity Cost*: Spending \$9.99 elsewhere + the chance to read the book.

Note that there are two costs within the opportunity cost: the *explicit* and *implicit* cost. Explicit costs involve money and resources while implicit costs are more abstract. Paying \$9.99 for a movie is an explicit cost. Not getting the chance to read is an implicit cost.

Real Life Application: You want to watch a movie, so you go down to your local Blockbuster. You have the choice between renting the VHS for \$4.99 (five nights) or buying the VHS for \$9.99. You decide to rent. Your opportunity costs include the chance at spending \$4.99 on something else (explicit), a higher quality viewing experience due the degraded rental tape (implicit), and the ability to watch the movie as many times as you wanted after the rental period (implicit). You’re giving up the chance to spend money in other ways, higher quality, and, well, future opportunities.

Economics and Dungeons and Dragons are similar because there are fantasy elements in both, like the assumption that **people are rational**. One form of rationality is when it comes to **marginal decisions**. For example,

An alien invasion is taking place. In the mass panic, you grab your bike and start riding away from the chaos. Unfortunately, there are diminishing returns the further you ride your bike (the crowds are panicked). You know you can walk 5 km/h. In hindsight, when should you have hopped off your bike and began to walk?

Time	Speed (km/h)
11:00	22
12:00	18
13:00	15
14:00	9
15:00	4
15:00	2

It’s clear that you should have done so at 15:00. You could have covered 5 km instead of 4. This is the idea of the marginal decision.

Let's examine a more realistic scenario, involving work and pay. The **shadow government** has hired to you to work odd jobs around the compound. You can spend the hour feeding sharks or baking for the office. They pay you \$10 per shark you feed and a fixed rate of \$45 to bake for an hour. Here's your average shark record:

Time	Total Sharks Fed	Additional Sharks Fed	Profit
8:00	20	20	\$200
9:00	30	10	\$100
10:00	45	5	\$50
11:00	48	3	\$30
12:00	49	1	\$10

The sharks swarm for breakfast, but don't bite around lunch. It's clear that you should start baking at 11:00. If you just feed sharks, you make \$30 instead of \$45.

1.1 Macro Versus Micro

Microeconomics revolve around households and firms making decisions within a market. Macroeconomics study the overall economy, like its inflation rate, unemployment rate, and growth. For example,

Questions in Microeconomics include

1. What impact do minimum wage laws have on the labor market?
2. How do cake shortages affect the market for birthday parties?
3. What impacts individual savings decisions?
4. How do firms make production decisions?

Questions in Macroeconomics include

1. What causes economic recessions?
2. Are there policies that can help reduce economic recessions?
3. What makes economies grow?
4. How do heists of federal banks impact the economy?
5. How much should the government spend on public goods provision?

1.2 Positive Versus Normative

Positive statements are descriptive, confirmed, and testable statements:

1. The rate of unemployment is 4 percent.
2. A household swimming pool is 100 times more likely to lead to an accidental child death than a household firearm. (Read Freakonomics)
3. 3 percent of Americans ski and/or snowboard.

Normative statements are speculative arguments that aren't able to be confirmed or refuted, made by people named Tiffany who are too busy hanging out with their boyfriends to go skiing:

1. The rate of unemployment is too high.
2. The pool tax should be higher than the gun tax.
3. "Just go with Samuel and Jaya, you'll have an equally good time, and we can go another day."

Notice the parallel between the positive and normative statements. Statistics usually (well, they should usually) have backing. While an economist can make an argument for how the unemployment rate is too high, it's still up to be confirmed or refuted. An opinion, like the second point, is just the speaker stating what they think, not the reality. Similarly, the third statement (while potentially true) isn't concrete.

1.3 Examples

1. **Q:** Suppose you can either choose to go to the movies which cost \$7 for a 2 hour movie or you can babysit for your neighbor who pays you \$10 per hour. What is your total cost or opportunity cost of choosing to go to the movies? **A:** \$27
2. **Q:** Your work offers you the chance to work 2 hours of overtime this weekend at \$15 an hour. Instead, you choose to see a 2 hour movie. You pay \$8 for a ticket and \$5 for a snack. What is your opportunity cost of seeing the movie? **A:** \$43
3. **Q:** (T/F) Governments can never improve market outcomes. **A:** False, they so totally can
4. **Q:** Classify the question — 'What factors impact the US savings rate?' **A:** Macroeconomics
5. **Q:** Classify the question — 'What determines the quantity of shoes supplied in the market for shoes?' **A:** Microeconomics
6. **Q:** Classify the question — 'What's up with Black Friday?' **A:** Microeconomics
7. **Q:** Classify the statement — 'We should reduce the amount of federal taxes that individuals pay.' **A:** Normative
8. **Q:** Classify the statement — 'The Federal Reserve Bank voted to raise the target Federal Funds Rate in December 2015.' **A:** Positive
9. **Q:** Classify the statement — 'Greece must default on its debt if it is to recover economically from the severe depression it is currently in.' **A:** Normative
10. **Q:** Classify the statement — 'The U.S. needs to increase its defense spending to be prepared to protect against terrorist attacks.' **A:** Normative
11. **Q:** Classify the question — 'How would an increase in the taxes on gas impact the market for gas?' **A:** Microeconomics

2 Part Two: The Frontier

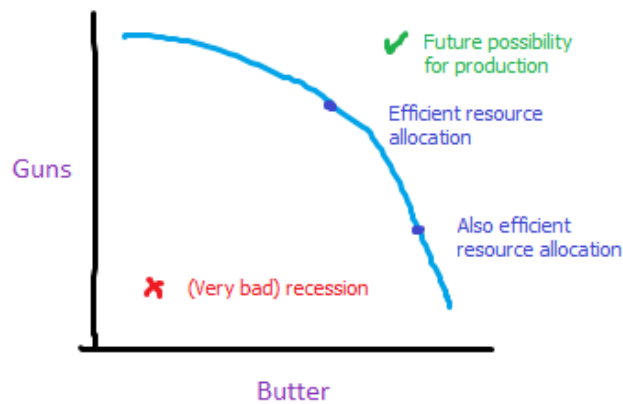
Thinking like an economist

2.1 Society's Four Resource Categories

1. Labor: Human time spent producing goods and services.
2. Capital: Long-lasting, man-made tools that factor into the production of other goods and services.
Human capital: The skills and training of the labor force.
Physical capital: Physical goods like machinery, equipment and factories.
3. Land: The physical space on which production takes place, as well as the useful materials (natural resources) found under it or on it, i.e. crude oil, iron, coal, soil, etc...
4. Entrepreneurship: The ability and willingness to combine the other resources into a productive enterprise.

2.2 Production Possibilities Frontier

The curve that defines the most efficient combination of production of two goods.



2.2.1 Assumptions

1. Fixed Resources: No changes in resources
2. Fixed Technology: No changes in technology
3. Productive Efficiency: When a society can not produce more of one good without reducing the production of another good
4. Full Employment: All available factors of production are being used to their maximum potential
5. Only 2 Goods: The society only has 2 goods available to produce

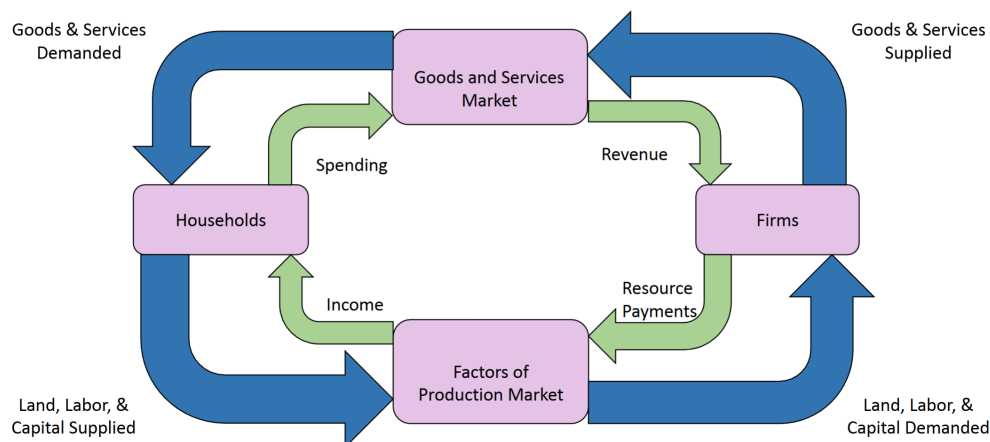
Recessions: A recession is represented as a point below the curve, not a shift in the curve.

