

ECON 101

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February 26, 2014

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Preface

Notes about prof:

1. She has a toddler, and needs to miss hanging out with him to teach us.

Part I

First Midterm Content

Chapter 1

What is Economics?

1.1 Wants and Scarcity

Wants economic problems arise because we desire (want) more than we can get.

Scarcity scarcity is the inability to satisfy our wants.

Choices we make choices in the face of scarcity.

Incentive incentives are the reward (or threat) that encourages a choice to be made.

1.2 Economics

Economics study of how people choose to allocate their limited resources to satisfy their nearly unlimited wants.

- Essentially, this is human behavior.

Micro Economics study of how people choose to allocate their limited resources to satisfy their nearly unlimited wants.

Macro Economics is the study of the performance of the national and global economies.

There's an underlying theme of "Two big questions" here, so I'm going to riff on that a bit. It's not in the book, so here we go:

Two Big Economic Questions Are:

1. How do choices end up determining *what*, *how*, and *for whom* are goods and services produced?
TODO: this needs to be cleaned up.

(a) What?

This question is answered with "Economics provides some answers to these questions"

(b) How?

Goods and Services are the objects that people value and produce to satisfy humans.

- i. Goods and Services can be instrumented by the *factors of production*. Doing this shows us how they are created.

$$Y = F(L, T, K, H, A)$$

Where:

Y is the profit

L is the labour

T or N is the land (“gifts of nature”)

H is the human capital

A is technology

K is the capital

(c) What?

- i. Land earns *rent*.
- ii. Labor earns *wages*.
- iii. Capital earns *interest*.
- iv. Entrepreneurship earns *profit*.

2. When do choices made for *self-benefit* also promote *social-benefit*?

People make decisions for self-benefit, but sometimes they come out working for social-benefit.

Social interest is measured in both *efficiency* and *equity*.

Efficiency is achieved when goods are used to produce goods & services cheaply and in perfect quantity.

Equity is achieved when income equals are equal (socialism).

We’d like to pose the question:

Is it possible that when each one of us makes choices that are in our self-interest, it also turns out that these choices are also in the social interest?

3. Economic Way of Thinking:

- A choice is a trade-off between what we want and what is attainable
- People make rational choices by comparing benefits and costs
- Benefit is what you gain from something
- Cost is what you must give up to get something
- Most choices are “how-much” choices made at the margin
- Choices respond to incentives

Another way to put it: (she wrote this)

- (a) All economic questions arise because we want more than what we can get
- (b) Our inability to meet all our wants is called *scarcity*
- (c) Because we face *scarcity*, we make choices
- (d) The choices we make are influenced by the incentives we face
- (e) Choices involve *trade-offs*
- (f) People make rational choices by comparing benefits (MB) and costs (MC)

Opportunity Cost is the best forgone alternative when you make a choice

She used the example of her toddler that she doesn't see when she teaches us.

Ex: Cost of skipping University and going directly to the workforce.

Type	Name	Value
Explicit Costs	Tuition	8 x \$6,000 \$
Explicit Costs	Books & Materials	8 x \$1,500 \$
Implicit Costs	Lost Salary	4 x \$20,000 \$

TODO: some of those should've been negative.

1.3 Positive & normative Statements

Positive Statements are statements about what is.

- Definite statements that can be checked against facts

Normative statements are opinion-based statements about what *ought to* be.

- They cannot be tested
- XYZ is “too”...
- Everyone “should”...

Should be able to identify statements that are positive or normative. Look for the words “should” or “ought”.

TODO: Format to put Choices and trade-offs in it's own section. It was in that “big economic questions” section

1.4 The Economic System and the Environment

The environment provides to the economy goods and services, and the economy uses these. As a byproduct, there is pollution and waste. In Classic economy, we take this as a closed (unmodifiable) system. Environmental economy disputes this.

1.5 Graphs in Economics

We should be able to graph after doing this section. Also, correlation & stuff.

1.5.1 Economic Models

An abstraction from reality that consist of economic variables.

Three different types of graphs:

- Time-series graphs (PT Metropolis OTS/TS)

- Cross-section graphs
- Scatter plots

Characterizing models: Assume models can be expressed as a function.

Positive Relationships are when $\frac{dy}{dx} > 0$. i.e when the slope is positive.

Negative Relationships are when $\frac{dy}{dx} < 0$. i.e when the slope is negative. Also known as inverse relationship.

Convex Curve $|\frac{d^2y}{dx^2}| > 0$. i.e. the under-part creates a cave.

Concave Curve $|\frac{d^2y}{dx^2}| < 0$ i.e. the under-part doesn't create a cave.

Linear (Curve) $\frac{d^2y}{dx^2} = 0$

Lines:

$$y = a + by$$

Where the parameters are: a is the y -intercept and b is the slope.

$$\begin{aligned}\text{Slope} &= \frac{\text{Rise}}{\text{Run}} \\ &= \frac{\Delta y}{\Delta x}\end{aligned}$$

Chapter 2

The Economic Problem

We care about the Production of Goods and services that rely on the factors of production.

Production of goods and services,

1. Inputs/factors of production

$$(L, T, K, H, A)$$

2. Existing technology, A

2.1 Opportunity Cost and Production Possibility Curve

Production Possibility Frontier (PPF) shows all combinations of two goods producible using existing tech and available resources.

i.e. the tradeoff between n of x vs m of y that you can make for a fixed total cost.

Anything above the curve represents scarcity. Anything on the curve represents efficient resource use. Anything below the curve represents inefficiency, and is an opportunity (capitalism)

Production Efficiency exist on all points on the frontier, where in order to produce one more of anything, we must produce one less of something else.

Inefficient Points are the points under the PPF.

Tradeoffs are made to move from one point on the PPF frontier to another.

Forgone cost is that of the thing being omitted. The opportunity cost of something is the highest valued alternative foregone.

Marginal Cost of a good or service is the opportunity of producing one more unit of it.

Preferences are what people like and dislike

Marginal Benefit of a good or service is the benefit received from consuming one or more unit of it. We measure this by what a person is willing to pay for it.

