

1 Chapter 1

1.0

There are 6 main issues we will focus on in economics:

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Definition 1. Productivity Growth

Productivity is measured by $\text{Productivity} = \text{Output}/\text{Worker}$

Incentives lead to productivity growth.

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Definition 2. Population Growth

Canada is open to immigrants, we have a low birth rate compared to past generations. No population growth leads to less workers, meaning workers must work harder. There are benefits and costs of having children.

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Definition 3. Climate Change

Cities in Canada are moving towards bodies of water. Risk of submersion. Need to think about city design and allocation of people and resources.

Example 1.1. Farmers' harvests are affected by climate change. Impacts their income.

Economic impact of climate change is a big issue.

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Definition 4. Technological Change

Changing many industries, including education. Automation, job losses but also new job markets. Presently, might technological change may seem to be bad news but the future brings changes.

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Definition 5. Protectionism

Has been, unfortunately, on the rise over 20-40 years. Opposed to trade or comes with conditions. Countries have decided to tie trades to labour and climate conditions and standards. Free trade resists protectionism.

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Definition 6. Inequality

Highly undesirable, unless you are at the top of the distribution. Not within your control. Income inequality is problematic but has a deeper understanding. There is a difference between unfair and unequal. Need to analyze individual potential.

1.1

Definition 7. *Economics is a social science that studies how we allocate limited resources to satisfy unlimited wants.*

Definition 8. *Social science is the study of people.*

Is the allocation of resources fair? just? efficient? By resources we mean:

- Land (T)
- Labour (L)
- Capital (K)

These resources are also known as factors of production. Note: Money is not a resource, it is a means of making exchange easier. With Land, Labour or Capital you could make use of them on a island alone.

These resources are limited or scarce but **our wants are unlimited**. Even billionaires give away their money for their wants. Scarcity → Choice.

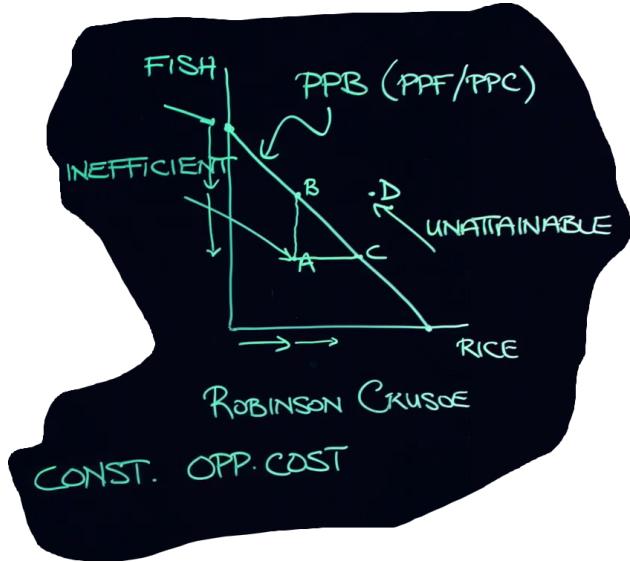


Figure 1: Robinson Crusoe^a's Constant Opportunity Cost

^aStory of a life of comfort to a solitary existence on a deserted island

$$\text{Opportunity Cost} = \frac{\text{Gain}}{\text{Loss}} \quad (1)$$

Naturally we try to equalize the values of rice and fish (EQUITY). If we used all of Crusoe's resources we would get a linear line (PPB/PPF/PPC meaning Production Possibility). Say that point A is below the line. This means it is potential with his resources but we say it is **inefficient**. Same with point B and C but they maximize his resources. Point D is above the line and is **unattainable**, meaning he cannot achieve it.

Definition 9. *Opportunity Cost is the value of the next best alternative forgone.*

Example 1.2. If Crusoe has maximized his use of resources, to acquire more rice, Crusoe must give up some fish. The cost is constant in this example.

Note: In real life, a constant opportunity cost is generally not realistic.

Imagine Crusoe's opportunity cost is no longer constant but increasing. The graph of his resources would be a slope.

Crusoe is able to give up the inefficient methods of obtaining fish/rice for the other initially. To obtain more

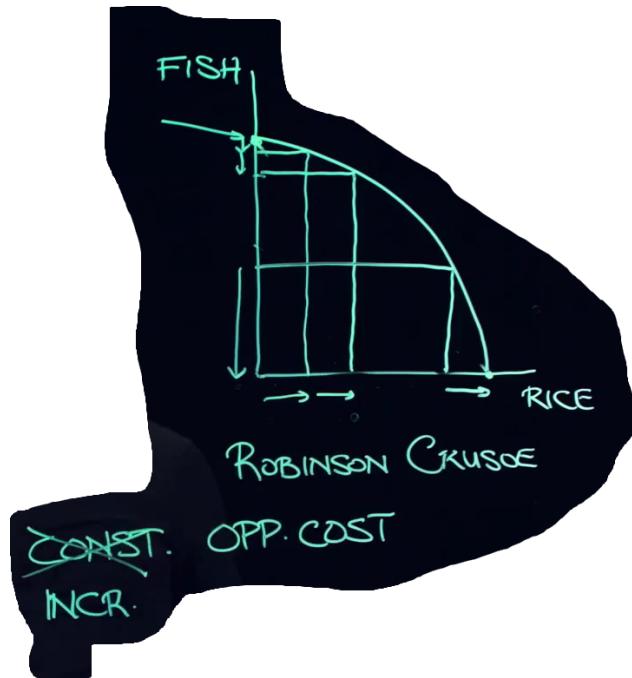


Figure 2: Robinson Crusoe's Increasing Opportunity Cost

and more of the other, he must give up more and more of the other. This is the law of increasing opportunity cost.

1.2

Definition 10. *Market Economy is an economy where resources are allocated through the decentralized decisions of many firms and households as they interact in markets for goods and services. The economy is characterized by being self-organizing and efficient. We assume that the agents of the market are self-interested and incentivized.*

The three agents are individuals, firms and government and are all interested in maximizing something. Individuals maximize utility (happiness), firms maximize profit and government maximizes social welfare (in an ideal world).

Definition 11. *Incentives are rewards or penalties that motivate behaviour.*

Definition 12. *Free Trade is the policy of not discriminating against imports from other countries and relying on the market to allocate resources.*

Definition 13. Protectionism is the policy of protecting domestic industries against foreign competition by imposing tariffs, quotas and other trade barriers.

Example 1.3. Let us focus on two agents: individuals and firms and three markets: goods (tangible) and services (intangible), financial and factor. Firms provide goods and services to the goods and services market



Figure 3: Circular Flow of Income and Expenditure

and expect revenue. The factor market provides firms with resources (T, L and K) and expect wages, rent and profit. Individuals receive income (wages, rent and profit) from the factor market and provide resources (T, L and K). Individuals spend their income on goods and services in the goods and services market. Individuals save their income in the financial market and expect interest. Firms lend from the financial market and the market expects interest.

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Definition 14. Specialization of labour - *the specialization of individual workers in the production of particular goods and services.*

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Definition 15. Division of labour - *is the breaking up of a production process into a series of specialized tasks*

1.3

Market Economy is generally the most efficient way to allocate resources. However, there are some limitations to the market economy.

Alternatives to the Market Economy:

- Traditional Economy: Resources are allocated based on inheritance and custom.
"We've always done it that way."
- Command Economy: Resources are allocated by a centralized authority.
- Mixed Economy: Resources are allocated by a combination of market, tradition and command.

Government's Role in the Market Economy, correcting where the market fails:

- Institutions
- Legal System
- Courts
- Justice
- Public Goods - Goods that cannot be efficiently provided by the market.

2 Chapter 2

2.1

There are two ways to express economic statements:

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Definition 16. Positive statements *are factual statements. They do not always have to be factually correct. They just have to be presented as facts.*

•

Definition 17. Normative statements *are value judgements or opinionated.*

We do not need to worry about muddled statements that could be both positive and normative. Neither positive nor normative statements are better than the other.

