FIYS 197 FOUNDATIONS OF ECONOMIC THINKING

Rob Lemke
Department of Economics
Lake Forest College
Fall 2008

I. THREE FOUNDATIONS OF ECONOMIC THINKING.

1. No Free Lunch

- Examples.
  - Mandated labor benefits.
  - Requiring firms to "go green".
  - Bailing out mortgage brokers.
  - Extending unemployment benefits.
  - Shortening the patent length on prescription drugs.

- Opportunities for efficiency improvements may exist, and economists recognize this, so the statement is harsher that what we actually believe. That said, it is a strong reminder to look hard and be pessimistic when someone suggests an opportunity for a free lunch.

2. Real Measurements

- Standard of Living = goods & services, time, happiness, etc., but society largely talks about goods and services because that is what is most readily available and easily measured.

- Examples:
  - Trade imbalance
  - National debt
  - Social Security surplus.

- It's a little different for individuals, because loans and investments are measured in terms of money. So some situations may make themselves better or worse simply by accounting.

- Governments can allow (or encourage) such things to happen for their benefit as well, but this is risky. Intentionally allowing inflation to increase is one way the government can lower the burden of its debt by accounting, which of course hurts everyone who owns government bonds. This is called **monetarizing the debt**.

3. Voluntary Trade Makes Both Sides Better Off

- Examples
  - Consumers paying high gas prices.
  - Baseball owners paying large contracts.
  - Workers accepting low-wage, non-union jobs at Wal-mart (or in a sweatshop).
  - Sick people paying high prescription drug prices.
  - Buying cigars or sugar from Cuba would make many people better off, Americans and Cubans, but doing so is currently illegal.

- Voluntary trade does not imply that you don't want to pay less or that the firm doesn't want to sell the product at a higher price. It simply says that both parties are better off from the transaction than they would have been had they not made the trade at the exchanged price.

- Voluntary trade doesn't imply that someone doesn't regret the trade after the fact. Some trades are risky or involve unknown components.

- What are the possible problems?
  - It can be difficult to ascertain the difference between voluntary trade and coercion.
    - Do workers have a choice about working at Wal-mart or in a sweatshop?
    - Legalizing drugs or prostitution.
  - Trades can affect third parties. In economics, these effects are called **externalities**.
    - Pollution
    - Fast food & cigarettes (future health care costs)
    - Speeding

II. Constraints (Taylor Chapters 1 – 3)

1. An efficient economy.

An **economy** involves the **production**, **exchange** (**trade**), and/or **consumption** of goods and services. Economics studies these three aspects of an economy, and tries to quantify how well different types of economies work. That is, economists are concerned with four questions:

1. What is produced?
2. Who produces it?
3. Who consumes it?
4. How efficient is this process?

Why are these interesting questions? One, most people like eating more things. Two, most people would choose to work less if given the opportunity (and they could keep eating things). Three, resources are **scarce**, so decisions require making tradeoffs, which is not easy. (Recall, no free lunch.) Economics has a lot to do with **efficiency**. The problem is that there are a lot of different types of efficiency.

1. **Pareto efficiency**: There is no way to make someone better off without hurting someone else.
2. **Productive efficiency**: The production process is efficient – there is no way to make more of the good without using more inputs, or there is no way to make the same amount of goods with fewer inputs.
3. **Allocative efficiency**: Inputs are distributed to production processes in the way society wishes them to be. As a society, we could devote all of our resources to growing brussel sprouts, and we could grow them efficiently. If society didn't want to eat only brussel sprouts, however, producing them efficiently would not mean that the economy was being efficient (although the production process would be).

What are the goals of an economy?

1. Efficiency
2. Consume more goods and services.
3. Increase happiness.

Economics focuses on all three, but frequently the media and politicians focus on goods and services because it is all that can be easily quantified. It is difficult, for example, to say that social or cultural or political choices in Canada have made Canadians happier than the social or cultural or political choices in Mexico have made Mexicans. It is easy, however, to say that per capita income in Canada is three times that in Mexico; implying that the average Canadian can purchase three times as many goods and services as the average Mexican. The same goes for the social or cultural or political choices made in Ohio vs. California and in Los Angeles vs. Miami.

How does an economy improve on Pareto or allocative efficiency? (For the record, it is difficult to achieve Pareto or allocative efficiency, so economists frequently discuss improving efficiency.)

1. Free markets. **Adam Smith's invisible hand**.
    a. *The Wealth of Nations*, published in 1776.
    b. Each person acting in their own interest helps society.
    c. Recognized a necessary role of government.
    d. Recognized the role of bargaining power.
    e. Every idea is in Smith!