Shifts: A shift inwards represents a loss of technology and/or available resources while a shift outwards is a gain in technology and/or available resources.

Cause of the Curve: The frontier is bowed outwards because allocating more and more resources to the production of a certain good renders diminishing returns. A linear curve indicates a constant opportunity cost, which means that the resources spent on both goods are interchangeable. For example, producing guns and butter require very few overlapping resources while producing cars and buses require various overlapping resources.

Opportunity Cost Eq.: Opportunity Cost of Producing Good A = $\frac{\text{Good B Diff}}{\text{Good A Diff}}$

2.3 Circular Flow Diagram



2.4 Examples

- Q:** Steel used in the construction of some goods is classified as what type of input? **A:** Physical Capital (steel is man-made)
- Q:** Attending College is considered what type of input in the production process? **A:** Human Capital
- Q:** (T/F) The PPF Curve can tell us about the causes of productive inefficiency. **A:** False
- Q:** (T/F) According to the PPF Model, the only 2 factors that influence economic growth are changes in technology and changes in land. **A:** False
- Q:** What concept(s) does the PPF Curve illustrate? **A:** Opportunity cost, growth, and scarcity
- Q:** (T/F) The PPF Curve provides an explanation for economic recessions. **A:** False
- Q:** Unrefined oil, from the ground, is an example of what type of factor of production (input) in the production process? **A:** Land (Natural Resources)

3 Part Three: To Trade Or Not To Trade

Scarcity and society: comparative advantage

3.1 Specialization

Society is as advanced as it is due in part to specialization. Specialization allows for a society to

1. Develop Expertise: you don't need to churn your own butter (or faux butter if you're lactose intolerant), grow your own food, etc...

2. Minimize Downtime: switching between drastically different activities takes energy.
3. Gain Comparative Advantage: people become masters of a craft, and can trade that skill for money, goods, and/or services

3.2 Trade Advantage

Absolute Advantage is the ability to produce a good or service using fewer inputs than another producer uses. **Comparative Advantage** is the ability to produce a good or service at a lower opportunity cost than another producer.

Good	US	Brazil
Meat	3 meat units	4 meat units
Cake	1 cake unit	2 cake units

In this scenario, Brazil has absolute advantage over the US when it comes to both Meat and Cake production. It gets more interesting when solving for the opportunity cost of each good. Opportunity Cost Good 1 = $\frac{\text{Good 2 Count}}{\text{Good 1 Count}}$

Good	US	Brazil
Meat	$\frac{1}{3} = 0.33$ cake units	$\frac{2}{4} = 0.5$ cake units
Cake	$\frac{3}{1} = 3$ meat units	$\frac{4}{2} = 2$ meat units

These indicate that the US forgoes 0.33 cake units per meat unit they produce and 3 meat units per cake unit they produce. The same applies for Brazil's productions. In this case, Brazil has comparative advantage in meat production ($0.33 < 0.5$) while the United States has comparative advantage in cake production ($3 > 2$).

Using this information, each country can glean what they would accept as a trade price. Justified prices range from the opportunity cost of one good's creation to the other country's opportunity cost to create that good. For example, the two countries would be willing to trade anywhere from 2-3 meat units per cake unit. Let's be more specific. The truth is that the US is willing to trade 3 *or fewer* meat units per cake unit and Brazil is willing to trade 2 *or more* meat units per cake unit. If the US was spending more than 3 meat units on a cake, it would be more efficient for them to just make a cake unit instead. If Brazil was receiving fewer than 2 meat units per cake, they don't break even with their production cost for a cake unit.

We all know that the cake is a lie, however, so let's use a different example.

Good	Indonesia	Australia
Coconuts	3 hours	6 hours
Fishing Poles	9 hours	8 hours

Here we have Indonesia and Australia's time to produce one coconut and one fishing pole. Absolute advantage goes to the country that spends the least time making a good. In this case, Indonesia is more efficient at making coconuts ($3 < 6$) and Australia is more efficient at making fishing poles ($9 > 8$). Since the metrics are in hours, the equation is the inverse of the first one Opportunity Cost Good 1 = $\frac{\text{Good 1 Hours}}{\text{Good 2 Hours}}$.

Good	Indonesia	Australia
Coconuts	$\frac{3}{9} = 0.33$ poles	$\frac{6}{8} = 0.75$ poles
Fishing Poles	$\frac{9}{3} = 3$ coconuts	$\frac{8}{6} = 1.33$ coconuts

The process for determining comparative advantage here is the same, as the values are the opportunity cost for creating one of Good A. Indonesia is more efficient at growing coconuts ($0.33 \text{ ppc} < 0.75 \text{ ppc}$, ppc indicating poles given up per coconut). Australia is more efficient at making fishing poles ($3 \text{ cpp} > 1.33 \text{ cpp}$). The range of prices is determined the same as before.

3.3 Examples

- Premise:** Suppose that in one hour of work, Pat can produce either 9 bushels of wheat or 3 yards of cloth. In the same amount of time, Quinn can produce either 8 bushels of wheat or 4 yards of cloth.

Q: Who has absolute advantage in the production of each good? **A:** Pat has an absolute advantage in wheat, and Quinn has an absolute advantage in cloth.

Q: What is Quinn's opportunity cost of producing 1 yard of cloth? **A:** 2 bushels of wheat

Q: Who has comparative advantage in the production of each good? **A:** Pat has a comparative advantage in wheat, and Quinn has a comparative advantage in cloth.

Q: What would be the range of acceptable trade prices for 1 yard of cloth? **A:** 2-3 bushels of wheat
- Premise:** Suppose Morgan requires 2 hours to produce 1 computer and 4 hours to produce 1 printer. Riley requires 3 hours to produce 1 computer and 5 hours to produce 1 printer. Each worker has the same amount of labor hours available.

Q: Who has absolute advantage in the production of each good? **A:** Morgan rules in both, but she's humble about it.

Q: What is Riley's opportunity cost of producing 1 printer? **A:** 1.7 computers

Q: Who has comparative advantage in producing computers? **A:** Morgan

Q: What would be the range of acceptable trade prices for 1 printer? **A:** 1.7-2 computers

3. **Q:** Why is it a cake unit and not a cake? **A:** Standards keep the world going around. Engineering!
4. **Q:** (T/F) The market for sandals is an example of a market for factors of production. **A:** False
5. **Q:** (T/F) If a country has absolute advantage in the production of both goods, then there will be no trade. **A:** False. Diplomacy actually works out well for both parties.
6. **Q:** What are examples of things not gained from specialization? **A:** Absolute Advantage, Using Fewer Resources

4 Part Four: Karl Marx' Bane

Supply and Demand

4.1 Perfectly Competitive Markets

4.1.1 Assumptions

Upholding the economist's continuing faith in humanity, here are the bold assumptions about a perfectly competitive market:

1. **The Infinite:** The market consists of many buyers and sellers such that no individual can have an impact on price. Instead, they are price takers.
2. **What Glass Ceiling?:** There are no barriers to enter or exit the market, i.e. all firms can freely enter and exit the market.
3. **By The Book:** All products are homogeneous, i.e. there is no difference between products sold by different sellers. (Ex: Every Eggs Benedict is the same).
4. **Omniscience:** Both buyers and sellers have perfect information. All firms have access to the same production capabilities and resources. All buyers know all prices offered by all sellers.

4.2 Laws of Supply and Demand

4.2.1 The Law of Supply

The quantity supplied is the amount of a good that sellers are willing and able to sell at a given price.

The Law of Supply states that as the price of a good increases, the quantity supplied increases and vice versa. Sellers are more eager to sell an item at \$20 than at \$10.

4.2.2 The Law of Demand

The quantity demanded of a product is how much of a good consumers are willing to pay at a given price.

The Law of Demand states that as the price of a good decreases, the quantity demanded of that good increases and vice versa. More people are willing and able to pay \$10 for a sandwich than they are to pay \$20 for one.

4.3 Market Equilibrium

Market Equilibrium at the intersection between the supply curve and the demand curve. If the price of a good is below the market equilibrium, there's a shortage for that good. If the price of a good is above the market equilibrium, there's a surplus of that good. People like a good deal but won't be as likely to buy something overpriced.

During a shortage, suppliers will increase their prices to take advantage of the crazed crowds. This will lead to the market price drifting back to equilibrium.

During a surplus, suppliers will decrease their prices in the hope that people will purchase their product instead of a competitor's. This will lead to the market price drifting back to equilibrium.