Example 2.1. • Positive: Today is Monday.

Note: Whether or not today is Monday is not the point. The point is that it is presented as a factual statement.

- Normative: The minimum wage in Quebec is too low.

2.2

What's the process of presenting findings in *Economic Analysis*?

Start with *observations*. As the world changes, our observations change with it. We then develop *theories* based on these observations. Theories consist of variables, assumptions and predictions. A theory is tested by confronting its predictions with evidence.

Example 2.2. We observe that every crisis leads to a rebound.

We then develop a theory into a *model*. These models are mathematical. Models are simplifications of reality. The more realistic the model, the more accurate and the more complex it is. Models have response, independent and dependent variables.

Within the model, there are some variables that are determined within the model itself, some are outside that we drop in and utilize. An outside variable is called an *exogenous or independent variable*. An inside variable is called an *endogenous or dependent variable*, it is determined within the model. Given some parameters, we can this will determine a particular value of this variable in the model. The more endogenous variables, the more complex the model.

In this course, you should be able to differentiate between exogenous, endogenous, indepedent and dependent variables.

Models are based on assumptions. Recall that the Robinson Crusoe model was based on assumptions.

Why do economists disagree?

They disagree because they are making different assumptions which lead to different conclusions. To each party their assumptions are correct. The role then is to make value judgements, ask: was this a positive or normative situation?

When drawing conclusions, be careful of what you are identifying:

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Definition 18. correlation is a relationship between two variables, positive correlation is when one variable increases, the other increases. Negative correlation is when one variable increases, the other decreases.

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Definition 19. causation is a relationship between two variables where one causes the other.

Example 2.3. Women's skirts were worn higher when stock markets were up. This is a correlation. Both the stock market and skirt height were related to economic confidence. The stock market did not cause the skirt height to rise or vice versa.

Example 2.4. Raising bank interest rates reduce consumer and business spending. This is causation. The bank interest rates caused the spending to decrease.

The causation or correlation relationship of some variables today may change tomorrow.

2.3

Data can be collected through the real world or simulations. One type of data is called an index set of data or index number.

Example 2.5. Consumer Price Index (CPI) is an index number that measures the average price of a basket of goods and services purchased by households.

An index number is trying to present a cost relative to a reference period for every hundred dollars. They can be used to measure inflation.

<u>YR</u>	<u>I.C.</u>
2018	2.00
2019	2.10
2020	2.31

Figure 4: Ice Cap Costs Over Three Years

With an index, we need to select a *base year*. The base year influences the index number.

Let us assume 2018 is the base year.

<u>YR</u>	<u>I.C.</u>	<u>IND ('BY = 2018)</u>
2018	2.00	$200/2.00 \times 100 = 100$
2019	2.10	$2.10/2.00 \times 100 = 105$
2020	2.31	$2.31/2.00 \times 100 = 115.5$

Figure 5: Index of Ice Cap Costs Over Three Years, with 2018 as the base year

$$\text{Index} = \frac{\text{Cost in Year X}}{\text{Cost in Base Year}} \times 100 \quad (2)$$

Composite index is an index made up of multiple items.

Data type sets commonly come in two forms:

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Definition 20. Time series data, *looking at particular data over a period of time*.

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Definition 21. Cross-sectional data, *looking at a snapshot of data at a particular point in time*.

2.4

Economics is math driven. It is used to describe the real world with models.

Definition 22. Functions can be expressed in words, tables, equations or graphs.

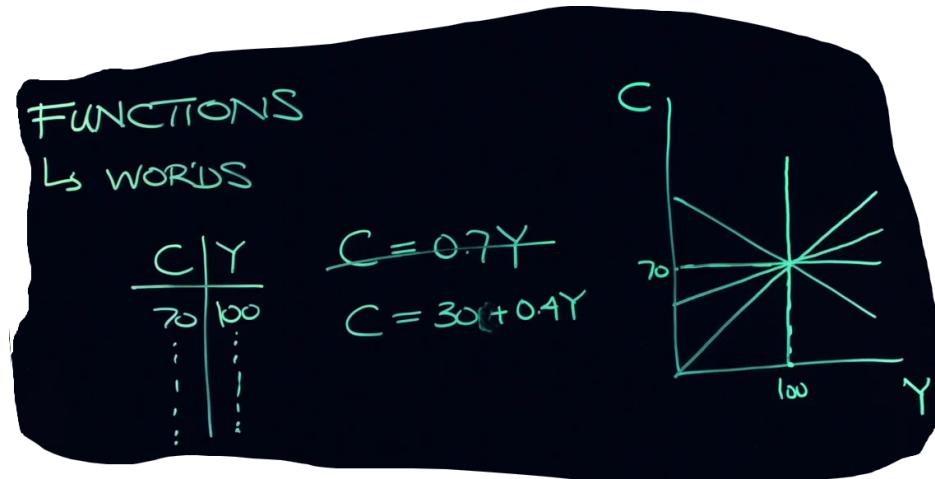


Figure 6: Different Representations of Functions

Most of what is done in intro to economics is done with linear functions. Non-linear functions are interesting because they can be used to find maximum and minimums (optimization).

3 Chapter 3

3.1

Definition 23. Law of demand says ceteris paribus, meaning all things equal. Demand is consumer-driven. As the price of something goes up, your willingness to buy it goes down. The reverse is true too, as the price of something goes down, your willingness to buy it goes up.

Note: Technically, the law of demand is as the price of something goes up, your willingness to buy it should not increase.

Definition 24. Demand Schedule is a table that shows prices and quantities. Graphing the demand schedule has the quantity as the dependent variable and the price as the independent variable. Even though this is the case, Price is on the dependent axis (y-axis) and quantity on the independent axis (x-axis).

P	Q
2	7
3	5
4	4
:	:
:	:

Figure 7: Demand Schedule

Definition 25. *Demand curve is a graphical representation of the demand schedule. Price is on the y-axis and quantity on the x-axis. It is a downward sloping curve, but in the real world it is not always. It is drawn linearly for simplicity, this comes with a problem. If the price was free ($y=0$) it would break the law of demand. Assume the demand curve is for the entire market for the product.*

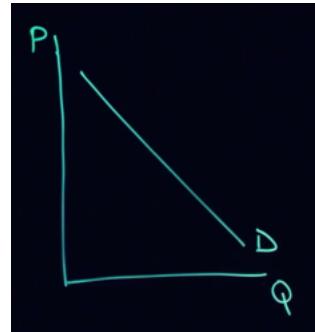


Figure 8: Demand Curve

Definition 26. *A shift in demand is when other factors besides price change.*

A *change in demand* is a change in quantity demanded at every price - a shift of the entire curve.

A *change in quantity demanded* refers to a movement from one point on a demand curve to another point - a movement along the demand curve.

Example 3.1. If your income goes up, given the same price of a product, you would want to purchase more of it. (normal good)

Note: There are some goods that you would want to purchase less of if your income goes up (inferior goods). In this event, there would be a left shift.

The demand curve would shift to the right.

If a substitute product's price goes up, you would want to purchase more of the original product.

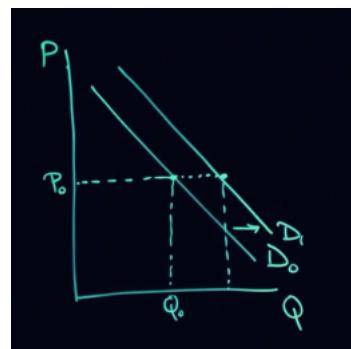


Figure 9: Demand Curve Shifts to Right

If the price of a complementary product goes up, you would want to purchase less of the original product (left shift).

If the price expectation (future price) goes up, you would want to purchase more of the product now.

If the number of consumers increases, demand curve shifts right.

All the above scenarios cause a change in demand.

If the price of the product goes up, the demand curve does not shift. This is only a change in quantity demanded.