2. Free trade: larger markets allow for more beneficial trades.
    a. 2007 U.S. economy:
        i. $14 trillion GDP
        ii. $1.65 trillion exports
        iii. $2.35 trillion imports
    b. Foreign trade is about 14% of the U.S. economy
    c. U.S. has a **trade deficit** of $60 billion per month. Thus, each month, each person in the United States consumes, on average, $200 of goods and services more than what the U.S. produces.

How does an economy improve on productive efficiency (and thereby also allowing the economy to improve on Pareto and allocative efficiency)?

1. **Division of labor**

    This is fundamentally explained in Smith (and his pin factory). The main idea is that the division of labor allows workers to specialize and learn the intricacies of what they are doing. It also saves time by not having workers move from task to task.

2. **Returns to Scale**.

    Average costs fall as production increases (not always, but usually, and at least up to a point.) The implication is that it is efficient for Japan to concentrate on making DVD players and for the United States to concentrate on writing software, for example.

3. **Resource/knowledge advantages**.

    Under free trade, which goods countries choose to specialize in may be historical accident, but it also may be due to available resources (nutrient-rich farmland vs. mountains full of copper) or knowledge (Swiss watches).

When studying economics, many questions, concepts, and/or ideas will be classified as being **microeconomics** or **macroeconomics**. Microeconomics concerns individual choices or behavior, while macroeconomics concerns the results of choices or behavior at the group level. In some sense, therefore, everything is microeconomics. An individual's behavior is micro, but a household's behavior (consisting of 4 individuals) is macro. A household's behavior is micro, but a town's behavior (1,000 households) is macro. And so on up the chain. The field of macroeconomics has split into two.

1. **Micro foundations of macroeconomics**.
   These economists are micro economists who try to explain macro phenomenon by looking at individual choices. This is where the cutting edge of the field is at.

2. **Standard Macro**
   Standard macro is concerned with measuring economic variables at the national level. These variables are then used to explain one another and to predict the future. A lot of attention is also given to comparing these variables across countries.

Macroeconomists are also concerned with the role and effectiveness of **monetary policy** and **fiscal policy**. The goal might be to move an economy out of a recession (or to prevent a recession), and the question is how can that best be achieved – with monetary policy or with fiscal policy.

1. **Monetary policy** concerns the government doing something to money (usually the FED increasing or decreasing the amount of money there is in an economy), in hopes of expanding or contracting economic activity.

2. **Fiscal policy** concerns the government increasing or decreasing its spending or collecting more or less taxes in hopes of expanding or contracting economic activity. Intuitively, if the government purchases more goods and services (i.e., spends more) or if the government lowers taxes so people have more money to spend, then economic activity will increase. If the government decides to purchase fewer goods and services (i.e., spends less) or if the government raises taxes so people have less money to spend, then economic activity will decrease.

2. Opportunity Sets: The Budget Line

How wealthy someone is (or how wealthy a country is) can be thought of or measured by how much stuff one can literally afford to purchase. That is, how many goods and services can you eat? In economics, this idea is called an **opportunity set**. The opportunity set contains all affordable bundles of goods and services. If you can consume a particular bundle, you can attain it, and it is in your opportunity set. If the bundle is unaffordable, then it is unattainable, and it is not in your opportunity set. The larger is ones opportunity set (in a dominating way), the richer or wealthier the person/nation is.

For an individual, the opportunity set can be thought of as being defined by one's income and prices. Income is a bit strange, and in the real world one can borrow money or choose to work more hours in order to earn more income, but for now lets assume you have a fixed income to spend and that prices are fixed as well.

The **budget line** (which defines the **opportunity set** or **budget set**) simply reveals which bundles exactly exhaust one's income. If there are two goods with fixed prices, then $M = p_x \cdot x + p_y \cdot y$ is the budget line, though it can get more complicated than this.

[Provide a basic graph.]

Notice that if income increases or decreases, you get richer or poorer, because your budget set gets larger or smaller in a dominating way – every option you used to have is still available to you plus more (richer) or no new options are available to you and some that used to be no longer are (poorer).

Notice that the slope of the budget line represents the tradeoff you face. It is the number of one good you must give up in order to receive more of the other. This is determined completely by prices. The ratio of prices reflects the tradeoff consumers face, and it reflects the real cost of goods.