Principle of Decreasing Marginal Benefit is that when we have more of any good, the smaller the marginal benefit is.

Marginal Benefit Curve shows the relationship between the marginal benefit of a good, and when it is consumed.

Allocative Efficiency is when we cannot produce more of anything without stopping producing something more important.

Technological Change is when tech changes and effects how we can grow our economy.

Capital Accumulation is the growth of capital resources.

Sustainability is a thorn in the thigh of environmental growth. It is the American dream, that children will be better-off than their parents.

Production Possibilities Frontier (PPF) is the boundary between combinations of goods and services that can be produced.

Ceteris Paribus means “all else remains the same” (except what we’re considering). See Wikipedia for more.

We can talk about the different ontology of resources:

- Depletable resources are resources that can be depleted
- Renewable Resources are resources that are replenished naturally
- Current reserves are resources that can be extracted at current prices
- Potential reserves are resources that may be available at higher costs
- Resource endowments is the natural occurrence of resources

2.2 Advantage

Comparative Advantage is that a person can perform the activity at a lower opportunity cost than anyone else.

Absolute Advantage is that the person is more productive than others.

2.3 Gains From Trade

Learning-By-Doing is when a body specializes by repeatedly doing (or producing) a good or service.

Dynamic Comparative Advantage is what a body gains a comparative advantage by learning-by-doing.

2.4 Free v Fair Trade

Free trade allows traders to trade across boundaries without interference from their respective governments.

Fair Trade contributes to development by offering better trading conditions and securing rights.

Firm is an economic unit that hires factors of production

Market is any arrangement that enables buyers and sellers to interact

Property Rights are the social arrangements that govern ownership, use, and disposal of resources

Money is... money.

Chapter 3

Demand and Supply

Prices act as incentives.

Demand is the marginal benefit curve of the relationship between the willingness and ability to pay, correlating the price and quantity demanded.

Supply is the marginal cost curve of the relationship between the price and the quantity supplied.

Competitive Markets are markets that enough buyers and sellers so no single player can influence the price.

Money Price is the number of dollars that must be given up for it.

Relative Price is an opportunity cost, measured in terms of one money price to another. This is usually what we mean.

3.1 Supply and Demand

Quantity Demanded Q_d is the amount that consumers plan to buy at a given price.

Quantity supplied Q_s is the amount that producers can produce at a given price.

The **Law of Demand** states that the higher a price P of a good is, the smaller the quantity that is demanded Q_d ; same with vice versa.

Substitution Effect dictates that as the price of a good increases people seek substitutes; this causes quantity demanded to decrease.

Income Effect dictates that as a price increases relative to income it becomes un-affordable; this causes quantity demand to decrease.

When the price goes up, Q_d decreases, and Q_s increases. Same with vice versa.

The **Demand Curve** is the $\approx \frac{1}{x}$ curve that shows the relationship between the quantity demanded and its price; this can be tabulated in a *Demand schedule* instead of a graph.

Six main factors that change demand are:

- Prices of related goods
- Expected future prices
- Income
- Expected future income and credit
- Population
- Preferences

A *substitute* is a good that can be substituted, and a *complement* is a good that can be used in conjunction with another good.

We can categorize **normal goods** as goods that increase in demand as income increases. Goods that have demand decrease are named **inferior goods**.

Supply reflects a decision about which items were produced.

Quantity Supplied of a good or service is the amount that producers plan to sell in a given time period.

The **Law of Supply** states:

Other things remaining the same, a price P increase leads to a increased Q_s . Similarly, reducing the price P causes Q_s to decrease as well.

The **Supply Curve** is the $\approx x^2$ curve that shows the relationship between the quantity supplied and its price; this can be tabulated in a *Supply Schedule* instead of a graph.

The lowest price that would be supplied is called the *marginal cost*.

3.2 Equilibrium - Price and Quantity

Equilibrium Price is the price at the intersection of demanded quantity and quantity supplied.

Equilibrium Quantity is the quantity bought and sold at the equilibrium price.

Having a price above the equilibrium price creates a surplus that forces the price down. Having a price below the equilibrium price creates a shortage that forces the price up. Modifying the Supply Curve or the demand curve modifies the different locations of the Equilibrium point. Be smart and think - you can predict where it ends up.

Part II

Second Midterm

Chapter 4

Elasticity

4.1 Price Elasticity of Demand and Supply

Price Elasticity of Demand measures how demanders respond to a change in the price of a good, and how changes will affect price and quantity demanded.

Income Elasticity of Demand measures how demanders respond to a change in income

Cross Elasticity of Demand measures how strongly demanders respond to the change in the price of another good.

Price Elasticity of Supply measures how strongly suppliers respond to a change in the price of a good.

Price Elasticity of demand is a units-free measure of the responsiveness of the quantity demanded of a good to a change in its price, *ceteris paribus*.

In general, **elasticity measures responsiveness**. It effectively measures how much demanders respond to a variable price.

We can calculate elasticity as follows:

$$\frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

- We express the change in price as a percentage of the *average price* - the average of the initial and the new price.
- We express the change in the quantity demanded as a percentage of the *average quantity demanded* - the average of the initial and new quantity.

By using the **average price** and the **average quantity**, we get the same elasticity value regardless of whether the price rises or falls.

1. The ratio of two proportionate changes is the same as the ratio of two percentage changes.
2. The measure is units free.

3. The demand elasticity formula is negative because price and quantity move in different directions. This means we get to use magnitude/absolute value of the **price elasticity of demand**. We don't measure slope because the units may change (i.e. cents \rightarrow \$).

Inelastic Demand is when the quantity demanded doesn't change when the price changes. Price Elasticity of demand < 1 is *inelastic demand*. The demand curve is completely vertical.

Elastic Demand is non-inelastic demand. Price Elasticity of demand > 1 is *elastic demand*.

Perfectly Elastic Demand is when the price elasticity of demand is ∞ .

4.2 Relationship Between Price Elasticity of Demand and Total Revenue

Total Revenue from the sale of goods or services is the price of good multiplied by the quantity sold.