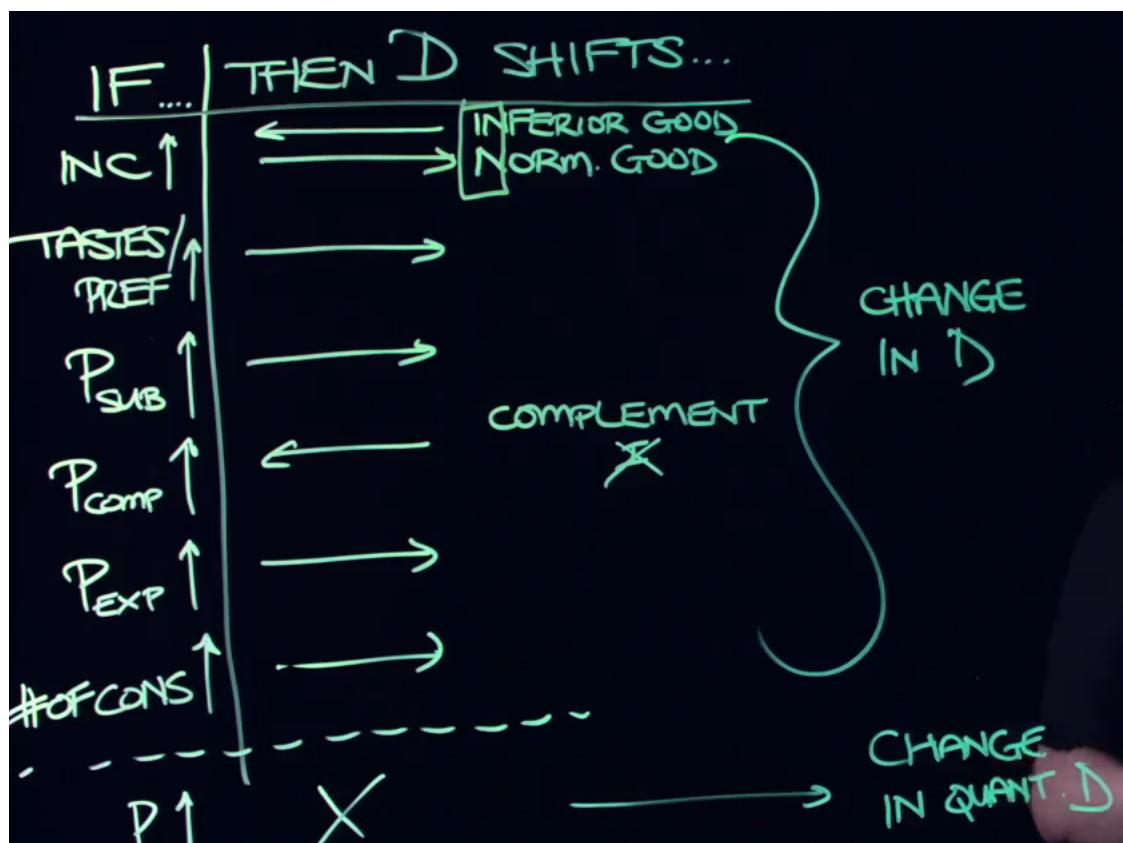


Figure 10: Demand Shift Examples

3.2

Remember ceteris paribus

Definition 27. Law of Supply, *as the price of something goes up, your willingness to produce it goes up.*

Definition 28. Quantity Supplied

- The amount of a product that firms desire to sell in some time period is called the quantity supplied of that product.
- Quantity supplied is the amount that firms are willing to offer for sale and not necessarily the quantity actually sold.
- Quantity supplied is a flow as opposed to a stock.

Definition 29. Supply Schedule is a table with prices and quantities (subscript s). Your willingness to produce a product should not go down as the price goes up. The quantity supplied depends on the price.

Definition 30. Supply Curve is a graphical representation of the supply schedule. Price is on the y-axis and quantity on the x-axis. It is an upward sloping curve, it does not need to be linear. The supply curve is for the entire market for the product. There exists a price where the quantity supplied is 0 (reservation price).

Definition 31. A shift in supply is when other factors besides price change.

A change in supply is a change in quantity supplied at every price - a shift of the entire curve.

A change in quantity supplied refers to a movement from one point on a supply curve to another point - a movement along the supply curve.

Example 3.2. If price of inputs (resources) are increased, the supply curve shifts left.

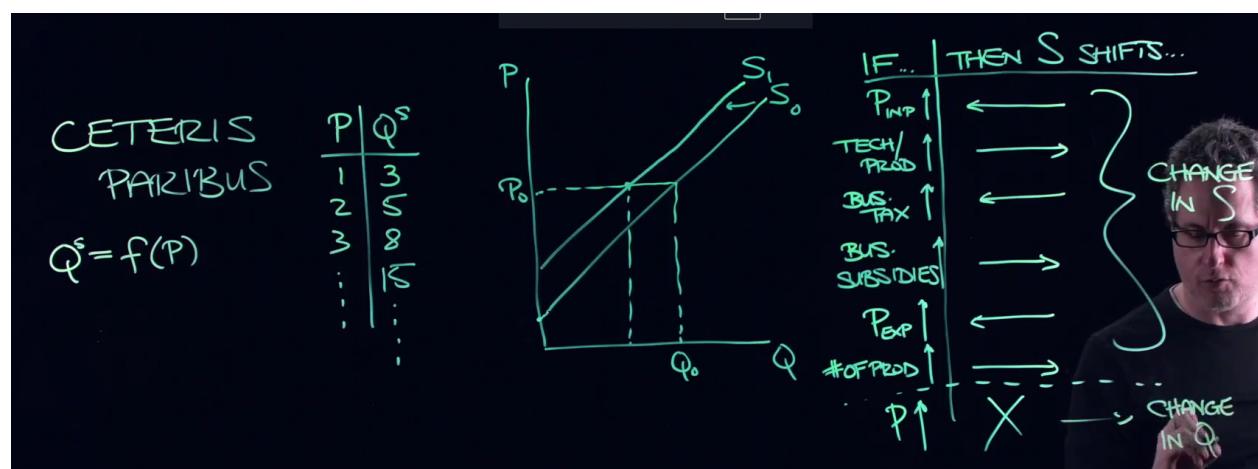


Figure 11: Supply Information

3.3

Definition 32. The equilibrium point is where the supply and demand curves intersect. Price of the product is the variable that brings the market to equilibrium.

P^* and Q^* are the equilibrium price and quantity.

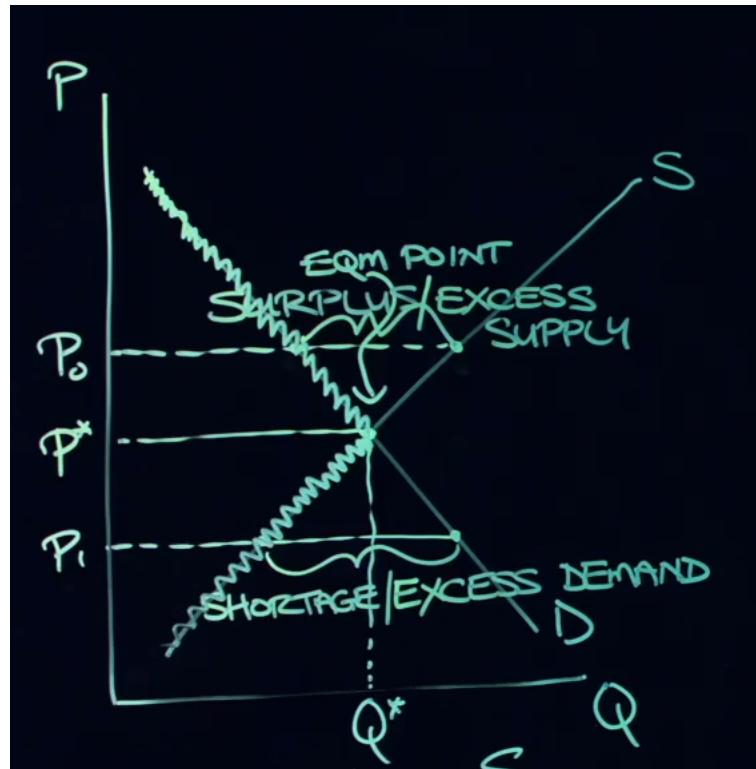


Figure 12: Demand Supply Graph

If prices raise above the equilibrium price, there will be a surplus in supply. If prices fall below the equilibrium price, there will be a shortage.