4.4 Examples

1. **Q:** At a price of \$5 per baseball, people want to purchase 1000 baseballs a month from Target. Suppose Target raises the price to \$7 per baseball and people only want to purchase 750 baseballs a month. True or false: this is an example of the law of demand. **A:** True
2. **Q:** This principle defines the the Law of Demand. **A:** What is, uh, 'As the price of a good falls there is an increase in quantity demanded for that good and vice versa?'
3. **Q:** Is it true that a decrease in the price of cars would increase the demand for cars? **A:** No. It would increase the *quantity demanded*.
4. **Q:** At a price of \$10 a hamburger, In-N-Out wants to sell 1,000,000 hamburgers. Suppose at a price of \$8 a hamburger, In-N-Out wants to sell 2,050,000 hamburgers. This is an example of the Law of Supply. **A:** False. In-N-Out wants to sell more burgers at a higher price. The stockholders are shaking their heads.
5. **Q:** Should you get In-N-Out right now? **A:** Up to you
6. **Q:** The fact that an increase in price leads to an increase in supply is known as **A:** a question full of red herrings. If you're thinking of the Law of Supply, you want the words 'quantity supplied' to be in there.
7. **Q:** Suppose the current price of your favorite fishing bait is \$60 (premium bait), but the equilibrium price of the good is \$46. What is this market state called? **A:** A surplus. Why would you spend \$60 on bait that you can buy cheaper somewhere else?
8. **Q:** True or false: the Law of Supply states that there is a positive relationship between the price of a good and the quantity supplied of a good. **A:** True. Again, they wanna make money.
9. **Q:** A price set above the market equilibrium price causes quantity demanded to exceed quantity supplied causing a shortage which puts upward pressure on prices. **A:** Nope, it's a surplus. \$60 bait just isn't worth it.
10. **Q:** What are some assumptions of the perfectly competitive market? **A:** Sellers don't set the price of the product, all products are exactly the same, and all companies have the same production capabilities.
11. **Q:** Is it true that an increase in the price of cars leads to an increase in the supply of cars? **A:** No, you're looking for *quantity supplied*.

4.5 Supply and Demand

Market manipulation isn't the only shifty business in economics: certain events will shift the supply and demand curves.

4.6 Curve Shifts

The supply curve shifts right when the supply increases. Note how the supply and not *quantity supplied* increases. *As a result* of the supply increasing, the quantity supplied at each price will increase.

The demand curve shifts right when the demand increases. Again, note how the demand and not the *quantity demanded* increases. *As a result* of the demand increasing, the quantity demanded at each price will increase.

The supply curve shifts left when the supply decreases. Again, note how the supply and not *quantity supplied* decreases. *As a result* of the supply decreasing, the quantity supplied at each price will decrease.

The demand curve shifts left when the demand decreases. Again, note how the demand and not the *quantity demanded* decreases. *As a result* of the demand decreasing, the quantity demanded at each price will decrease.

4.7 Shifting the Supply Curve

Shifts in the supply curve can occur due to

1. **Input Prices**

An increase in input prices causes a decrease in supply and vice versa.

2. **Technology**

Advances in technology of a production of a good causes an increase in the supply of that good, and vice versa.

3. **Number of Sellers**

An increase in the number of firms and/or sellers in a market causes an increase in the supply of that good.

4. **Sellers Price Expectations**

An increase in the expected future price of a good decreases the current supply of that good and vice versa. Sellers want to hold off their stock until they can sell it at a higher price, or will want to sell as much of their stock as possible before its price drops.

5. **Weather/Natural Disasters**

Favorable weather conditions increase the supply of an affected good while disasters cause a decrease in the supply of an affected good.

4.8 Shifting the Demand Curve

Shifts in the demand curve occur due to

1. **Income**

There are two types of goods: normal and inferior. Whether a good is normal or inferior affects its demand after a change in income. The demand for normal goods increases when income increases. These are items like cars, houses, organic chicken meat, and household plants. Inversely, the demand for inferior goods decreases as income increases. These are items like cup ramen and apartments.

Normal goods' price elasticity of demand is elastic while inferior goods' price elasticity of demand is perfectly inelastic.

2. Prices of Related Goods

The relationship of the good to its related good affects its demand after the price change. There are two types of related goods: complements and substitutes.

Complement goods are consumed alongside the original good. These are goods like shampoo and conditioner, toothbrushes and toothpaste, and Christmas trees and ornaments. An increase in the price of a complement decreases the demand for the original good while a decrease in the price of a complement increases the demand for the original good. Since they are consumed together, given that a consumer will spend the same on both, they'll end up spending more to get the same quantity of the first and have to get less of the second. Inversely, if a consumer is spending the same amount of money, they can afford more of the original good since the related good is cheaper.

Substitute goods are consumed in lieu of the original good. These are goods like headphones and earbuds, Ghirardelli and Betty Crocker brownie mix, and apples and oranges. An increase in the price of a substitute increases the demand for the original good while a decrease in the price of a substitute decreases the demand for the original good. Consumers will be more willing to spend money on a cheaper product.

3. Number of Buyers

An increase in the number of buyers for a good will increase the demand for that good and vice versa.

4. Buyers' Price Expectations

If buyers expect a good's price to increase in the future, the demand for that good will increase in the present as those buyers won't want to spend more money on that product. This behavior ends up speeding up (or causing) the good's price to increase as the quantity demanded increases, following the Law of Demand and the market response to a shortage.

If buyers expect a good's price to fall in the future, the demand for that good will decrease in the present as those buyers will want to spend less money on that product. This behavior ends up speeding up (or causing) the good's price to decrease as the quantity demanded decreases, following the Law of Demand and the market response to a surplus.

5. Tastes

The more people prefer a good, the higher the demand for that good will be, and vice versa.

1. **Q:** Why is riding the bus considered an inferior good? **A:** Because Americans hate public transport. **Q:** Why? **A:** Because the public transport system is ignored by those with the power to improve it. **Q:** Why? **A:** Because Americans hate public transport.
2. **Q:** Suppose the price of Tropicana orange juice increases. What happens in the market for Simply Orange juice? **A:** The demand for Simply Orange juice increases.
3. **Q:** Suppose the price of coffee beans falls. Should we expect that the demand for coffee filters also decreases? **A:** No, we shouldn't.
4. **Q:** A change in the price of shoes could be represented as what type of shift in the market for shoes? **A:** A movement along the supply and demand curves.
5. **Q:** Hamburger patties and hamburger lettuce are an example of what type of goods? **A:** They're complements.
6. **Q:** Suppose that the median income in the U.S. rises. What would you expect to happen in the market for televisions? **A:** The demand for televisions would increase causing the price and the quantity of televisions supplied and demanded to increase.
7. **Q:** Suppose buyers expect the price of housing to fall next month. What would you expect to happen in the market for housing today? **A:** The demand for housing would decrease causing housing prices and the quantity of homes supplied and demanded to decrease.

8. **Q:** Suppose the price of hot dog buns increases. What do you expect to happen in the market for hot dogs?
A: The equilibrium price and the equilibrium quantity of hot dogs bought and sold both decrease.
9. **Q:** Suppose sellers expect the price of hot chocolate to increase next month. Also suppose that more people, some of which drink hot chocolate, move into the area. What happens in the market for hot chocolate today?
A: Price increases and quantity is indeterminate.
10. **Q:** Suppose a robot is invented that can assemble TVs in half the time it takes individuals to assemble a TV. Also suppose that a recession causes average incomes in the US to fall. What happens in the market for TVs?
A: Equilibrium price falls and quantity is indeterminate.

5 Part Five: Elasticity

Elasticity measures how responsive a quantity demanded or quantity supplied of a good is to a change in one of its determinants.

5.1 Price Elasticity of Demand

The Price Elasticity of Demand is a measure of how much the quantity demanded of a good responds to a change in the price that good.

For any good, the price elasticity of demand for that good measures how willing and able customers are to buy less of a good as its price rises. Curves can be elastic, inelastic, or unit elastic.