- *Elastic* demand means that a 1% price cut increases quantity sold by $> 1\%$, so total revenue increases.
- *Inelastic* demand means that a 1% price cut increases quantity sold by $< 1\%$, so total revenue decreases.
- *Unit Elastic* demand means that a 1% price cut increases quantity sold by exactly 1%, so total revenue stays the same.

Total Revenue Test is a method of estimating the price elasticity of demand from the change in total revenue from a price change. Basically, we reverse-engineer the δ revenue to find the type of demand.

We can influence the elasticity of demand using one of these three:

- Closeness of substitutes.
When substitutes are closer to the real deal, the more elastic the demand is.
- Proportion of income spent on the good.
The larger the proportion of income consumers spend on a good, the larger the elasticity of demand.
- The time since the last price change.
The more time that consumers have to adjust to a price change, or the longer it can be stored without losing value, the more elastic the demand is for the good.

4.3 Cross Elasticity of Demand and Income Elasticity of Demand

The **cross elasticity of demand** is a measure of how responsive the demand for a good is to the change of the price of a substitute or complement.

We can calculate it as follows:

$$\frac{\% \text{ change in quantity demanded}}{\% \text{ change in price of substitute or complement}}$$

In general, the cross elasticity is signed. For a **substitute**, it's positive. For a **complement**, it's negative.

As the price of a substitute rises, the quantity of the product rises. As the price of a complement rises, the quantity of the product decreases.

The **Income of Demand** measures how quantity demanded responds to a change in income.

It can be calculated as:

$$\frac{\% \text{ change in quantity demanded}}{\% \text{ change of income}}$$

Income Elastic goods have elasticity of demand > 1 , and are *normal goods*

Income Inelastic goods have elasticity of demand is in $0 < 1$, and are *normal goods*

Inferior Goods goods have elasticity of demand of < 0 .

The **elasticity of supply** measures the how quantity supplied responds to a change in price of a good.

It can be calculated as:

$$\frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$

Perfectly Inelastic supply is if the supply curve is vertical and the elasticity of supply is 0

Unit Elastic supply is if the supply curve is linear and passes through the origin

Perfectly Elastic supply is horizontal and the elasticity of supply is infinite.

The elasticity of supply depends on:

- Resource substitution possibilities
- Time frame for supply decision

What happens when the price of a good changes? How does it impact another group. (that's cross elasticity of demand).

If I increase Pepsi by 10%, the quantity requested by Coca-Cola will go up. Coca-Cola is a substitute for Pepsi.

The more time that passes after a price change, the greater the elasticity of supply is.

Momentary Supply is perfectly inelastic - there is no change to supply as the price changes. This is the period of time immediately after a price change.

Short-run Supply is somewhat inelastic. It is how the quantity responds to a price change when only some tech adjustments are made.

Long-run Supply is the most elastic. It is the asymptotic behavior once all adjustments are made.

Chapter 8

Utility & Demand

“Marginal utility theory” can be used to derive the downward-sloping demand curve. It also explains the factors that change demand. Finally, the theory also reinforces the power of marginal analysis in determining the utility-maximizing allocation of consumer budgets.

8.1 Consumer’s Choice

Consumers’ choices are limited by income, and can only buy goods they can afford. They have choices within their financial ability. Consumers will generally choose the combinations of goods and services that maximizes their utility.

8.1.1 Total Utility

Total Utility is the benefit a person gets from consuming goods. The more that people consume, the higher the utility is.

8.1.2 Cardinal and Ordinal Utility Theory

Cardinal Utility is an antiquated system that numerically evaluates the **utility** of objects in a unit named the **util**.

Ordinal Utility is a (modern) system where utility of goods are compared (and are therefore preferred). Magnitudes of difference has no meaning.

Utilitarianism is the doctrine that dictates that maximization of utility is a moral criterion to organize society.

8.1.3 Maximizing Utility

Marginal Utility is the change in total utility that results from a one-unit change in the volume consumed of a good. Essentially, there is a *diminishing marginal utility* of consuming more and more of a good.

8.2 Marginal Utility Theory

The theory postulates that houses chooses the consumption possibility permutation that maximizes their total utility. We call this chosen combination the **consumer equilibrium**.

8.2.1 Maximizing Utility

Marginal Utility Per Dollar is the marginal utility of a good divided by its price. In other words, it's the obtained utility of a good by spending an extra dollar.

8.2.2 Utility-Maximizing Rule

For good x , we call the marginal utility MU_x , and the price P_x .

The marginal utility per dollar is:

$$\frac{MU_x}{P_x}$$

When choosing between two goods, we want to pick choices to maximize the amount spent where $\frac{MU_a}{P_a} = \frac{MU_b}{P_b}$.

If $\frac{MU_a}{P_a} > \frac{MU_b}{P_b}$, then we are spending too much on b and not enough on a .

Generally, we want to equalize the two marginal utilities per dollar.

8.2.3 Marginal Utility Theory

Marginal Theory Predicts the change of demand:

- A fall in the price of a substitute decreases a demand in the good being substituted out.
- A rise in income increases the demand for normal goods.

8.2.4 New Budget Equation

In 2-dimensional budgets, we can express budget constraints as the following equation:

$$P_\alpha Q_\alpha + P_\beta Q_\beta = Y$$

Where P_x and Q_x are the price and quantity of good x sold, respectively.

8.2.5 Algorithm for Decision Making Using Marginal Utility

Given the table below, we begin iterating from 0 of each element, and choose the element that gives us (for each value) the best marginal utility per dollar. ¹

¹This is an optimization problem. I think it's called the integer backpack problem, but our solution **should** work.