The invisible hand of the market that guides consumers and producers will bring the market back to equilibrium.

The short-side (left of Q^*) of the market decides what happens.

Laissez faire is the idea that the government should not interfere with the market.

There are 9 different cases of supply and demand shifts.

In some scenarios, for example if supply and demand both shift right, the equilibrium price is ambiguous. The price depends on how much demand or supply shifts right.

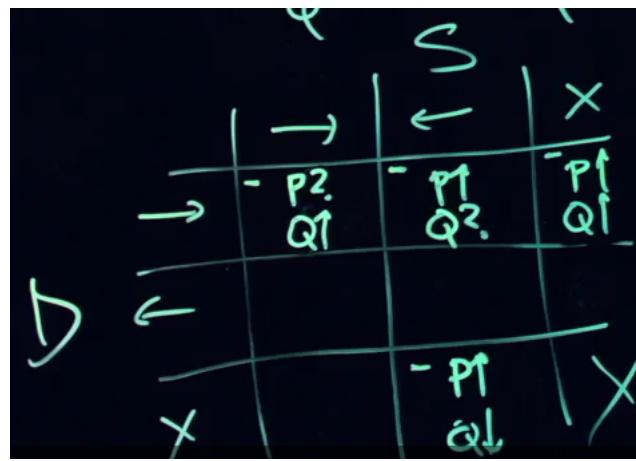


Figure 13: Demand Supply Scenarios

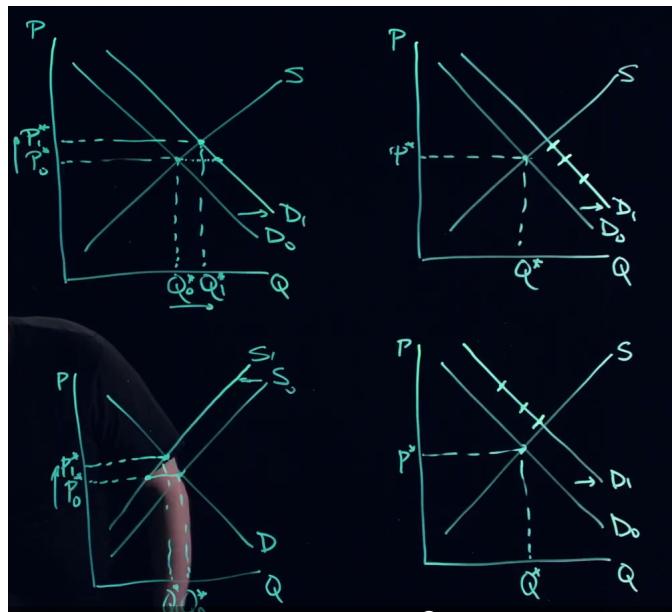


Figure 14: Demand Supply Scenarios

The *absolute price* of a product is the amount of money that must be spent to acquire one unit of that product.

The *relative price* is the price of one good in terms of another.

Demand and supply curves are drawn in terms of *relative prices* rather than *absolute prices*.

4 Chapter 4

4.1

How much does the price and quantity of a product go up or down?

Definition 33. Elasticity of Demand *is the measure of how much the quantity demanded changes when the price changes.*

Q: If price changes by 1%, by how much does quantity demanded change (in %)?

A: Price Elasticity of Demand(η).

$$\eta = \frac{\% \Delta Q}{\% \Delta P} = \frac{(Q_1 - Q_0)/Q_0}{(P_1 - P_0)/P_0} = \frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_0}{Q_0} = \frac{1}{\text{Slope}} \cdot \frac{P_0}{Q_0} \quad (3)$$

When working on price elasticity for demand, the answer is always negative.

$$\eta = \begin{cases} \eta = 0 & \text{Perfectly Inelastic e.g. Insulin} \\ 0 < \eta < 1 & \text{Inelastic e.g. Gasoline} \\ \eta = 1 & \text{Unit Elastic e.g. Lander's mother buying lottery tickets} \\ 1 < \eta < \infty & \text{Elastic e.g. Non-essential goods} \\ \eta = \infty & \text{Perfectly Elastic e.g. PC Cola} \end{cases}$$

Elasticity changes as you move along a given demand curve.

There are three basic determinants of elasticity:

1. Ceteris Paribus, The more substitutes the product has, the more elastic its demand is.
2. Ceteris Paribus, the more of your budget this good takes up, the more elastic demand for it is.
3. Ceteris Paribus, the more time you have to adjust, the more elastic your demand for the product will be.

Elasticity is connected to how much a consumer spends on a product and much revenue a producer makes.

Example 4.1. If price goes up, then total revenue...

IF...	AND P↑, THEN TR...
$\eta = 0$	$\uparrow \text{BY } 1\%$
$0 < \eta < 1$	$\uparrow \text{BY LESS THAN } 1\%$
$\eta = 1$	$- \text{BY } 0\%$
$1 < \eta < \infty$	\downarrow
$\eta = \infty$	\downarrow

Figure 15: Price Elasticity Effects on Total Revenue

4.2

Definition 34. Elasticity of Supply is the measure of how much the quantity supplied changes when the price changes.

The determinants are shared with Elasticity of Demand.

1. Ceteris Paribus, The more substitutes the product has, the more elastic its demand is.
2. Ceteris Paribus, the more of your budget this good takes up, the more elastic demand for it is.
3. Ceteris Paribus, the more time you have to adjust, the more elastic your demand for the product will be.

Consumers and producers can view products differently leading to different elasticities.

4.3

What would happen if a tax was introduced into the marketplace?

The price the producer receives would be different than the price the consumer pays at equilibrium.

Definition 35. Unit tax is a fixed amount of tax per unit of the good.

Ad valorem tax is a percentage of the price of the good.

$$t = \text{Unit tax} \quad (4)$$

$$P^D = P^S + t \quad (5)$$

$$t = P^D - P^S > 0 \quad (6)$$

Who is paying this tax?

Definition 36. Legal Incidence/Burden is the person who is legally responsible for paying the tax.
Economic Incidence/Burden is the person who actually pays the tax. It is determined by elasticity.

If you are inelastic, you pay more of the tax. If you are elastic, you pay less of the tax.

$$\eta^D < \eta^S \rightarrow \text{Consumers pay more of the tax.} \quad (7)$$

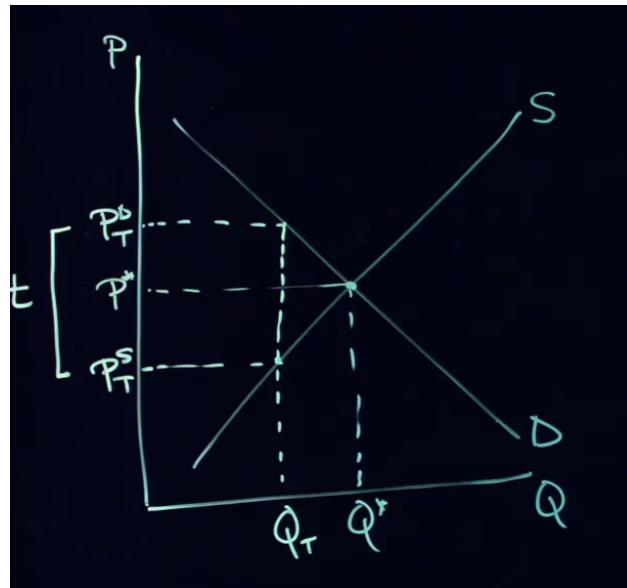


Figure 16: Fifty-Fifty Burden

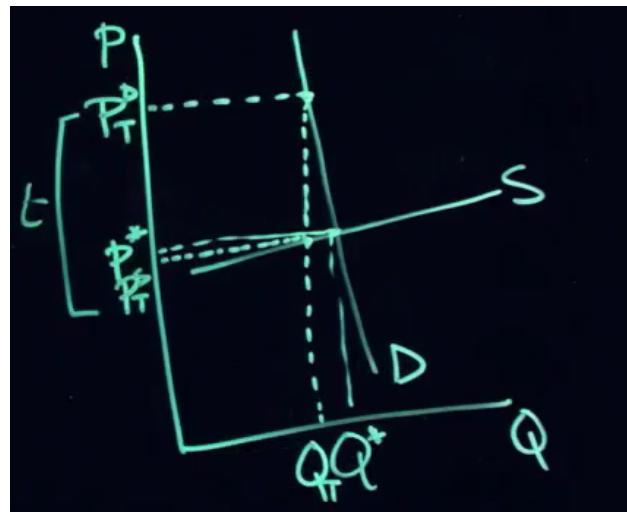


Figure 17: Consumer Tax Burden

4.4

What if the price that's being changed and the quantity of being affected are different products?