Elastic quantities move proportionately more than the price, i.e. small changes in price cause large changes in quantity. $Elasticity > 1$

Inelastic quantities move proportionately less than the price, i.e. small changes in price cause even smaller changes in quantity. $Elasticity < 1$

Unit Elastic quantities move proportionately to the price, i.e. the price and quantity change by the same amount. $Elasticity = 1$

Perfectly Inelastic quantities and price are uncorrelated, i.e. the price has nothing to do with the quantity, i.e. the price of a good increases while the quantity remains the same. $Elasticity = 0$

Perfectly Elastic price is essentially fixed, i.e. a good with a price greater than the fixed price has 0 demand while anything with a price less than the fixed price has infinite demand. $Elasticity = \infty$

5.1.1 Factors

1. Availability of Close Substitutes: Goods have an elastic demand if it's easy to switch from one good to a substitute in response to a price increase.
2. Necessities vs Luxuries: Necessities have inelastic demands while luxuries have elastic demands. People need food, housing, and healthcare to live. People do not need subscriptions, name brand items, and other such luxuries to live.
3. Definition of Market: A market's specificity affects the its demand's elasticity. Broad markets tend towards inelasticity while narrow markets tend towards elasticity. There are no close substitutes for beverages (a broad market), while there are close substitutes for the coffee market.

4. Time Horizon: Over a shorter time horizon, goods' demand tends to be more inelastic while over a longer time horizon, goods' demand tends to be more elastic.

5.1.2 Calculation

Percentage Change Method

$$\text{Price Elasticity of Demand} = \left| \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} \right| = \left| \frac{\frac{Q_2 - Q_1}{Q_1}}{\frac{P_2 - P_1}{P_1}} \right|$$

Midpoint Method

$$\text{Price Elasticity of Demand} = \left| \frac{\left(\frac{\text{change in quantity demanded}}{\text{midpoint of quantity demanded}} \right)}{\left(\frac{\text{change in price}}{\text{midpoint of prices}} \right)} \right| = \left| \frac{\frac{Q_2 - Q_1}{\frac{Q_2 + Q_1}{2}}}{\frac{P_2 - P_1}{\frac{P_2 + P_1}{2}}} \right|$$

$$\text{Total Revenue} = \text{Price} * \text{Quantity}$$

5.2 Income Elasticity of Demand

The income elasticity of demand is a measure of how much the quantity demanded of a good responds to changes in a consumers' income.

$$\text{Income Elasticity of Demand} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}} = \frac{\left(\frac{Q_2 - Q_1}{Q_1} \right)}{\left(\frac{\text{Income}_2 - \text{Income}_1}{\text{Income}_1} \right)}$$

5.2.1 Normal vs Inferior Goods

Normal goods have positive income elasticity for demand, $IEOD > 0$, because quantity demanded and income move in the same direction. These elasticities vary widely, however, as necessities have small elasticities while luxuries have large ones.

Inferior goods have negative income elasticity for demand, $IEOD < 0$, because quantity demanded and income move in opposite directions.

5.3 Cross-Price Elasticity of Demand

$$\text{Cross-Price Elasticity of Demand} = \frac{\% \text{ change in quantity demanded of good 1}}{\% \text{ change in price of good 2}} = \frac{\left(\frac{\text{good}_1 Q_2 - \text{good}_1 Q_1}{\text{good}_1 Q_1} \right)}{\left(\frac{\text{good}_2 P_2 - \text{good}_2 P_1}{\text{good}_2 P_1} \right)}$$

5.3.1 Substitutes vs Complements

Substitutes have positive cross-price elasticity of demand, $CPED > 0$, since the price of good 1 and the quantity demanded of good 2 move in the same direction.

Complements have negative cross-price elasticity of demand, $CPED < 0$, since the price of good 1 and the quantity demanded of good 2 move in opposite directions.

5.4 Price Elasticity of Supply

The Price Elasticity of Supply is a measure of how much the quantity supplied of a good responds to a change in the price that good.

For any good, the price elasticity of supply for that good measures how willing and able suppliers are to sell less of a good as its price rises.

5.4.1 Factors

1. Time Horizon

In the short run, supply is typically inelastic as firms cannot easily change their scale of production by building new factories or destroying existing ones and they can't easily enter a new market or exit their current market.

In the long run, supply is typically elastic for the reasons inverse of the ones listed above.

Note that perfectly inelastic supply reacts the same as perfectly elastic demand: the price may fluctuate without a change in quantity supplied. Perfectly elastic supply supplies an infinite quantity above the fixed price and zero below the fixed price.

5.4.2 Calculation

Percentage Change Method

$$\text{Price Elasticity of Supply} = \left| \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}} \right| = \left| \frac{\frac{Q_2 - Q_1}{Q_1}}{\frac{P_2 - P_1}{P_1}} \right|$$

Midpoint Method

$$\text{Price Elasticity of Supply} = \left| \frac{\left(\frac{\text{change in quantity supplied}}{\text{midpoint of quantity supplied}} \right)}{\left(\frac{\text{change in price}}{\text{midpoint of prices}} \right)} \right| = \left| \frac{\frac{Q_2 - Q_1}{\left(\frac{Q_2 + Q_1}{2} \right)}}{\frac{P_2 - P_1}{\left(\frac{P_2 + P_1}{2} \right)}} \right|$$

5.5 Taxes

A **per unit tax** is a payment from an individual or firm imposed by the government that raises a good or service's per unit cost of consumption or production.

Taxes raise the price for private sales or purchases of a good. The **tax incidence** is the manner in which the burden of a tax is shared among participants in a market (how do the buyers and sellers share the burden of a tax?)

Taxes imposed on sellers effectively increase the per unit cost of making a good (causing the supply curve to shift left) while taxes on buyers effectively increases the per unit cost of purchasing a good (causing the demand curve to shift left).

Taxes levied on buyers and sellers are equivalent. Regardless of who is taxed, the market will be affected in the same way.

5.5.1 Example

Lawmakers want the price of chicken to raise by a certain amount, so they place a chicken tax on buyers, pushing up the price of the poultry. As the cost of chickens has increased, the quantity bought and sold will fall significantly. Producers, wanting to preserve their poultry patronage, become willing to pay a portion of the tax, so they lower the price of the initial good so that the price doesn't increase by the full price of the tax.

Lawmakers levy new legislation taxing cakes, but they want the price of the pastries to remain the same. The cost for sellers, however, increases by the price of the tax and reduces the quantity that they can supply. If buyers like the product enough, they can cover the extra cost of the cake that sellers are paying, so sellers can raise the price of a good by less than the full amount of the tax.

5.5.2 Who Pays More?

The tax burden (incidence) is shared between buys and sellers, but the factor that determines the group that pays more is the elasticity of the supply and demand curve for the given product. The **more inelastic** curve will pay more of the tax. The less elastic the market, the harder it is for them to adapt to the new prices as they have fewer alternatives to the good and are less willing to leave the market.

5.5.3 Payroll Taxes

The supply of labor in the United States is relatively inelastic, and the demand for labor is relatively elastic. This means that when the government imposes payroll taxes on income to pay for Medicaid and Social Security, the employees end up paying more than the employers.

5.5.4 Luxury Items

If the government were to tax luxury items, the sellers would have more of a tax burden as buyers don't need those items to survive and can more easily leave the market. If the government were to tax an item like bread, though, the buyers would carry the majority of the tax burden as they would have fewer options than sellers to leave the market.

5.6 Examples

1. **Q:** You should expect an insulin shot used in the management of diabetes to have what type of price elasticity of demand? **A:** Inelastic. Also, insulin only costs \$2-\$4 to produce (here's a source). Bruh.
2. **Q:** Over the next 50 years, we should expect oil (used in the production of gas) to have what type of price elasticity of demand relative to the price elasticity of demand today? **A:** Elastic.
3. **Q:** Why do BMWs have an elastic demand curve while water, Tylenol, and natural gas have inelastic demand curves? **A:** Despite what the advertisements say, you don't need a BMW. You do, however, need freshwater to live.
4. **Q:** You work for a BMW dealership. Your boss tells you that he has decided to raise the price of all of the BMWs, because he wants to increase the dealership's total revenue. This will likely increase the dealership's total revenue. **A:** False. Again, people don't need BMWs and the dealership across the street (why are car dealerships always next to each other?) is selling a different brand for cheaper. Also, they're next to each other because of Hotelling's Law.
5. **Q:** Suppose you work in the apple business, a good with many close substitutes. You want to increase your overall total revenue. If you lower the price of your apples, will you make bank? **A:** Yes. People will flock to your amazing prices. You may also cause a price war.
6. **Q:** In the market for laptops, 2500 laptops are demanded at a price of \$1,500 per laptop. However, 6000 laptops are demanded at a price of \$800 per laptop. Using the midpoint method, calculate the price elasticity of laptops. **A:** 1.35
7. **Q:** Suppose at a price of \$1 there are 50 bananas demanded, and at a price \$2 there are 38 bananas demanded. What type of elasticity can you deduce from this data? (Use the percentage change method) **A:** Inelastic
8. **Q:** Total revenue did what after the price increase in the prior Practice Question? **A:** Increased.
9. **Q:** Does the price elasticity of demand tell us how responsive price is to a one unit change in quantity demanded? **A:** No.
10. **Q:** Lowering the price of a good will increase total revenue if the demand curve is relatively elastic. **A:** Yes. People love a good deal.
11. **Q:** In general, we should expect that the demand for cars will be relatively more inelastic than the demand for Hondas (an affordable car brand). **A:** Yes.
12. **Q:** What type of elasticity do EpiPens' demand curve have? **A:** Inelastic. It's a life saving device. Also, EpiPens cost less than twenty dollars to produce (here's a source). Brand name EpiPens cost around \$600. Bruh.
13. **Q:** Think: will the price elasticity of supply always be positive? **A:** Yes.
14. **Q:** The income elasticity of demand is a measure of how much the demand of a good responds to changes in a consumers income. **A:** False. It relates the quantity demanded to income.
15. **Q:** (T/F) If farmers become more productive in growing wheat, the total revenue received by wheat farmers will rise. **A:** Since the demand for wheat is relatively inelastic and since price of wheat will fall (due to the law of supply), revenue will fall.
16. **Q:** The cross-price elasticity of demand between golf balls and golf clubs is **A:** negative since they are complements.
17. **Q:** Before a tax in the market for trucks, the equilibrium price is \$10,000 per truck, and the equilibrium quantity is 86,000. After the tax is imposed, buyers pay a price of \$12,000 and sellers receive a price of \$3,000. The new equilibrium quantity is 75,000 trucks. What is the total tax burden? The consumers' tax burden? The producers' tax burden? **A:** \$9,000, \$2,000, \$7,000