Quantity	MU	$\frac{MU}{\$}$	Quantity	MU	$\frac{MU}{\$}$
4	28	7.00	10	5	1.25
5	26	6.50	9	7	1.75
6	24	6.00	8	10	2.50
7	22	5.50	7	13	3.25
8	20	5.00	6	20	5.00
9	17	4.25	5	22	5.50
10	16	4.00	4	24	6.00

8.2.6 Predictions From Marginal Utility Theory

Well, we can tell a few things using that graph I referred to earlier:

- As the price decreases, the marginal utility per dollar increases. More of that item will be purchased.²
- As the amount available to spend³ increases, the amount purchased will increase.⁴

8.3 Paradox of value

8.3.1 Surplus

We can define two variables to do with surplus as follows:

PS is the Producer Surplus - the difference between what producers receive for sale of a good and (the minimum) they'd choose to accept when selling a good.

CS is the Consumer Surplus - the difference between what consumers pay for of a good and (the maximum of) what they'd choose to pay when selling a good.

For either party, this is the “money surplus” after a transaction.

8.3.2 Paradox of Value

Simply put, when the marginal utility of an item is large, so too will be the cost.

For example, the marginal utility of diamonds is large, so even though the total utility is small, their price is high. Similarly, the marginal utility of water is small, so even though the total utility is large, their price is low.

In terms of marginal utility per dollar, the two are the same.

²Ok, duh. That's obvious.

³This is usually income inside micro-economics

⁴Ok, duh. That's obvious too.

8.4 Overconsumption and Social Norms

8.4.1 Behavioral Economics

Behavioral Economics studies the brain's (in)ability to rationalize economic decisions, and how these influence the markets. There are three impediments to rational choice:

Bounded Rationality is the heuristics used when faced with uncertainty.

Bounded Will-Power is the sub-optimal will-power that prevents us from making decisions that we know are wrong and will regret.

Bounded Self-Interest is the self-interest that allows us to suppress helping others.

8.4.2 Some Behaviours

Here are a few effects observed by economists:

Endowment Effect is the tendency for people to value something more highly because they own it.

Neuro-Economics is the study of how the brain operates during economic decision making.

Controversy exists in economics between the role of economics in the future. One group believes it should be in examining **how** decisions are made. Another group believes it should be in examining **the effect** of decisions on the market.

8.4.3 Over-Consumption and Social Norms

In traditional economics and in times of scarcity, more is better than less. Since the environmental impact needs to be considered, this isn't always true.

One could stipulate that an equation exists as follows:

$$\text{Environmental Impact} = (\text{Population})(\text{Affluence})(\text{Technology})$$

Where:

Population is the number of people

Affluence is measured in terms of wealth per person

Technology is measured in environmental impact per dollar.

Ecologically speaking, if technology can't keep up with affluence and population, we're @*\\$&'d.

8.4.4 Easterlin Paradox

The **Easterlin Paradox** prescribes that income and happiness are positively related, but the derivative of happiness is negative.⁵

8.4.5 Social Motives for Consumption

We can say that consumption is effected by a few social motives:

Bandwagon Effect is the desire to consume because others do too.

Snob Effect is the desire to consume because others do not.

Veblen Effect is the effect of buying something due to the prestige that comes with buying it.

⁵WTF how is this a paradox? Nobody knows, but this is math. Anything goes, for the un-initiated and un-thinking public.

Chapter 9

Possibilities, Preferences, and Choices

9.1 Preferences and Indifference Curve

9.1.1 Preferences and Indifference Curve

We can define an indifference curve as $f(x)\alpha\frac{1}{x}$. All points above the curve are preferred to points on (and below) the indifference curve. A consumer is Indifferent to all points on one curve.

A **preference map** is a series of indifference curves, almost like a gradient field.

The slope at any point of an indifference curve is the **marginal rate of substitution** - i.e. the rate that the consumer is willing to trade one good for another.

9.1.2 Marginal Rate of Substitution

The rate a person is willing to give up good y to get an additional good x while remaining indifferent is called the **marginal rate of substitution** (MRS).¹

The fact that the MRS decreases as we increase x (i.e. $\lim_{x \rightarrow \infty}$) is called the **diminishing marginal rate of substitution** - i.e. that the marginal rate of substitution diminishes.

9.1.3 Degree of Substitutability

The shape of indifference curves reveals the amount that two goods can be substituted for each other. We can categorize these as follows:

Perfect Substitutes are substances that consumers are willing to substitute for one another at a constant rate.² This is categorized by the equation for the utility:

$$U(x, y) = ax + by$$

¹MRS is measured as the absolute derivative.

²Think of gum brands.

Perfect Complements are goods that are consumed in fixed proportions together.³ They can be characterized by the utility equation:

$$U(x, y) = \min(ax, by)$$

9.2 Budget Schedule and Budget Line

9.2.1 Budget Line

A **budget line** describes the limit to an organism's consumption choices. Generally, the line is of the form of $y = mx + b$, where $m < 0$ and $b > 0$. A valid choice is any point at or below⁴ the line, and invalid ones are above the line⁵.

Divisible Goods can be bought at any point in a line (i.e. 3.564345 lb of flour)

Indivisible Goods can be bought at integer points in a line (i.e. 4.0000 cars)

9.2.2 Budget Equation

In an efficient budget, we get the following:

$$\text{Expenditure} = \text{Income}$$

If your only expenditure was movies and pop, this equation would look like (from prior):

$$P_P Q_P + P_M Q_M = Y$$

$$Q_P = \frac{Y}{P_P} - \frac{P_M}{P_P} Q_M$$

Equivalently, expressing Q_P as the second line allows us to define the following terms:

Real Income in terms of pop is $\frac{Y}{P_P}$. Equivalently, this is the point on the budget line where it meets the y -axis (assuming y is for Pop).

Relative Price of a movie in terms of pop is $\frac{P_M}{P_P}$. Equivalently, this is the magnitude of the slope of the budget line. It shows us how many pops must be forgone for one movie.

Since the **relative price** is an **opportunity cost**, the relative price of a movie in terms of pops gives us the opportunity cost of a movie in terms of pops forgone.

Changes of Price modify the slope of the budget line and the intercept of the line that the item being changed is plotted on.⁶

Changes of Income move the budget line to a parallel line that represents less or more money.

³Think of left/right shoes.

⁴This is called "inside" the budget line

⁵Similarly, this is called "outside" the budget line.