Definition 37. Cross-price elasticity is the percentage change in quantity demanded of one good divided by the percentage change in price of another good.

The sign of the cross-price elasticity matters.

$$\eta < 0 \rightarrow \text{Complements} \quad (8)$$

$$\eta = 0 \rightarrow \text{Unrelated} \quad (9)$$

$$\eta > 0 \rightarrow \text{Substitutes} \quad (10)$$

What if we are talking about income change instead of price change?

Definition 38. Income elasticity (η^Y) is the percentage change in quantity demanded divided by the percentage change in income.

$$\eta = \frac{\frac{(Q_1 - Q_0)}{(Q_1 + Q_0)}}{\frac{(Y_1 - Y_0)}{(Y_1 + Y_0)}} \quad (11)$$

$$\eta > 0 \rightarrow \text{Normal Good} \quad (12)$$

$$\eta = 0 \rightarrow \text{Unrelated to Income} \quad (13)$$

$$\eta < 0 \rightarrow \text{Inferior Good} \quad (14)$$

5 Chapter 5

5.1

Definition 39. Price Controls usually exist because the government objects to what the market is producing as an equilibrium outcome.

Definition 40. Price Floors are the lowest price you are allowed to pay and charge in the market.

To bind or make a price floor relevant, it must be above the equilibrium price. A price floor below or equal to equilibrium is non-binding.

The impact of a price floor is a surplus of the good. The issue is that the surplus cannot go anywhere. The supplier makes the government buy the surplus.

The consumers are "losers" because they are not able to buy the good at the equilibrium price.

The only "winners" are a small portion of the suppliers.

Trying to remove the policy will make the winners vocal.

5.2

Definition 41. Price Ceiling is the highest price you are allowed to pay and charge in the market.

To bind or make a price ceiling relevant, it must be below the equilibrium price.

The impact of a price ceiling is that the quantity demanded goes up and the quantity supplied goes down. This creates a shortage of the good.

A black market is created because there are consumers willing to pay more than the price ceiling and the

price equilibrium.

There are a small number of consumers that are "winners" because they are able to buy the good at a lower price.

The "losers" are the suppliers because they are not able to sell the good at the equilibrium price.

5.3

Demand and supply through a new lens

Demand is a proxy for value. The more you are willing to pay for a good, the more you value it.

Supply is a proxy for cost. As long as price covers cost of production, suppliers are willing to produce.

Therefore, equilibrium is balancing the value and cost.

The triangle to the left of the equilibrium benefits economic wellbeing. It is called total surplus. As a measure of efficiency.

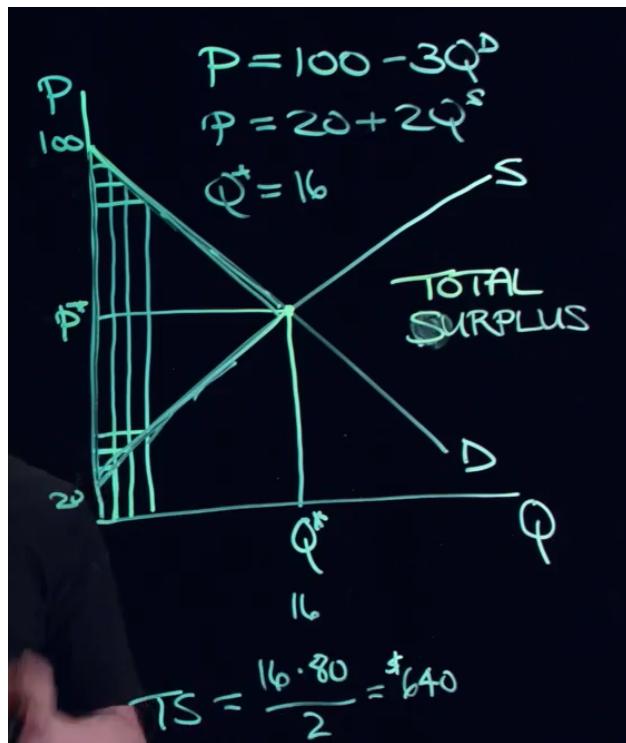


Figure 18: Total Surplus

Quota is an example of *Quantity Control*. It is a limit on the quantity of a good that can be produced or sold.

The optimal price and quantity control is no price and quantity control.

6 Chapter 6

6.1

Where does the demand curve come from?

Definition 42. Utility loosely is the happiness or satisfaction you get from a good.

It is measured in utils. The first good you consume gives you the most utility. Each additional good gives you less utility. Each good provides a Marginal Utility, which is the additional utility you get from consuming one more good. Diminishing Marginal Utility is the idea that the more you consume, the less utility you get from each additional good.

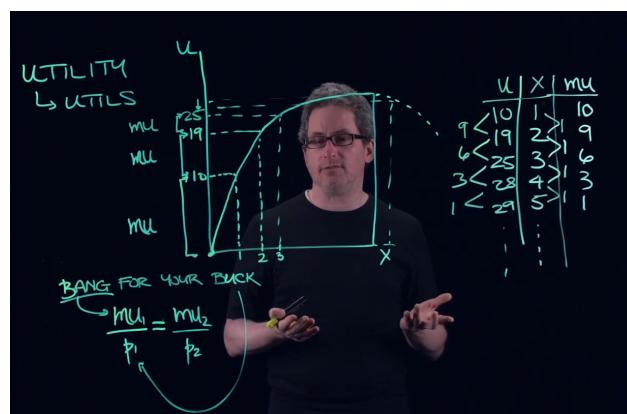


Figure 19: Utility

What if we compare the utility of different goods?

We need to factor in the utility and costs.

$$\frac{mu_1}{P_1} > \frac{mu_2}{P_2}$$

$$\frac{mu_1}{mu_2} > \frac{P_1}{P_2}$$

$$\frac{mu_1}{mu_2} = mrs \text{ (marginal rate of substitution, how much willing for 1 more good 1)} \quad (15)$$

$$\frac{P_1}{P_2} = \text{Relative price ratio (How much you have to give up for 1 more good 1)}$$

If $mrs > \text{Relative price ratio}$, you are willing to give up good 2.

If $mrs = \text{Relative price ratio}$, you are indifferent.

After enough transactions the inequality may change.

A consumer wants to equalize the equation.

The market demand curve is the sum of all individual demand curves.

$$\frac{\downarrow MU_1}{P_1} \geq \frac{MU_2 \uparrow}{P_2}$$

$$\frac{\downarrow MU_1}{\uparrow MU_2} = \frac{P_1}{P_2}$$

REL. P
RATIO

HAVE TO

MRS → How much
WILLING
FOR 1 MORE
Good 1

Figure 20: Marginal rate of substitution

We assume all consumers are rational and acting in self-interest. Some economists think consumers may be irrational but maybe some consumers are overwhelmed by choice, or the information is presented in different ways.

6.2

Understanding the logic of what a consumer goes through.

If the price of good 1 goes down, there are two effects.