18. **Q:** Suppose that before a tax is placed in the market for shirts, a shirt costs \$30 and 63,000 shirts are sold. Now, suppose a \$5 tax is implemented and sellers pay \$1 of the tax while buyers pay \$4. How much do buyers pay for shirts after the tax? **A:** \$34
19. **Q:** In practice, a tax typically has which effect in the market in which it is imposed? **A:** A decrease in quantity supplied and a decrease in quantity demanded. Buyers will end up paying more and sellers will receive less.
20. **Q:** Suppose the government decides to raise payroll taxes which pay for programs like Medicaid and Social Security. Who will pay a larger share of the tax burden? **A:** Individuals, not firms.
21. **Q:** Suppose the government decides that it wants to increase sales taxes for luxury goods like yachts, luxury cars, golf courses, those mints that fancy restaurants put at the exit, poodles, etc. Who will pay a larger share of the tax burden? **A:** Firms, not individuals
22. **Q:** When a good is taxed, consumers pay more of the tax burden in a market if the tax is placed on consumers. **A:** The tax burden is determined by the elasticity of supply and demand of the good or service taxed.
23. **Q:** Suppose the federal government decides to place a tax on the purchase of insulin. Who will pay a larger share of the tax burden? **A:** The consumers, not producers. Insulin is a life saving drug, and insulin is patented.
24. **Q:** Suppose French fries and ketchup are normally consumed together and the price of ketchup falls. Also, suppose that there a few restaurants stop offering French fries as a side. What happens in the market for French fries? **A:** Price rises and quantity is indeterminate
25. **Q:** If ice cream and ice cream cones are often consumed together, you should expect their cross-price elasticity to be **A:** negative.

6 Part Six: The Fed

Price floors and ceilings

6.1 Price Ceilings

A price ceiling is a maximum price that the government sets. If placed below equilibrium, it's binding and creates a shortage.

Rent control is a classic example of a binding price ceiling. Large cities that are attempting to fix rising rent levels. Landlords that don't want to charge below equilibrium will leave as soon as their contracts expire. All the while, consumers flock to the excellent prices and further increase the quantity demanded.

In the short run, both the supply and the demand for the apartments are relatively inelastic. In the long run, both the supply and the demand are relatively elastic. This means that, over time, the supply and demand curves flatten and worsen the shortage.

6.2 Price Floors

A price floor is a minimum price that the government sets. If placed above equilibrium, it's binding and creates a surplus.

Minimum wage is a binding price floor for low-skill jobs. Theoretically, minimum wage laws would create unemployment but this model doesn't account for the fact that people will spend more money as they earn more money.

6.3 Examples

1. **Q:** Rent controls cause **A:** shortages of apartments that are larger in the long-run than in the short-run.
2. **Q:** A binding price floor in the market for milk leads to **A:** A higher price paid by sellers, a higher price paid by buyers, and a surplus in the market for milk.
3. **Q:** A binding price floor in the market for corn will cause the quantity **A:** supplied to exceed the quantity demanded, thus creating a surplus of corn.
4. **Q:** Rent controls cause **A:** shortages of apartments that are larger in the long-run than in the short-run.
5. **Q:** True or false: binding price floors create surpluses. **A:** True
6. **Q:** How would a binding price ceiling on childcare affect its quantity supplied? **A:** It would decrease the quantity supplied
7. **Q:** Fact or fiction: “The data on minimum wage and unemployment demonstrates conclusively that an increase in the minimum wage increases unemployment.” **A:** Fiction.

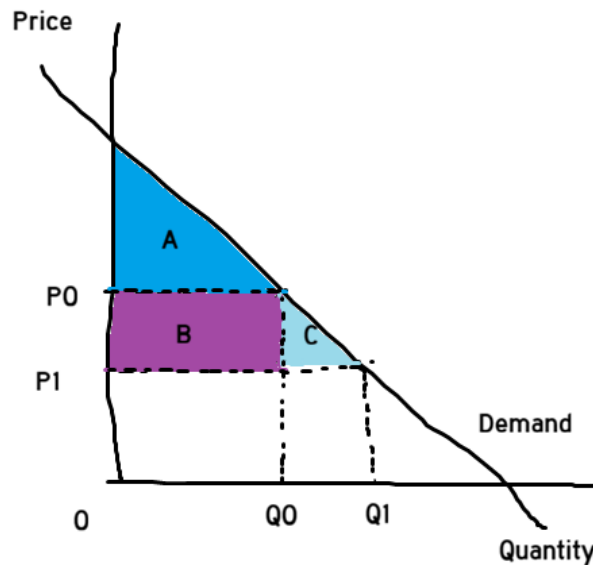
7 Part Seven: Consumers, Producers, and the Efficiency of Markets

Welfare economics is the study of how the allocation of resource affect economic well-being.

Someone's **willingness to pay** is the maximum amount of money a buyer will pay for a good.

7.1 Consumer and Producer Surplus

Consumer surplus is the amount that a buyer is willing to pay for a good minus the amount they actually pay.



The area below the demand curve and above the market equilibrium price P_0 measures the consumer surplus in a market. Suppose the equilibrium falls from P_0 to P_1 . A represents the initial consumer surplus to the buyers, B is

the additional consumer surplus gained by the initial buyers in the market and C is the new consumer surplus to the new buyers that enter the market when the price falls.

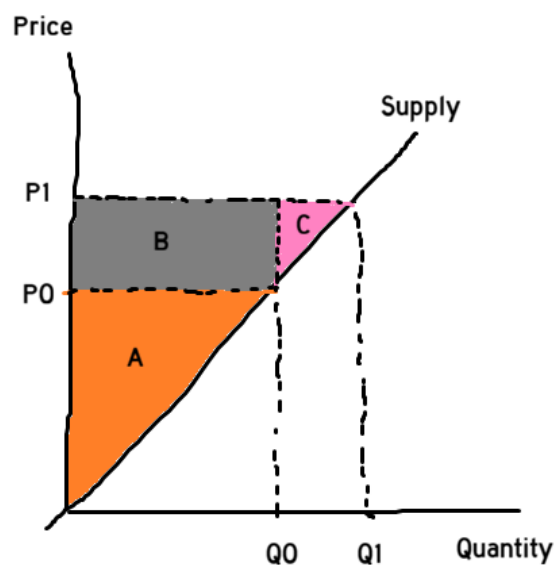
Buyer	Willingness to Pay for a Shirt
Mike	\$66
Jane	\$53
Sajana	\$49
Dana	\$36

Price p	Quantity Demanded	Buyers
$p > \$66$	0	None
$\$66 \geq p > \53	1	Mike
$\$53 \geq p > \49	2	Mike and Jane
$\$49 \geq p > \36	3	Mike, Jane, and Sajana
$\$36 \geq p$	4	Mike, Jane, Sajana, and Dana

If you are willing to pay \$30 for a board game on the market, and it's available for \$25, your consumer surplus is \$5. Your friend is willing to pay \$25, so their consumer surplus is \$0 (not included). If the price of the game falls to \$15, you gain \$10 of additional consumer surplus on top of the initial \$5 while your friend is now included, as they have a total consumer surplus of \$10.