⁶i.e. if Burgers are being plotted on the x -axis, then only the x -intercept will be changed.

9.3 Deriving an Individuals Demand Curve to Predict Choices

Efficient people tend to make the best choice by picking something on the budget line that is on the highest attainable indifference curve. Usually it follows that the marginal rate of substitution between the two goods is equal to the relative price of the two goods.⁷

We know that the **MRS** is a measure of how much someone is willing to give up a good. Similarly, the **Relative Price** of two goods shows how much the user must give up of one good to get another.

When the two are equal, the consumer is just⁸ willing to give up what they must give up to improve.

9.3.1 Changes in Price

Changes of price is called the **Price Effect**⁹.

During price changes, the indifference curves don't change, but the budget line rotates.

For normal goods, falling prices always increase the quantity consumed.

For inferior goods, increasing income leads to a decrease in quantity consumed.

9.3.2 Changes on Income

Changes of price is called the **Income Effect**¹⁰.

During price changes, the indifference curves don't change, but the budget strafes sideways.

9.3.3 Substitution Effect

The **Substitution Effect** is how a change in price modifies the quantity of items bought and the consumer remains on the same indifference curve.¹¹ This means that when the relative price falls, the consumer always substitutes more of that good for others.

9.3.4 Income Effect

As income increases, **Income Effect** implies that we can move from one indifference curve to another.

For normal goods, the income effect reinforces the substitution effect and is the second reason why the demand curve slopes downward.

⁷That's because the two lines must be tangential at this point. Check out a graph (not included D:)

⁸i.e. barely

⁹Wtf, I know.

¹⁰Wtf, I know.

¹¹Pictorially, this doesn't make any sense to me. Since when the prices change, the budget line rotates, it almost surely must intersect a new indifference curve. I suppose if both prices change at the same time, this is possible.

9.4 Work-Leisure Choices

We can apply this thinking to the decision between the “goods” of work and leisure.

You buy leisure by not supplying labor and by forgoing income. The “price” of leisure is the wage rate forgone.

By changing the wage rate, we can find a person’s labor supply curve. By increasing the wage, the substitution effect makes leisure more expensive and the person tends not to take leisure.

As wages increase, we choose different indifference curves to attain. In fact, once wages increase past a certain point, people decide to spend less time at work¹².

¹²Make lots of money, work less. Sounds good to me.

Chapter 10

Organizing Production

10.1 Firms

We're learning about how decisions are made by firms, and how they affect society. The sole objective of a firm is maximizing profit; the incentive of elimination or of acquisition drives this objective.

10.2 Explicit and Implicit Cost

Profit is the difference between total revenue (TR) and total cost (TC).

$$\begin{aligned}\text{Profit} &= \text{Total Revenue} - \text{Total Cost} \\ &= TR - TC \\ TR &= P_x Q_x\end{aligned}$$

There is a difference between accounting profit and economic profit.

Accounting Profit is the firm's revenues minus expenses and depreciation.

Economic Profit is the total revenue minus total cost, where the total cost is measured as the opportunity cost of production.

10.2.1 Economic Cost of Production

The opportunity cost of production is the value of the best alternative, expressed in money.

The opportunity cost of production is the sum of the cost of resources:

1. Bought in the market - since the alternative is having cold, hard cash.
2. Owned by the firm - since they implicitly rent it from themselves. This rate is effectively economic depreciation and interest forgone.

3. Supplied by the firm's owner - since the owner supplies entrepreneurship || labor, this is how much they're losing through labor and expected entrepreneurship profit¹

10.2.2 Firm Decision Making Process

Firms must make five basic decisions to maximize profit:

1. What/how much to produce
2. How to produce
3. How to organize and compensate managers and workers
4. How to market and price products
5. What to produce, and what to buy from other firms²

Similarly, a firm has the constraints of:

Technology constrains what firms can accomplish using their capital and labor³.

Information occludes what data a firm can use to predict the future.

Market constrains the firm by what customers willing to pay, and the efforts of other firms.

10.3 Technological and Economic Efficiency

Tech Efficiency is the phenomenon that occurs when a firm produces a specified level of output by using minimal inputs. Better stated, a technology A is inefficient if at least one other technology B is "less expensive" than A in at least one input, and is equal in all other inputs.

Economic Efficiency is the phenomenon that occurs when a firm produces a given output at minimal cost, comparing the relative costs of capital and labor.

All economically efficient production processes are technologically efficient. The reverse is not true.

10.3.1 Information and Organization

Firms organize production by allocating resources using these two systems:

Command Systems are rigid tree-like system to pass commands to sub-systems. These are better when it is easy to monitor individual performance.

Incentive Systems are systems that use market mechanisms to *convince* individual workers to maximize the firm's profit. These are better when it is hard to monitor individual performance.

¹This is also sometimes called the normal profit.

²This decision is called the "make-buy" decision.

³Alternatively, it's a function that converts labor and capital into goods

10.3.2 Principal-Agent Problem

The problem of devising compensation rules to induce an agent to act in the interests of a principal⁴ is named the **Principal-Agent Problem**.

We can solve this problem with a combination of:

Ownership of the firm incentivizes agents to operate efficiently, by converting them to principals as well.

Incentive Pay links individual compensation (and therefore goals) to the monetary success of the firm.

Long-Term Contracts ties agents long-term awards to the long-term performance of the firm.

10.3.3 Business Types

There are three types of businesses:

Sole Proprietorships are a type of firm where a single owner has *unlimited liability* for all debts of the firm.

Partnerships are a type of firm where two or more owners have *unlimited liability* and an agreed upon management and profit division structures.

Corporations are a type of firm owned by one or more stockholders who are only liable for the amount of their initial investment⁵

10.4 Markets and the Competitive Environment

10.5 Market Types

Perfect Competition is where there are *many indistinguishable* firms selling *identical products* to *many buyers* with *low entry costs* and *no occlusion*.

Monopolistic Competition is when there are *many* firms that produce *marginally differentiated products* and has a *small amount of market power*.

Oligopoly is when there are a *small number* of firms producing products in a market with *barriers to entry*.