1. Substitution Effect. If purchasing power stays the same, the money will stretch further, either more of good 1 or 2. If purchasing power changes with the price change, the consumer would want to purchase more of good 1 and less of good 2.
2. Income Effect. Based on purchasing power change alone, how does the consumer feel. If the price of good 1 goes down, the consumer is richer.

For a normal good, a price decrease, leads to a higher quantity demanded. But in a more complicated sense, the consumer substitutes good 1 for good 2 (substitution effect) as well as purchasing more of good 1 due to being richer (income effect).

Substitution effect and income effect work in the same direction.

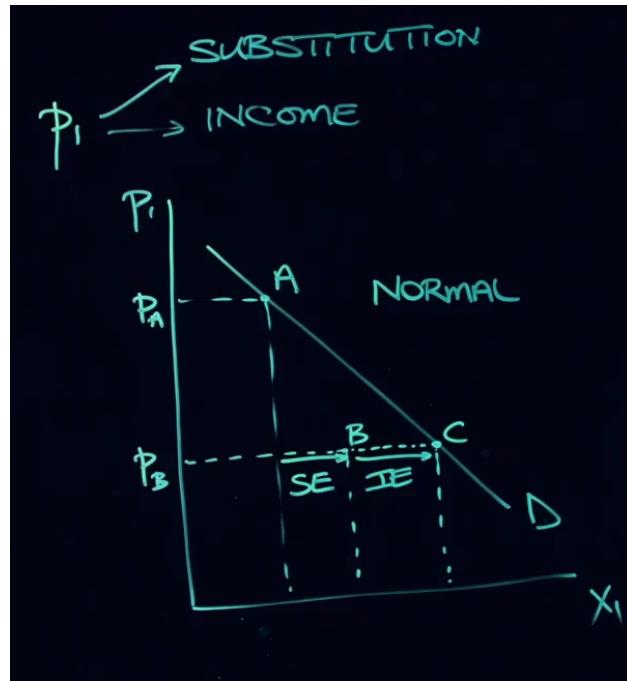


Figure 21: Normal Good

For an inferior good, a price decrease leads to the substitution effect and income effect working in opposite directions. The consumer feels richer and doesn't want to buy the inferior good.

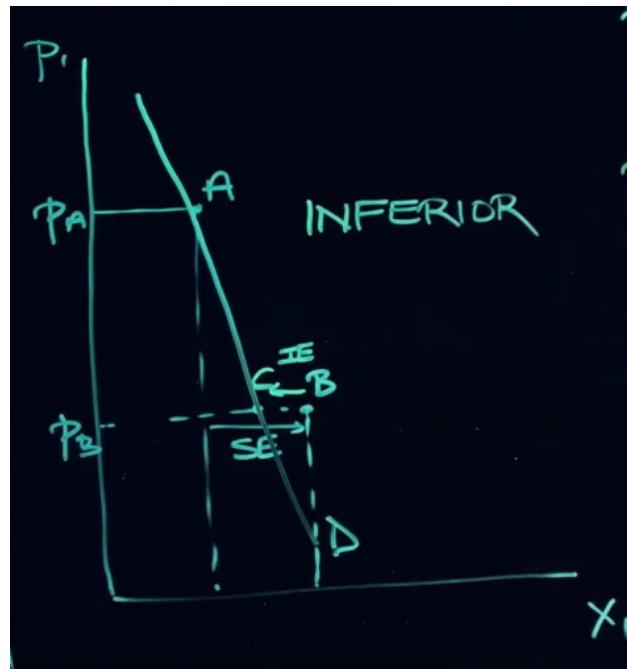


Figure 22: Inferior Good

There is a rare circumstance for an inferior good to be purchased even less after a price decrease. The income effect outweighs the substitution effect. This is called a Giffen good. Giffen goods must be inferior. The circumstance requires spending a large amount of income on the good, where the price change sends the consumer after better goods.

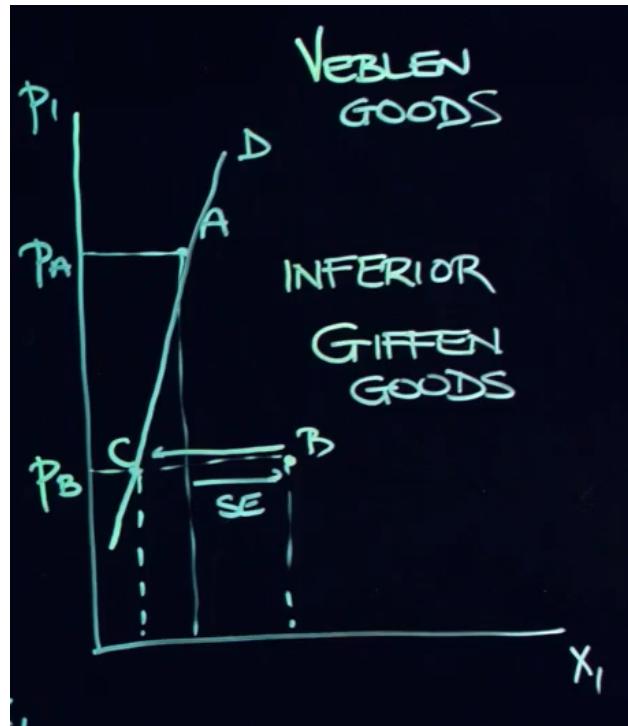


Figure 23: Giffen Good

Another scenario where this could happen is with Veblen goods. These are goods that are purchased for their status or the price contains something about the quality of the good.

The substitution effect is the change in quantity demanded that results from a change in relative prices while real income is/are constant . The income effect is the change in quantity demanded that results from a change in real income while relative prices is/are constant .

6.3

Definition 43. Consumer Surplus is the difference in the maximum the consumer is willing to pay and what is actually paid. Consumer surplus increases for three reasons.

1. the more inelastic the demand curve is.
2. the lower the price is.
3. if the demand curve shifts.

The maximum willingness to pay is reflected in the demand curve.

The consumer surplus is the area under the demand curve and above the price.

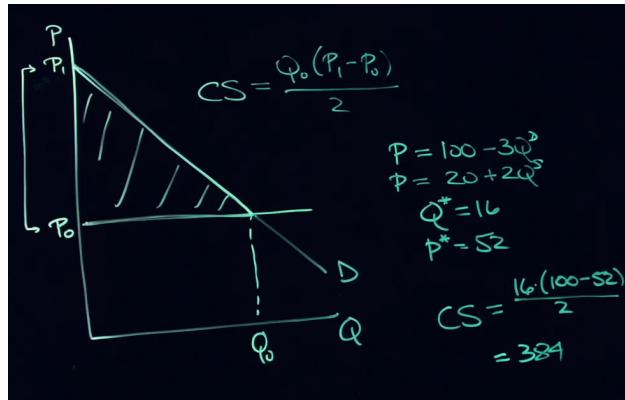


Figure 24: Consumer Surplus

Definition 44. Paradox of Value. *Think about water being essential for life, but reasonably cheap. Diamonds are not essential, but are expensive. The paradox was resolved because water is abundant and diamonds are scarce. We are willing to pay much more for water.*

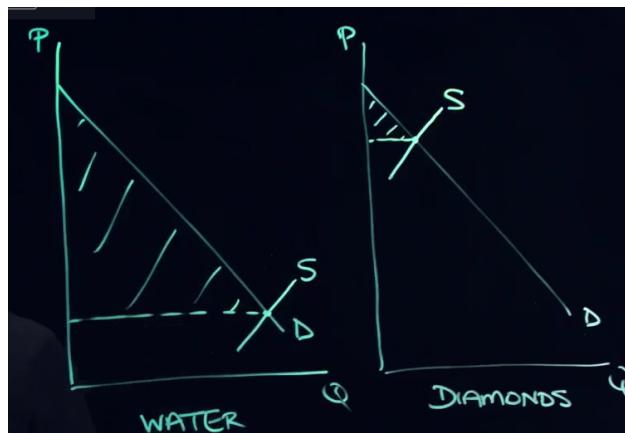


Figure 25: Paradox of Value

Appendix A.1

We need to build up the idea of consumer preferences and taste. If we compare the quantity of good 1 and good 2, any point or bundle will provide a certain level of utility. From this bundle, we can compare utility levels for other bundles. The curve of all points that give the same level of utility is the idea of an *indifference curve*. There is an infinite number of indifference curves for two goods. Extremes are unfavoured.