Consumer surplus can be calculated with $\frac{1}{2} * base * height$

Producer surplus is the amount a seller is paid for a good minus the seller's cost of providing it.



Suppose the market equilibrium price rises from P_0 to P_1 . A represents the initial producer surplus to the initial sellers in the market, B represents the additional producer surplus that is gained by the initial sellers in the market when the price rises and C is the new producer surplus to the new sellers that enter the market when the price of the good rises.

Seller	Cost of Producing a Shirt
Tracy's	\$10
Forever 19	\$15
Arrow	\$20
Michelle's	\$30

Price p	Quantity Demanded	Buyers
$p \geq \$30$	4	Tracy's, Forever 19, Arrow, Michelle's
$\$20 \leq p < \30	3	Tracy's, Forever 19, Arrow
$\$15 \leq p < \20	2	Tracy's, Forever 19
$\$10 \leq p < \15	1	Tracy's
$\$10 > p$	0	None

7.2 The Invisible Hand

The **invisible hand** is the unobservable market force that helps supply and demand of goods to naturally reach equilibrium in a free market.

7.3 Examples

1. **Q:** Suppose you buy a copy of Jurassic Park on eBay. The book is worth \$15 to you. If you buy it for \$10, your consumer surplus is **A:** the \$5 you were willing to spend but ultimately didn't have to
2. **Q:** Does consumer surplus increase when the price increases? **A:** No.
3. **Q:** Suppose you want to sell your third copy of Legally Blonde: Special Edition. You value the DVD value at \$12. Reese Witherspoon is willing to pay \$20 for it. If you sell it to her for \$18, what is your producer surplus? What is Reese's consumer surplus? **A:** \$6, \$2
4. **Q:** Producer surplus is the difference between the **A:** price and the seller's cost.
5. **Q:** True or false: an increase in price would increase producer's surplus. **A:** True
6. **Q:** True or false: at the market equilibrium price the market is efficient, because the value of the good (measured as willingness to pay) is exactly equal to the cost of producing the good (measured as seller's cost). **A:** True
7. **Q:** What does the equilibrium in perfectly competitive (free) markets? **A:** It maximizes the sum of producer and consumer surplus, allocates the demand for goods to the sellers who produce them at the least cost, and allocates the supply of goods to the buyers who value them the most as measured by willingness to pay.
8. **Q:** Does consumer surplus decrease when the price of a good falls? **A:** No

9. **Q:** If an additional unit of ice cream would add more to society's benefit (value) than to its cost, are producers producing more or less than the market equilibrium? **A:** Less

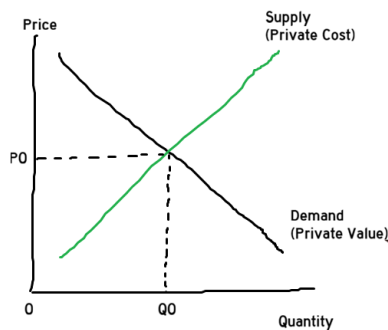
10 Part 10: Externalities

Why did we skip parts eight and nine?

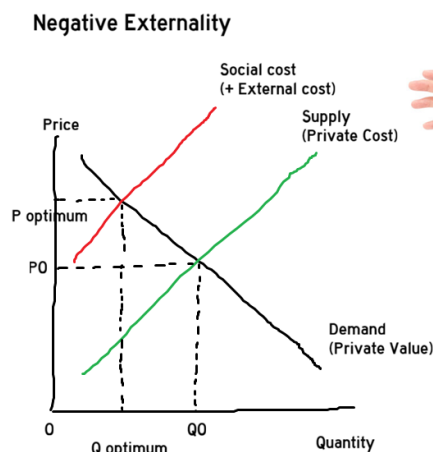
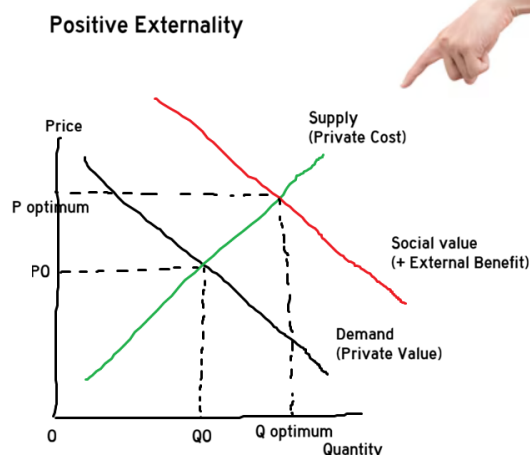
Externalities are the uncompensated impact of one person's actions on the well-being of a bystander. These can be positive or negative.

Renovating historic buildings, keeping a nice garden, getting vaccinated, wearing a mask, creating public art, smelling good, and baking bread with your window open are examples of **positive externalities**. You benefit others without compensation.

Smoking, owning a loud dog, sneezing on public transport, letting your unwashed pet rat run rampant in a coffee shop, and dumping toxic waste into the water supply to gain a marginal benefit in the cabinet industry are all examples of **negative externalities**.



Let's edit the supply/demand graph to denote that the supply and demand are associated with a private cost and private value.



Now we can graph the positive and negative externalities and see the new optimum price and quantities. Notice how the social cost of a good is the sum of the private cost of a good plus the negative externality of the good, and how in the case of negative externalities, the social cost of the good is greater than the private cost of a good.

10.1 Subsidies

Subsidies lower the price for private sales or purchases of a good. Subsidies to sellers shift the supply curve to the right by effectively decreasing the per cost unit of producing one good while subsidies to buyers cause the demand curve to shift to the right by effectively decreasing the per unit cost of purchasing one good.

Just like taxes, subsidies affect the market in the same way whether they are paid to the buyers or sellers.

10.2 Two Types of Government Policies

Governments can try to reduce externalities using one of two broad policy types:

1. **Command and Control Policies**, which involve direct regulation. To address negative externalities, they may pass legislation to mandate the reduction of CO_2 emissions, the adoption of certain technologies, or cleanup of environmental contamination. To introduce positive externalities, they may require vaccination for a variety of reasons.
2. **Market Based Policies** provide incentives for decision makers to solve the problem on their own. These include **Corrective Taxes**, **Corrective Subsidies**, and **Tradable Permits**.

Corrective Taxes are designed to induce private decision makers to take account of the social costs that arise from a negative externality.

Corrective Subsidies are designed to induce private decision makers to take account of the social value that arises from a positive externality.

Tradable Permits are issued in limited numbers by the federal government and allow the owner to exhibit a certain level of an externality, causing them to consider the cost of reducing negative externalities.

10.3 Examples

10.3.1 Handling Externalities

The students living in the “Party House” are prone to host loud parties on Saturday night. They value these parties at \$100. Their studious neighbors value peace and quiet at \$90. The noise ordinance in this college town requires the police stop loud parties if the neighbors complain. Assume zero transaction costs. An efficient solution for this problem would be for the party house to pay their neighbors between \$90 and \$100 to not call the cops.

A steel mill has 10 tradable pollution permits. Each permit allows for 1 unit of pollution and has a market value of \$1000. With new production technology, the firm can eliminate its first unit of pollution at a cost of \$750, its second unit of pollution at a cost of \$950, and its remaining 8 units of pollution at a cost of \$1100 each. Assuming the firm wants to minimize its costs, it should sell 2 permits and invest in the new technology.

1. **Q:** Give an example of a positive externality conferred by a college education? **A:** One answer: non college educated employees become more efficient at completing work related tasks from watching their college educated coworkers.
2. **Q:** True or false: if the government decides to subsidize the production of a good, then the price sellers receive will be greater than the price buyers pay. **A:** True
3. **Q:** Suppose that the last unit of output produced by a paper mill has a value of \$10 to society and a social cost of \$15. If the private cost to the producer is \$10, then what state is the market in and how is the output relative the social optimum? **A:** Equilibrium, greater
4. **Q:** If a positive externality exists in the market for flu shots, the private market equilibrium occurs at a price that is **A:** too low and a quantity that is too low in comparison to the socially optimal equilibrium.

11 Part Eleven: Karl Marx’s Favorite Chapter

Public goods and common pool resources

An **excludable** good is one that can prevent a person from using it.

A rivalrous good, or one that is **rival in consumption**, is when one person’s use of a good diminishes another person’s use.