Monopoly is when all output is *produced by one firm* with *no close substitutes* and *high barriers to entry*.

10.5.1 Market Concentration

We can evaluate market concentration using two measures:

⁴Stockholders of a firm are the principals, and the managers of a firm are their agents.

⁵This is usually in the form of the paper value of their stock.

Four-Firm Concentration Ratio is the percentage of total industry sales accounted for by the four largest firms.

Herfindahl-Hirschman Index (HHI) is the square percentage market share MS_x of each firm x over the largest 50 firms in the industry.

$$\text{HHI} = \frac{\sum MS_x^2}{\sum_{r \in \text{top 50 firms in the industry}} MS_r}$$

Lower scores 0 imply highly competitive markets. Higher scores 10,000 imply a monopoly.

While the above methods establish a good measure of concentration, they fail to address geographical scope, barriers to entry, and the correspondence between the market and firms in the industry.

10.5.2 Markets vs Firms

Firms coordinate production more effectively than markets since they are driven by efficiency gains vs the market.⁶

Firms can capitalize on:

- Lower transactional costs
- Economies of scale
- Economies of scope
- Economies of team production

10.6 Sustainable Business and Green Business

Sustainable businesses are ones that have no negative impact on global or local:

- Environment
- Community
- Society
- Economy

Sustainable businesses are ones that meet the needs of current society without compromising the ability of future generations to meet their own needs.

⁶It took me a while to understand this, but they're talking about how firms can coordinate their production more effectively than markets due to the firms individual drive to be increasingly efficient. For example, it's hard for a market to move to outsourced production, but individual firms may be able to do this to consolidate their dealings with others. Of course, this is expressed in four bullet points for reasons that escape me.

10.6.1 Triple Bottom Line

“People, planet and profit” succinctly describes the triple bottom line and the goal of sustainability.

Profit is the real economic impact that the organization has on its economic environment

Planet is the sustainable practices that protect and ensure that natural capital is available in the future.

People are the fair and beneficial business practices toward labor, community, and the region of the business.

Chapter 11

Output and Costs

Firms make decisions to **maximize profit**.

11.1 Laws of Production

The factors of production are termed the firm's **plant**.

11.1.1 Short Run

In the **short run**, the plant is fixed.

Other resources (labor, raw materials, energy, etc) can be changed in the short run. Decisions to change things in the short run are easily reversed.

11.1.2 Long Run

The **long run** is the time frame in which the quantities of all resources can be varied. These decisions are generally irreversible, and involve **sunk costs** that cannot be changed¹

11.1.3 Sunk Cost

Behavioral Economics predicts that sunk costs affect actors decisions, since humans are loss aversive and act irrationally.

The **sunk cost fallacy** is the irrational decisions that humans make because they feel obliged to take advantage of opportunities that are accidentally yield of sunk costs. Colloquially, this is known as *throwing good money after bad*.

¹If an asset has no resale value, the amount paid is a sunk cost.

11.2 Product Curves

To increase *short run* output, a firm must increase the variable amount of labor employed. Three concepts define the relationship between output and quantity of labor:

- Total Product
- Marginal Product
- Average Product

We can create graphs² of how the different products above change with respect to labor employed.

11.2.1 Total Product Curve

The **Total Product** (TP or Q) is the total output produced in a given period.

The curve for this “product” evaluates production wrt labor employed. Points below the line are attainable but inefficient; points above the line are unattainable. Points on the line are efficient and attainable.

11.2.2 Marginal Product Curve

The **Marginal Product** (MP , $\delta TP / \delta L$ or $\delta Q / \delta L$) of labor is the change in total product that by increasing labor employed by one.

As with all marginal xyz’s, this curve is effectively the derivative of the total product curve. Initially, there are increasing marginal returns, but there are diminishing marginal returns past a certain point.

The increase is due to a specialization and a division of labor³.

The diminishing return arises from the lack of capital and space to work in.

Law of Diminishing Return

The law of diminishing returns states:

As a firm uses more of a variable input with a given quantity of fixed inputs, the marginal product of the variable input *eventually diminishes*.

11.2.3 Average Product Curve

The **Average Product** of labor is equal to the average product per quantity of labor employed⁴.

²They call these curves. For whatever reason, the words “plot” and “graph” are anathema to these people.

³The phrase “context switch” comes to mind.

⁴Obviously

11.3 Short Run Cost Curves

We describe how cost changes as total product changes using three concepts and types of cost curves:

- Total Cost
- Marginal Cost
- Average Cost

11.3.1 Total Cost Curve

Total cost TC is the cost of *all* resources used. This is broken into fixed cost (TFC) which is the fixed inputs for all output quantities, and variable cost (TVC) which is the variable inputs that change with output quantities.

$$TC = TFC + TVC$$

11.3.2 Marginal Cost Curves

The **Marginal Cost** (MC) is the increase in cost that results from a one-unit increase in total product. Over a range with **increasing marginal returns**, marginal cost falls as output increases due to specialization. Over a range with **decreasing marginal returns**, marginal cost rises as output increases.

11.3.3 Average Total Cost Curve

The average total cost is expressed as ATC . Similar to *total cost*, average cost can be separated into **average fixed cost** (AFC) and **average variable cost** (AVC). Similar to total cost,

$$ATC = AFC + AVC$$

11.3.4 Short-Run Cost

A corollary of diminishing return is that output produced by any new worker is successively smaller.

11.3.5 The Affects of Technology on Cost and Productivity Curves

Technological change influences both productivity and cost curves.

Increasing productivity shifts all product curves upward, and cost curves downward.

If tech increases capital and reduces the labor needed, fixed costs increase and variable costs decrease.

11.3.6 The Affects of Prices of Factors of Production on Cost and Productivity Curves

Increasing *fixed* cost increases TC , and ATC , but MC remains the same.

Increasing *variable* cost increases TC , ATC , and MC curves upward.

11.4 Long Run Cost Curves

11.4.1 Production Function

The long-run cost depends on a **production function** defined as the relationship between the maximum output attainable and the quantities of labor and capital available.