1. The further/highest the indifference curve, the higher the utility.
2. Indifference curves must be downward sloping.
3. Indifference curves cannot intersect.
4. Indifference curves must be convex (bow out).

5. The slope of the indifference curve is $-\frac{MU_1}{MU_2}$ or $-MRS$.

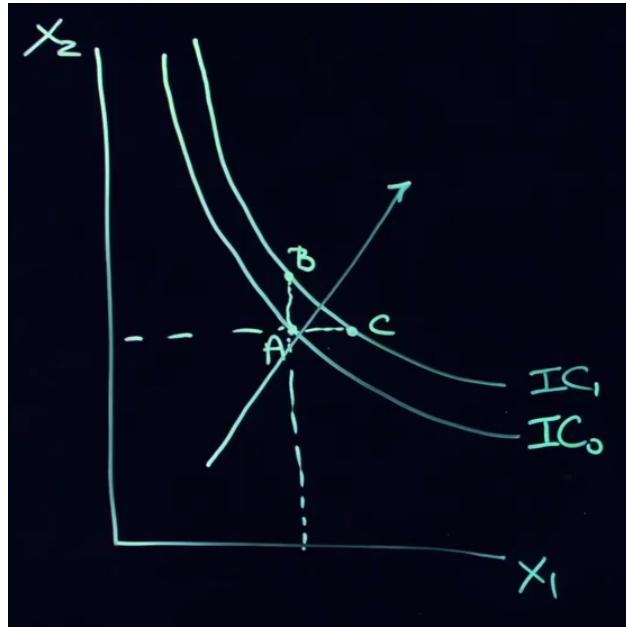


Figure 26: Indifference Curve

Appendix A.2

$$P_1x_1 + p_2x_2 = y \quad (16)$$

Where P_1 and P_2 are the prices of good 1 and good 2 respectively. x_1 and x_2 are the quantities of good 1 and good 2 respectively. y is the income.

If you plot this, the slope is $-\frac{P_1}{P_2}$. This is the budget constraint. Operating within the budget constraint is inefficient, outside is unobtainable.

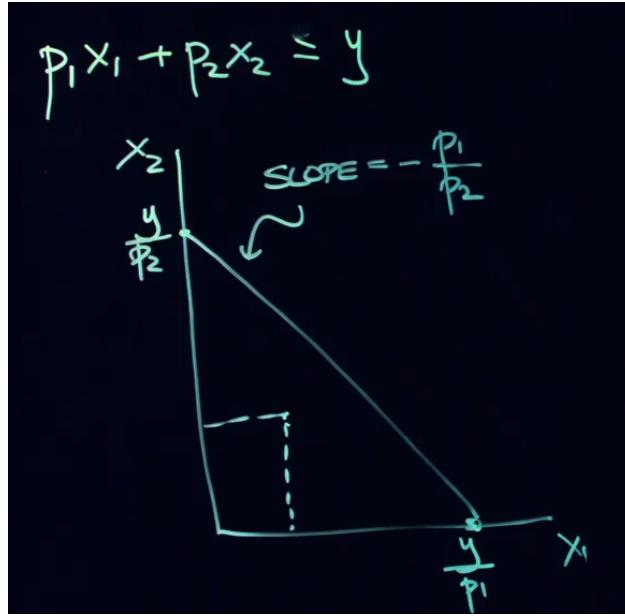


Figure 27: Budget Constraint

We can combine the constraint with the indifference curve to find the optimal point.

There will be some indifference curve with only one point on the budget constraint. This is the optimal point.

Where the marginal rate of substitution is equal to the slope of the budget constraint.

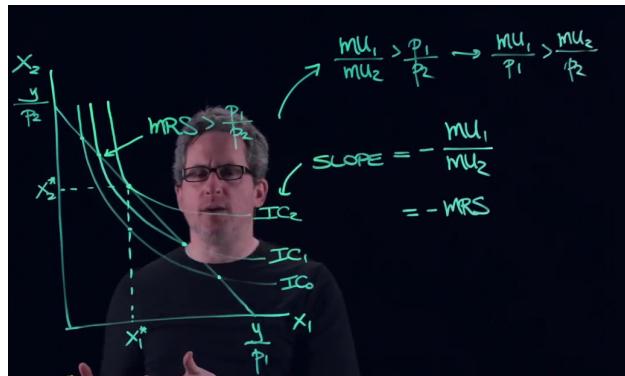


Figure 28: Indifference Curve and Budget Constraint

Appendix A.3

If income changes, the budget constraint will shift.

Depending on the new optimum, good 1 or 2 may be normal goods or inferior goods.

If you connect all the optimal points, you get the *income offer curve*.

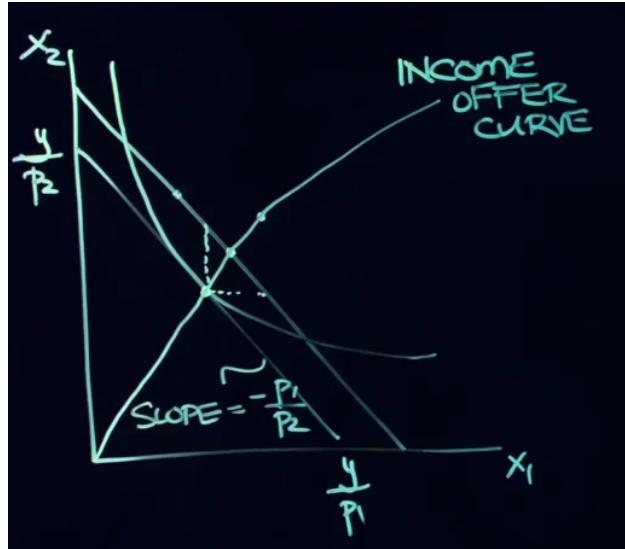


Figure 29: Income Offer Curve

If the price of good 1 changes, the budget constraint's slope will change. If we connect all the optimal points, we get the *price offer curve*.

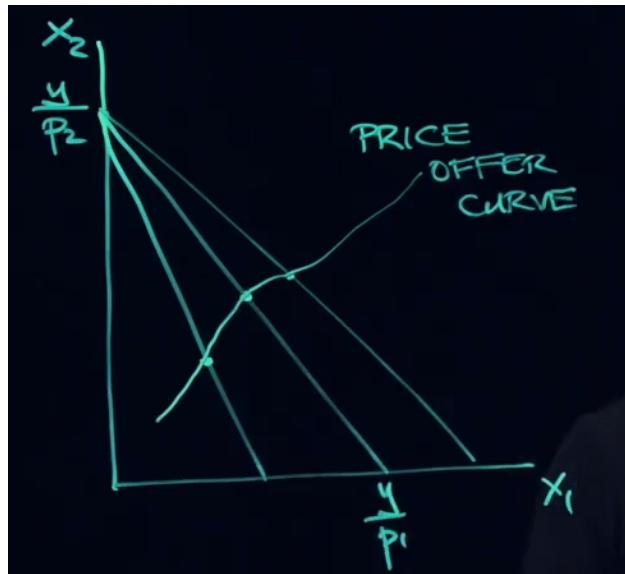


Figure 30: Price Offer Curve

Appendix A.4

With the indifference curve and budget constraint, if price of good 1 decreases, the budget constraints shift to the right. Knowing the previous and new optimal points, where do the substitution and income effect come into play? The substitution effect shows that the quantity of good 1 and good 2 will change on the tangent of the budget constraint.

The income effect is the tangent of the old slope onto the new slope of the budget constraint.