Type	Excludable	Rival in Consumption	Examples
Private Goods	Yes	Yes	Clothing, housing, cars, congestion toll bridges/roads
Club Goods	Yes	No	Electricity use, movies, toll bridges/roads
Public Goods	No	No	Public libraries, non-toll bridges/roads, public education
Common Resources	No	Yes	The Sierra Mountains (environment), fishing, congested non-toll bridges/roads

Free-riders are people who receive the benefit of a good without paying for it.

11.1 Public Goods

Public goods are an example of a positive externality.

1. **National Defense:** The military doesn't pick and choose what house to defend based on who pays their taxes or not
2. **Basic Research:** General knowledge, once created, is publicly available to anyone within the society and can't be patented. General knowledge is not excludable or rival in consumption.
3. **Fighting Poverty:** The argument is that regardless of whether or not an individual contributes resource to alleviate poverty, individuals benefit from the eradication of poverty, which doesn't stop anyone else from experiencing the benefit of eradicating poverty

1. **Q:** Are private goods excludable and non rival in consumption? **A:** No.
2. **Q:** Out of a country club, a traffic signal, a TV, and a restaurant, which is most likely to be a public good?
A: A traffic signal
3. **Q:** What's the dilemma involving public goods in perfectly competitive markets? **A:** The failure to efficiently allocate resources
4. **Q:** Which of the following is **not** an example of the free-rider problem?
 - (a) A student working on a group project puts forth minimal effort because the team will receive a team grade rather than individual grades.
 - (b) A park ranger takes a nap in his car because his boss is working hundreds of miles away and will never know about the nap.
 - (c) Tim attends a neighborhood party with live music; the other neighbors have paid \$5 each to give to the local band members, but Tim does not pay.
 - (d) Shannon catches a ride to a volleyball game with her friends but does not offer to pay for gas.

A: The park ranger. While they are taking advantage of their employer (the US government), they are not a free-rider.

5. **Q:** Why are timber companies are most likely to engage in over-logging of forests on publicly owned land? **A:** because it is a common resource
6. **Q:** What's a common illustration the tragedy of the commons problem? **A:** Over-fishing
7. **Q:** A public good is **A:** consumable by additional users without reducing consumption by other users
8. **Q:** Common pool resources are **A:** non-excludable and rival in consumption
9. **Q:** True or false: externalities arise in the markets for public goods and common pool resources, because these resources are valuable but have no price attached to them. **A:** True
10. **Q:** Out of the Truckee River bikeway, the fish in the river, a tube you can rent to float down the river while sipping an iced tea while fishing in the river, and a cycling group that you can join to ride along the river and watch people float in tubes and sip their iced tea and fish, which of the following is an example of a public good? **A:** The bikeway.
11. **Q:** True or false: advocates of anti-poverty programs argue that poverty reduction is a common resource. **A:** False

12. **Q:** In the 1960s, the lobstering community of Port Lincoln on Australia's southern coast set a limit on the number of traps that could be set and then sold licenses for those traps. Since then, any newcomer could enter the business only by buying a license from another lobsterman. How did this government intervention in the lobster market affect its economic efficiency and why? **A:** Increase, because of the tragedy of the commons.
13. **Q:** Out of national defense, a toll road in the Illinois highway system, a national park, and the internet, which is not an example of a public good? **A:** A toll road in the Illinois highway system
14. **Q:** True or false: accounting cost and economic cost are the same. **A:** False

13 Part Thirteen: Firm Theory

Industrial Organization is the study of how firms' decisions about prices and quantities depend on the market conditions they face.

13.1 2 Major Questions of Firm Theory

How much will firms choose to produce? To analyze this question we must look at the firm's production function. The concept of marginal product relates to the production function.

How much profit do firms make? To analyze this question we must look at the firm's profit function. The concepts of marginal cost and marginal revenue relate to the profit function.

13.2 The Product Function

The **production function** is the relationship between quantity of inputs used to make a good and the quantity of output of that good: how the inputs are combined to create the output.

The **marginal product** is the increase in output (production) that arises from an additional unit of input.

13.2.1 Example

Labor	Output	Marginal Product
0	0	-
1	22	$\frac{22 - 0}{1 - 0} = 22$
2	38	16
3	50	12

From 0 to 3 units of output, the production function exhibits decreasing marginal product: the marginal cost curve would be upward sloping.

Labor	Output	Marginal Product
0	0	-
5	30	$\frac{30 - 0}{5 - 0} = 6$
12	42	$\frac{42 - 30}{12 - 5} = 1.71$
30	91	$\frac{91 - 42}{30 - 12} = 2.72$

Diminishing marginal product is the property whereby the marginal product of an input declines as the quantity of the input increases.

$$Profit = Total\ Revenue - Total\ Cost \quad Total\ Revenue = Price * Quantity$$

Total cost is the market value of the inputs a firm uses in production.

Explicit costs are the input costs that require an outlay of money by the firm while **implicit costs** are the input costs that do not require an outlay of money by the firm.

13.3 Economic vs. Accounting Costs

Economic costs consider both the explicit costs and the implicit costs that face firms when they make production and pricing decisions. $Economic\ Profit = Total\ Revenue - (Explicit + Implicit\ Costs)$.

Accounting costs only consider the explicit costs that face the firms when they make production and pricing decisions are considered. $Accounting\ Profit = Total\ Revenue - Explicit\ Costs$

13.4 Fixed vs. Variable Costs

$$Total\ Cost = Fixed\ Cost + Variable\ Cost$$

Fixed costs do not vary with the quantity of output produced while **variable costs** vary with the quantity of output produced.

The total cost curve has a convex shape.

13.4.1 Example

Output	Total Cost	Fixed Cost	Variable Cost
1	\$21	\$13	\$8
2	\$29	\$13	\$16
3	\$37	\$13	\$24

13.5 Types of Costs

1. Average Fixed Cost

$$\text{Average Fixed Cost} = \frac{\text{Fixed Cost}}{\text{Quantity}}$$

2. Average Variable Cost

$$\text{Average Variable Cost} = \frac{\text{Variable Cost}}{\text{Quantity}}$$

3. Average Total Cost

$$\text{Total Cost} = \text{Fixed Cost} + \text{Variable Cost}$$

4. Marginal Cost

$$\text{Marginal Cost} = \frac{\text{Change in Total Cost}}{\text{Change in Quantity}}$$

13.5.1 Example

Quantity of Output	Fixed Costs	Variable Costs	Marginal Costs	Average Variable Cost
0	\$10	\$0	-	-
1	\$10	\$4	\$4	\$4
2	\$10	\$9	\$5	\$4.50
3	\$10	\$15	\$6	\$5
4	\$10	\$22	\$7	\$5.5
5	\$10	\$40	\$18	\$8

13.6 Important Curve Information

13.6.1 Rising Marginal Cost

The marginal cost of a good or service will eventually rise as long as variable cost is rising due to the **diminishing marginal product** of the inputs in the production process. When output is low, not all equipment is being used,

so adding additional workers can significantly increase the marginal product because the existing equipment can be easily be put to use. When output is high, new employees have to share equipment and thus may have to wait.

13.6.2 U-Shaped Average Total Cost

The average total cost curve reflects the shape of both the average fixed cost and average variable costs because the average total cost is the sum of those costs. At low levels of output, average fixed costs are high as they're spread over a few units. As output increases, fixed costs are spread over more units resulting in falling fixed costs. At low levels of output, average variable costs are low because of high marginal product. As output increases, variable costs rise faster than output due to diminishing marginal product. This results in increasing variable costs.

13.6.3 Relationship Between Average Total Cost and Marginal Cost

The bottom of the average total cost curve occurs at the quantity that minimizes the average total cost. This quantity is sometimes called the **efficient scale** of a firm. Efficient scale is the quantity of output that minimizes the average total cost.

If $MC > ATC$, then ATC will rise. If $MC < ATC$, then ATC will fall.

13.7 Production Changes

ATC curves differ in the short vs long run.

13.7.1 Time Horizon

Short-Run

1. A firm might decide to hire more bakers.
2. A firm might decide to have its bakers work more hours.
3. A firm might decide to purchase more flour, water, and salt.

Notice that these are variable costs.

Long-Run

The long run ATC curve gives important information about the production process for manufacturing a good a firm has available. Firm sizes vary and can be seen through the long run ATC curve.

1. A firm might decide to purchase more ovens.
2. A firm might decide to expand its existing factory.
3. A firm might decide to build more bread making factories.

Notice that these are fixed costs.