11.4.2 Diminishing Marginal Product of Capital

The **marginal product of capital** is the increase in output resulting from an increase in the amount of capital employed with a constant amount of labor.

11.4.3 Average Cost Curve

The long-run average cost curve is a planning curve which option minimizes cost of producing a given output range.

11.4.4 Doing Things at Scale

Economies of Scale are features of technology that lead to a falling long-run average cost as output increases.

Diseconomies of Scale are features of technology that lead to an increasing long-run average cost as output increases.

Constant Returns to Scale are features of technology that lead to a constant long-run average cost as output increases.

11.4.5 Minimum Efficient Scale

The minimum efficient scale is the smallest quantity of output at which the long-run average cost reaches its lowest level. If the Long-Run average cost has a minimum cost, this is it.

Part III

Final Stretch

Chapter 12

Perfect Competition

To study competitive markets, we need to see what happens when competition is as fierce and extreme as possible. We say that these markets display **Perfect Competition**.

There are a few types of markets:

- Perfect Competition
- Monopolistic Competition (TODO: Ref this)
- Oligopoly (TODO: Ref this)
- Monopoly (See Chapter 13)

12.1 Characteristics of Perfect Competition

Perfect competition occurs in an industry where there is:

- Many firms sell identical products to many buyers.
- There are no restrictions on entry to the industry.
- Established firms have no advantages over new ones.
- Sellers and Buyers are well informed on pricing and products of all firms in the industry.

Firms who are in perfect competition face the maximal amount of competition through the many competing firms, each of which produces an identical product.

12.1.1 How Perfect Competition Arises

Perfect competition arises when both these conditions are met:

- Firm's minimum efficient scale is small relative to the market demand. We know that the minimum efficient scale is the smallest output level at which the LRAC¹ reaches the minimum.
- Each firm produce indistinguishable products.

12.1.2 Price Takers

Price Takers are firms that cannot individually influence the price of a good or service.

In a market with perfect competition, all firms are price takers.

12.1.3 Economic Profit and Revenue

The main goal of a firm is to maximize **economic profit**, which is revenue less cost.

The total cost is the opportunity cost of production, which includes normal profit.

i.e.:

$$\begin{aligned}
 \text{economic profit} &= \text{total revenue} - \text{total cost} \\
 \text{total cost} &= \text{opportunity cost of production} \\
 \text{total revenue} &= (\text{price})(\text{quantity}) \\
 &= PQ \\
 &= TR
 \end{aligned}$$

The marginal revenue is the change in total revenue that results from a one-unit increase in quantity sold. Effectively,

$$MR = \frac{dTR}{dQ}$$

12.2 Profit Maximizing Condition

Firms want to maximize their economic profit, so they must decide:

- How to produce at a minimum cost²
- What quantity to output
- Whether to enter or exit a market

A perfectly competitive firm chooses output that maximizes economic output. Said otherwise, they're trying to maximize $TR - TC$.

In a perfect competition, since the marginal cost (MC) eventually increases and the marginal revenue (MR) is constant, we can look for the point where $MR = MC$.

¹What's an LRAC?

²It does this by operating with the plant that minimizes LRAC (TODO: What is LRAC?)

On a table-like question, find the column that maximizes this profit.

12.3 Break-Even and Shut-Down Points

Break-Even points are points where the firm makes zero profit.

When a firm is making an economic loss, it needs to decide to either exit the market or remain in the market. If it remains in the market, it must decide to either **shut down** temporarily, or to produce goods. These decision points will be based on the firm's economic best interest. We can say that the economic cost can be tabulated as follows:

$$\begin{aligned}\text{Economic loss} &= (\text{Total fixed cost}) + (\text{total variable cost}) - (\text{total revenue}) \\ &= \text{TFC} + Q(\text{AVC}) - Q(P)\end{aligned}$$

When a firm shuts down, $Q = 0$ and the firm still needs to pay the TFC. Alternatively, if ATC exceeds the price, the loss exceeds the TFC, and the firm shuts down.

At the shutdown point (i.e. the economic advantage of production is 0), the firm is indifferent between producing and shutting down.

12.4 Market Supply in the Short Run

The short-run market supply curve shows the quantity supplied by all firms in the market at each price when each firm's plant and the number of firms stay the same.

When the supply curve is equal to the AVC, some firms will produce the shutdown quantity, and others will produce zero. The market is perfectly elastic.

By increasing the demand³, the price and quantity produced increased. Vice versa holds.

12.4.1 Profits and Losses in the Short Run

Maximum profit is not always a positive economic profit. Depending on the value of the marginal cost v.s. the marginal revenue, sometimes the lowest point on the average total cost curve is sometimes (and sometimes not) an economically profitable position.

12.4.2 Profits and Losses in the Long Run

12.5 Entry and Exit

We're trying to determine how firms decide to enter/leave the market.

Firms will leave when they incur an economic loss. Firms will enter an industry when existing firms make an economic profit.

³By this, we shift the demand-curve to the right

12.5.1 Entry

The entrance of a firm creates an increased market supply, which results in a reduced market price.

12.5.2 Exit

When firms incur an economic loss, they will leave. This reduces the market supply, and thus the market price.

12.6 Changes in Demand

12.6.1 Decreasing Demand

By decreasing demand, the market demand curve shifts leftward. Thus, the price and quantity decreases.

Since this is now below each firm's minimum average cost, some firms incur economic losses. The economic losses cause some firms to exit in the long run, which decreases the market supply.

As the price rises, the quantity produced by all firms decreases overall, but each firm makes more individually.

A new equilibrium is formed at the new equal minimum average total cost.

In the initial and new long-run equilibrium, the number of firms in the market achieving equilibrium is lower.

12.6.2 Increasing Demand

By increasing demand, the demand curve is shifted rightward. The price and quantity increases. Due to low barrier, firms enter and increase the short-run supply. As the supply increases, the price falls, and the market quantity continues to increase.

Net-net, the only difference between the initial and new long-run equilibrium is that there are a larger number of firms producing the equilibrium quantity in the new equilibrium.