In particular, the slope of the budget line is: $slope = -p_x / p_y$. It is negative, because it represents a tradeoff – you must give something up to get something else. In this case, you must give up p_x / p_y units of the y good in order to be able to afford to purchase one more unit of the x good. Thus, **the slope of the budget line is the price of the *x* good measured in terms of the *y* good**.

If the price of the x good increases, $p_x \uparrow$, then the slope increases. This makes sense. If the price of the x good increases, you must give up more units of the y good to purchase one more unit of the x good. Note too that when $p_x \uparrow$, the budget line rotates in on the x axis. This is because you can still afford to buy the same amount of the y good if that is all you buy, but you can no longer buy as much of the x good. The opposite (rotate out along the x axis) would happen if $p_x \downarrow$. Thus, prices affect your budget line as well.

If prices are not constant or if one is endowed with some of the good, the budget line can get fairly funky. Thinking of the basic budget line (or any budget line really), one can choose any point on the budget line. So what point does one choose?

1. In this set-up, one should choose to be on the budget line, not inside the budget set. Otherwise you are not choosing an efficient bundle. (You could be made better off without hurting anyone else but just spending your income.) Also recall that for the current model, there is no incentive to save your income.

2. You can't be beyond your budget line, because you simply cannot afford those bundles.

3. Where on your budget line you choose to be depends on your **preferences**. Economists recognize that people have their own preferences and that preferences differ. In general, economists believe that people/governments should not impose their own preferences on other people/governments. At the same time, most economists are realists, not relativists, in that we recognize that some preferences are simply bad and some people/governments should not be permitted to act upon their preferences.

    a. Ask the class for some examples, or provide some.
    b. The real trick is determining when this is necessary.

What do individuals take into account when making decisions?

1. The **opportunity cost** of a possible choice is the value of the next best alternative, or some crap like that. It's the true costs, taking into account all costs, of the decision. So, the cost of going to a baseball game is not just the cost of tickets, but it is also the cost of parking, gas, and time.

2. **Sunk costs** should not affect decisions. You pay $120 for tickets. You go to the game and pay $18 for parking, and have a great 3-hour tailgate party in the sun. While doing this, the sun wipes out your kids' energy. By the time the third inning roles around, they want to go home. In deciding to go home in the third inning or the fifth or staying until the end of the game, should the

cost of parking or tickets enter your decision? No. (Although, the cost of the tickets may reflect how much you are going to enjoy the rest of the game because of seat location.)

The **law of diminishing returns** is not a law like gravity, it is just intuition, and it says that people receive less and less value from consuming more and more of the same thing, at least past some point. There are exceptions, such as heroine, but most things follow the rule. For example, the third piece of pie goes down really hard. What is the implication of the law of diminishing returns? If prices are constant, then you should buy more of the good as long as the **marginal value** exceeds the price, which, because price is constant, the price is the **marginal costs** you face in purchasing.

In general, you buy something if the total benefit exceeds the total cost. But when you can buy incrementally or do something incrementally, the question arises how much you should buy or, put differently, when should you stop buying or stop an action. In economics, the answer to this question is called the **optimal stopping rule**.

In general, buy more of a good or undertake more of an action as long as the **marginal benefit** exceeds the **marginal cost** of buying more of the good or undertaking more of the action. Examples:

1. Buy more pie as long as the benefit you receive from the last piece of pie you buy (the marginal benefit) is at least as much as the price (the marginal cost) of the last piece of pie.

2. How much should you exercise? Until the marginal benefit equals the marginal cost.

3. When should you stop coming to class? When the marginal benefit is no longer greater than the marginal cost.

4. How long should the United States keep its troops in Iraq? Until the marginal benefit no longer exceeds the marginal cost.

    a. Be careful. Sometime marginal decision making is not right. The marginal benefits or benefits may increase or decrease locally, when what is needed is understanding of the global or overall picture. (In calculus, the difference is between local optima and global optima.) Over the next day or two, for example, the marginal benefit of staying in Iraq will not exceed the marginal cost, but that doesn't mean that the benefit of keeping troops in Iraq for another year or another two years or another five years will not exceed the cost of doing so.

    b. Also, you might recall (when you were 10) that George W. Bush make campaign promises in 2000 to get troops out of places like South Korea and Germany and the Middle East because the benefits no longer seemed to be larger than the costs.

3. Opportunity Sets: Hours of Work

Consider the decision of how much time to devote to work. To make the model simple, suppose you are offered an hourly wage, and you can work as many hours as you want at that wage. The two goods are then leisure and consumption. If T is your time endowment, h is hours worked, and L is hours of leisure, then $T = h + L$ and $M = wh = w\,(T - L)$ and $C = M$.