There are three different terms for the relationship between the size of a firm's operations and its costs:

1. **Economies of scale** dictates that the long-run average total costs falls as the quantity of output increases. This occurs because higher production levels allow specialization among workers, which allows each worker to become better at their specific task within the production process.
2. **Constant returns to scale** dictates that the long-run average total cost stays the same as the quantity of output changes. This occurs once all possible avenues for specialization within the production process have been exploited, but the firm is not yet experiencing coordination problems, i.e. workers are already specializing in a specific task within the production process so higher production levels do not increase specialization among workers and do not increase coordination problems.
3. **Diseconomies of scale** dictates that long-run average total cost rises as the quantity of output increases. This occurs because coordination problems arise when the firm becomes too large. Increasing production at this point increases communication problems and inhibits management's ability to exercise control over the production process.

13.8 Examples

1. **Q:** True or false: the production function has a concave shape due to diminishing marginal product. **A:** True
2. **Q:** Chris owns 'Christina's bakery' that currently has 2 workers. The first worker can produce 100 delicious baked goods in one day, and the second worker increased the total production by 80 delicious baked goods in one day. Chris is hiring a 3rd worker. What is the likely total production in one day? **A:** more than 180 but less than 260 delicious baked goods
3. **Q:** Suppose Sandy owns a factory that makes bikes. Sandy sells 1,525 bikes per year at a price of \$300 each. Sandy's total cost is \$1000 annually. What is Sandy's Total Revenue? What is Sandy's Profit? **A:** \$457,500, \$456,500
4. **Q:** Suppose Don sold 145 cars this weekend at the dealership he owns. Each car was priced at a sale price of \$13,500. Suppose it cost Don \$525,750 in total to sell the cars. What is Don's Total Revenue from the weekend? What is Don's Profit from the weekend? **A:** \$1,957,500, \$1,431,750
5. **Q: Review:** You can either go see a 2 hour movie or work at a wage of \$10 per hour. Suppose you choose to go to see a movie. You pay \$7 for the ticket, \$5 in gas, and \$12 for refreshments. What is your explicit (accounting) cost of going to the movies? What is your implicit cost of going to the movies? **A:** \$24 \$20
6. **Q:** Alexander owns a small factory that makes fishing lures. He can make 10,000 lures per year and sell them for \$10 each. Alexander pays \$25,000 for raw materials to produce the 10,000 lures. He invested a total of \$20,000 in equipment. Alexander could work at a competing factory for \$40,000. What's are his accounting and economic profits? **A:** \$55,000, \$15,000
7. **Q:** True or false: total cost will always be greater than or equal to fixed cost. **A:** True
8. **Q:** True or false: a firm's economic costs of production will always be greater than or equal to a firm's accounting costs of production. **A:** True
9. **Q:** True or false: average variable cost will be less than average total cost as long as there are positive fixed costs. **A:** True
10. **Q:** True or false: average fixed cost will be less than average total cost as long as there are positive variable costs. **A:** True
11. **Q:** Which of the following is most likely to be a fixed cost in the short-run?
 - (a) Interest payments on funds borrowed by a farmer to finance farm machinery.
 - (b) Wages paid to workers who assemble computers.
 - (c) Performance bonuses for sales staff of a pharmaceutical company.

(d) Payments for gasoline for company cars driven by sales staff.

A: The interest payments on funds borrowed by a farmer to finance farm machinery.

12. **Q:** Out of economies of scale, constant returns of scale, specialization, and diseconomies of scale, which is most likely to occur if a firm experiences coordination problems? **A:** Diseconomies of scale
13. **Q:** True or false: if marginal cost is greater than average total cost, then average total cost is falling. **A:** False

14 Part Fourteen: Firm Decisions in Perfectly Competitive Markets

14.1 The Perfectly Competitive Market

Firms make decisions on the quantity of a good that they produce and the price that they charge for a good. A **competitive market** is a market with many buyers and sellers trading identical products so that each buyer and seller is a price taker.

14.1.1 Perfectly Competitive Market Assumptions

1. The market consists of many buyers and sellers such that no individual can have an impact on price. Instead, they are price takers
2. There are no barriers to enter or exit the market. So, all firms can freely enter and exit the market
3. All products are homogeneous. So, there is no difference between products sold by different sellers
4. Both buyers and sellers have perfect information. All firms have access to the same production capabilities and resources. All buyers know all prices offered by all sellers

$Total\ Revenue = P * Q$ $Average\ Revenue = \frac{P * Q}{Q} = P$: all types of firms' average revenue equals the price of the good. $Marginal\ Revenue = \frac{Change\ in\ Total\ Revenue}{Change\ in\ Quantity}$

14.1.2 Example

Output	Price Per Good (\$)	Total Cost (\$)	Total Revenue (\$)	Average Revenue (\$)	Marginal Revenue (\$)
0	5	3	$0 * 5 = 0$	-	-
1	5	5	$1 * 5 = 5$	$\frac{1 * 5}{1} = 5$	$\frac{5 - 0}{1 - 0} = 5$
2	5	8	$2 * 5 = 10$	5	5
3	5	12	$3 * 5 = 15$	5	5
4	5	17	$4 * 5 = 20$	5	5
5	5	23	$5 * 5 = 25$	5	5

14.2 Profit Maximization

Recall that $Profit = Total\ Revenue - Total\ Cost$. Firms will increase their production (quantity produced Q) of a good as long as the profit from producing an extra unit of the good (Q) is positive. This will occur when the revenue generated from producing an extra unit of the good is greater than the cost of making an extra unit of that good $Marginal\ Revenue > Marginal\ Cost$.

14.2.1 Example

Quantity	Total Cost (\$)	Marginal Profit (\$)
0	10	-
1	30	20
2	48	18
3	64	16
4	82	18
5	102	20
6	124	22
7	148	24

Assume the market price is \$18. To maximize profit or minimize loss, the firm will select 4 units. They pick 4 over 2 as they will make more profit without losing money. The firm will thus earn profits of -\$10.

If the market price is \$21, then the firm will produce 5 units and earn profits of \$3.

14.2.2 General Rules

When $Marginal\ Revenue > Marginal\ Cost \rightarrow$ Output quantity increases. (Producing an extra unit of the good provides more revenue than it costs to produce)

When $Marginal\ Revenue < Marginal\ Cost \rightarrow$ Output quantity decreases. (Producing this quantity of the good is more costly than the revenue it generates.)

When $Marginal\ Revenue = Marginal\ Cost \rightarrow$ Profit of output is at a maximum . (Producing this quantity of the good generates enough revenue to just offset the cost.)

14.2.3 Example

Output	PPG (\$)	TC (\$) (\$)	Total Revenue (\$)	Marginal Revenue (\$)	Marginal Cost (\$)	Profit (\$)
0	5	3	0	-	-	$0 - 3 = 3$
1	5	5	5	5	$5 - 3 = 2$	$5 - 5 = 0$
2	5	8	10	5	$8 - 5 = 3$	2
3	5	12	15	5	4	3
4	5	17	20	5	5	3
5	5	23	25	5	6	2

14.3 To Produce or Not To Produce

Firms examine their situation in the short-term and long-term before making a decision to shutdown or exit the market they're in.

When a firm decides to **shutdown**, they are making a short-run decision to not produce anything during a specific period of time. Ski resorts can't operate if there's no snow to ski on, so they shutdown when the season is over and start back up when it starts again.

Firms decided to **exit**, make a long-run decision to leave the market, when they don't see a benefit in staying in the market.

Sunk costs are costs that have already been committed and cannot be recovered. In the short-run, firms view fixed costs as sunk costs because they cannot easily recover their fixed costs by temporarily stopping production (also known as the irrelevance of sunk costs). Long-run firms do not view their fixed costs as sunk costs as they are able to make decisions that impact their fixed costs of production.

14.3.1 Rules for Shutdown

If $Profit > Average Variable Cost \rightarrow Do not shutdown$

If $Profit = Average Variable Cost \rightarrow Choose$

If $Profit < Average Variable Cost \rightarrow Shutdown$

14.3.2 Rules for Exit

If $Profit > Average Variable Cost \rightarrow Do not exit$

If $Profit = Average Variable Cost \rightarrow Do not exit$

If $Profit < Average Variable Cost \rightarrow Exit$

14.4 Examples

1. **Q:** A competitive firm will charge a price determined on and by whom and what? **A:** The market and by the demand and market supply
2. **Q:** True or false: the supply curve of the perfectly competitive firm is its ATC curve above its MC curve. **A:** False