12.7 External Economics and Diseconomies

External Economics are factors beyond the control of an individual firm that lower the firm's costs as industry output increases.

External Diseconomies are factors beyond the control of an individual firm that raise the firm's costs as industry output increases.

In the absence of the External Economics and Diseconomies, a firm's cost remains constant as the market output changes.

In the absence of external economies and external diseconomies, an increase in demand doesn't change price.

In the presence of external economies, an increase in demand lowers prices.

In the presence of external diseconomies, an increase in demand raises prices.

We call the price curve as demand changes the **long-run market supply curve**.

12.8 New Technologies

New technology always lowers costs. Firms that adopt new tech make an economic profit.

A new tech enables firms to produce at lower average cost and/or lower marginal cost. This shifts their cost curves downward.

New tech firms enter, and old tech firms must either adapt or die.

The industry supply increases, and the supply curve shifts rightwards. The price falls, and the quantity increases.

Eventually, a new long-run equilibrium emerges where all firms use the new technology.

12.9 Efficient Resource Usage

Resources are used efficiently when nobody can be made better without making a someone else becomes worse off.

A consumer's demand curve shows how the best budget allocation changes as the price of a good changes. Consumers then get the most value out of their resources at all points along their demand curves. Without external benefits, the market demand curve is the marginal social benefit curve.

A competitive firm's supply curve shows how the profit-maximizing quantity changes as the price of a good changes. Firms get the most value out of their resources at all points along their supply curves. Without external cost, the market supply curve is the marginal social cost curve.

12.10 Equilibrium and Efficiency

At competitive equilibrium, resources are used efficiently. This means that the amount demanded is the amount supplied.

The gains from trade for consumers is measured by consumer surplus.

The gains from trade for producers is measured by producer surplus.

Total gains from trade is equal to the total surplus. In the long-run, the total surplus is maximized.

Chapter 13

Monopoly

Monopolies are markets with only one seller but many buyers. Since the monopoly is the sole producer of a product, the demand curve is the market demand curve.

A monopoly is a market where:

- No close substitute exists for a given good or service.
- Markets have a high barrier to entry.

There are three different types of barriers to entry:

Natural - When economies of scale enable one firm to supply the entire market at the lowest possible cost.

Ownership - When one firm owns a significant portion of a key resource.

Legal - When entrance to a market is restricted by a public franchise¹, Government License², a Patent, or a Copyright.

13.1 Price-Setting Strategies

Monopolies set their own price. If a monopoly raises the price, they do not need to worry about competitors.

Single-Price Monopoly is a firm that must sell each unit for the same price.

Price Discrimination is the practice of variable pricing depending on the customer.

The average revenue (AR) of a monopolist is the market demand curve.

The total revenue (TR) is the price multiplied by the quantity sold ($TR = PQ$) The marginal revenue (MR) is the change in total revenue that results from a one-unit increase in the quantity sold. For a single-price monopoly, the marginal revenue is less than the price at each level of output ($MR < P$).

¹Like the Canada Post

²Like a license to sell cell-phones, practice engineering, etc.

To sell more, monopolies must set a lower price. When this happens, we effect the TR by:

- Lowering the price creates a revenue loss
- Increasing the quantity increases revenue

A single-price monopoly's marginal revenue is related to the elasticity of demand for that good. Elastic demand means that a fall in price brings an increase in total revenue. Inelastic demand means that a fall in price brings a decrease in total revenue. If the demand is unit elastic, a fall in price doesn't change total revenue.

The total revenue is maximized when the marginal revenue is 0.

In monopolies, demand is always elastic.

13.2 Price and Output Decision

The monopoly sets the price where they can make the most profit.

A monopoly makes profit when $MR = MC$.

Monopolies may make economic profits in the long run, and ones that incur economic losses may shut down temporarily in the short run, or exit the market in the long run.

Compared to perfect competition, monopolies produce a smaller output for a higher price.

There is no relationship between the quantity supplied and the price defined by the marginal cost curve, since the price comes from the market demand curve.

13.3 Single-Price Monopoly vs Competition

13.3.1 Surpluses

Some of the lost consumer surplus goes to the monopoly as a producer surplus, but not all of it.

Consumer surplus shrinks since they pay higher prices, and they get less of the good.

The producer surplus shrinks since the price raise reduces the quantity sold.

13.3.2 Rent-Seeking Equilibrium

Any surplus is called **economic rent**, and the act of pursuing this wealth is called **rent seeking**.

Rent seekers pursue their goals in two ways:

- Buy a monopoly

- Create a monopoly

13.4 Price Discrimination

When different prices are set for different audiences, we call this **price discrimination**.

To be able to price discriminate, a monopoly must:

- Identify different buyer types.
 - Through units of a good, such as quantity discounts.
 - Among groups of buyers, such as restrictions on airline tickets and advance purchasers.
- Sell a product that cannot be resold.

Firms can increase their profit through price discrimination. **Perfect price discrimination** occurs if a firm is able to sell each unit at the highest price anyone is willing to pay³.

13.4.1 Rent Seeking with Price Discrimination

Monopolies that price discriminate better, are more efficient and have close output to the competitive output.

This is different than perfect competition in two ways:

- Monopoly captures the entire consumer surplus.
- Increased economic profit attracts more rent-seeking activities, which lead to inefficiencies.

13.5 Regulation

Regulations are the rules administrated by government to influence price, quantities, entry, etc.

Deregulation is the process of removing regulations.

There are two main theories on how regulation works:

Social Interest Theory is where regulation relentlessly seeks out inefficiency.

Capture Theory is where regulation serves the self-interest of producers, who capture regulators.

³Tweeted on Nov 25

13.5.1 Regulating Natural Monopolies

When cost and demand create natural monopolies, quantity produced is less than the efficient quantity.

Governments regulate natural monopolies to fix this by using a **marginal cost pricing rule** that sets the price equal to the monopoly's marginal cost. Since the quantity demanded at the marginal cost price is the efficient quantity, this works. Comparing price and output between monopoly and perfect competition