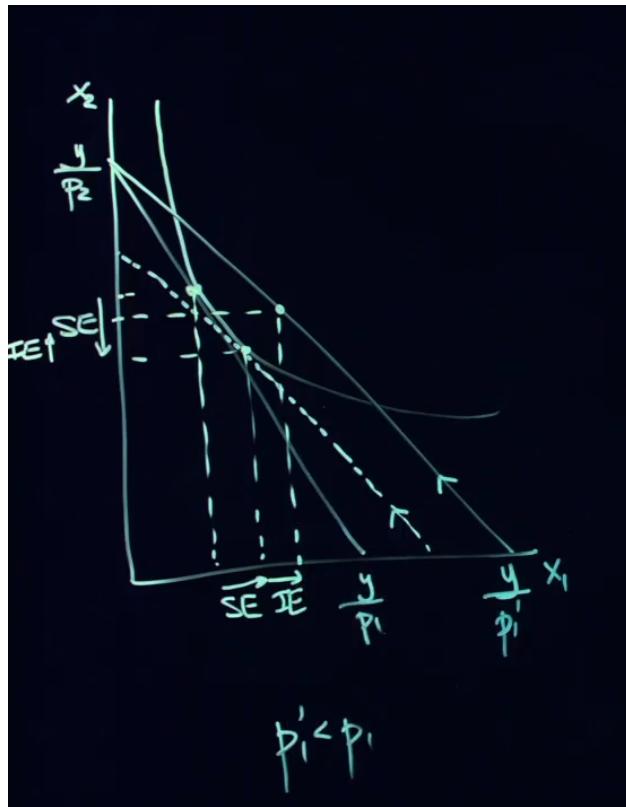


Figure 31: Substitution and Income Effect

7 Chapter 7

7.1

The goal of the firm is to maximize profits.

We use the greek letter π to represent profit.

$$\pi = \text{Total Revenue}(TR) - \text{Total Explicit and Implicit Costs}(TC) \quad (17)$$

Definition 45. *Explicit cost, loosely, is something you can get a receipt for.*

Definition 46. *Implicit cost are distinctly economics, you can't get a receipt for it but it is a cost for doing business.*

For example, if you own a business, the salary you could have earned from your work is an implicit cost.

Accounting profits are always greater than economic profits.

$$\pi_A > \pi.$$

Opportunity cost is contained within implicit cost.

7.2

Should firms always maximize profits?

Companies that have a higher calling, still need to maximize profits to stay in business.

Profits incentivize firms to achieve goals.

Total revenue is the price of the product times the quantity sold.

$$TR = P \times Q \quad (18)$$

The amount that a firm produces is equal to amount of resources that the firm has.

$$Q = f(K, L) \quad (19)$$

Land is combined with capital.

We can split the production function into two parts, the short run and the long run.

The short run is when at least one factors of production are fixed. Capital is harder to change than labor.

$$Q = f(\bar{K}, L) \quad (20)$$

The long run is when no factors of production are fixed.

7.3

The short run function can take any number of shapes.

No workers, no matter the capital, bring no output.

As you hire more and more workers, at first the output increases at an increasing rate, then slows down.



Figure 32: Short Run Production Function

$$\text{Average Production (AP)} = \frac{TP}{L} = \frac{Q}{L} \quad (21)$$

The slope of the line from the origin to any point on the short run production curve is the average production. Marginal production is the benefit from hiring one more worker.

$$\text{Marginal Production (MP)} = \frac{\Delta TP}{\Delta L} = \frac{\Delta Q}{\Delta L} \quad (22)$$

One worker means everything they produce is marginal production and the average production. Therefore average production and marginal production are equal at the beginning of the curve. If the average rises, the marginal is above the average. At the maximum point of the average production, the marginal production is equal to the average production.

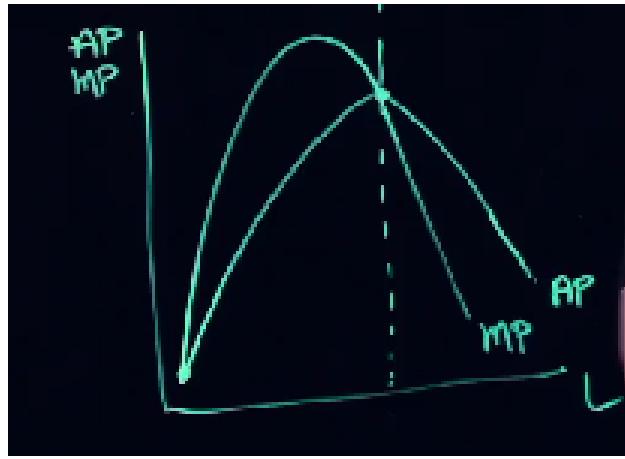


Figure 33: Short Run Average and Marginal Production

We can also see the short run in a table.

L	Q	AP	MP
0	0	-	-
1	3	3	3
2	7	3.5	4
3	13	4.3	6
4	22	5.5	9

Figure 34: Short Run Production Table

7.4

Total cost is the sum of total variable cost and total fixed cost.

$$TC = TVC + TFC \quad (23)$$

Or total cost is the sum of the labour and capital costs.

Total variable cost is worker wages multiplied by the number of workers.



Figure 35: Total Cost

The average (total) cost, average variable cost and average fixed cost are found by drawing a linear line from the origin to the total curve.

The AC starts at infinity and decreases as the quantity increases.

The tangent point of TC must come after the tangent point of TVC.

AC and AVC never cross.

AFC decreases as quantity increases and can never be zero.

$$AC = \frac{TC}{Q} \quad (24)$$

$$AVC = \frac{TVC}{Q} \quad (25)$$

$$AFC = \frac{TFC}{Q} \quad (26)$$

$$AC = AVC + AFC \quad (27)$$

Marginal cost is the cost of producing one more unit.

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta TVC}{\Delta Q} \quad (28)$$

$$MVC = \frac{\Delta TVC}{\Delta Q} = \frac{\Delta TC}{\Delta Q} - \frac{\Delta TFC}{\Delta Q} \quad (29)$$

$$MFC = \frac{\Delta TFC}{\Delta Q} = 0 \quad (30)$$

$$MC = MVC \quad (31)$$

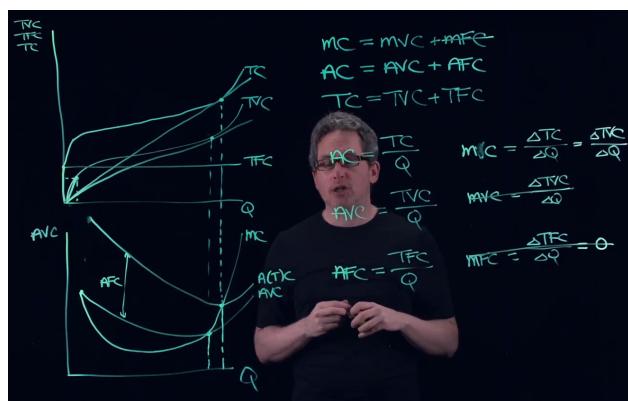


Figure 36: Average and Marginal Cost

$$MC = \frac{W}{\text{Marginal Product}(MP)} \quad (32)$$

$$MC = \frac{\Delta TC}{\Delta Q} \quad (33)$$

$$\frac{W}{MP} = \frac{W\Delta L}{\Delta Q} = \frac{\Delta TC}{\Delta Q} \quad (34)$$

$$AVC = \frac{W}{AP} \quad (35)$$

This can also be represented in a table.

K	L	Q	TVC	TFC	TC	AVC	AFC	AC	MC
10	0	0	0	+ 100 = 100	100				
10	1	3	20	+ 100 = 120	120	6.6	33.3	20	6.6
10	2	7	40	+ 100 = 140	140	5.71	14.29	5	
10	3	13	60	+ 100 = 160	160	4.6	7.7	3.3	
10	4	22	80	+ 100 = 180	180	3.6	5.5	2.2	

Figure 37: Cost Table

When AC is at minimum point, profits are maximized.

8 Chapter 8