[Draw the budget line.]

What is the price of an hour of leisure? That is, what do you give up when you choose to work one less hour? The answer is w. You "purchase" one more hour of leisure by working one less hour, which means you have w less to consume. Notice that this tradeoff is, again, incorporated into the slope of the budget line. In order to purchase one more unit of the x good (i.e., one more hour of leisure), you give up w units of the y good (i.e., you give up w in income or w in consumption).

So, what happens when the price of leisure increases? In the earlier budget line example, the budget line would rotate in on the leisure (x) axis. This can't happen here, because the time endowment is fixed. In fact, when the price of leisure increases, the worker is actually made better off as the budget line rotates *out* along the consumption axis. (Similarly, when the price of leisure falls, the worker is made worse off as the budget line rotates in along the consumption axis.) This is what makes studying labor issues so interesting. The labor/leisure tradeoff does not work like any other economic tradeoff.

Lastly, what would have to happen to have the budget line in this example shift in or out? The answer is that you would have to be given a greater time endowment (shift out) or have some of your time endowment taken away (shift in). It is difficult to think of increasing your time endowment (there are 24 hours in the day and 168 hours in the week for all of us), though one can think of extending life expectancy. There are also different time endowments given to people in that some people require 8 hours of sleep each night while others require 4. Losing your time endowment is easier to grasp. Examples include having children and becoming physically disabled.

4. Opportunity Sets: Present and Future Consumption

Let's review the principles of finance. Suppose you save P money (principal) at annual interest rate r. At the end of the first year, therefore, your investment is worth your original investment, P, plus the interest earned, rP, for a total of $(1 + r)P$. If you hold the investment for more than one year, your investment will grow even more, and your interest will earn interest (**compound interest**). For example, after two years, your investment is worth the original P plus rP of interest during the first year plus rP of interest during the second year plus $rrP = r^2P$ of interest in the second year on interest received in the first year. The power of interest on interest (or compound interest) makes the investment grow exponentially. After T years, your investment is worth not $P + TrP$ but rather $(1 + r)^T \cdot P$. To given an example, \$1,000 invested at 5% per year at age 18 until age 68 grows not to $1000 + 50(0.05)(1000) = \$3{,}500$ but rather to $1.05^{50} \cdot 1000 = \$11{,}467$.

Rule of 72. Although it doesn't work exactly, an investment is expected to double in N years when the annual rate of return is r where $N = 72 \div r$ (and r is 9 if the interest rate is 9%). Example, \$500 invested at 9% per year is worth \$996.28 after 8 years.

The **interest rate** is also called the **rate of return** or the **price of capital**. Adjustments need to be made if interest accrues at different times than in which the interest rate is specified, but that is for a finance class. One last example, consider saving \$1,000 a year every year at 7% from age 18 for 50 years (total investment of \$50,000) versus saving \$4,000 a year every year from age 43 for 25 years (total investment of \$100,000) versus saving \$20,000 a year from age 58 for 10 years (total investment of \$200,000). These three investments, at age 68, are worth, respectively, \$435,000; \$271,000; and \$296,000.

Last finance lesson is that the interest rate matters a lot as well. If the interest rate in the preceding examples is 6%, the final numbers are: \$308,000; \$233,000; and \$279,000.

Why is borrowing or saving money associated with an interest rate?

1. **Risk**. There is some chance the money will not be repaid.

2. **Inflation**. Prices change over time. Usually prices increase over time (**inflation**). If inflation over the next year is expected to be 4 percent, for example, then what costs $100 today is expected to cost $104 in a year from now. It seems only fair to be repaid $104 in a year from now (at least) for a loan of $100 today.

3. **Time value of money**. There are costs (emotional, psychic, who knows) associated with postponing enjoyment of consumption. Lenders require being compensated for their delayed enjoyment.

Suppose you have income, M, today that must finance your consumption today (the present) and tomorrow (the future). Then you die. You also face a per-period interest rate of r. What is your opportunity or budget set? Letting C_0 denote consumption today and C_1 denote consumption tomorrow, your budget line is determined by: $C_1 = (1 + r)(M - C_0) = (1 + r)\cdot M - (1 + r)\cdot C_0$.

[Draw the budget line.]

The slope of the budget line is $(1 + r)$, which makes sense. The slope is the number of units of consumption tomorrow you must give up to get one more unit of consumption today. In order to gain 1 unit of consumption today, you must give up $1 + r$ units of consumption tomorrow (which is what 1 unit would grow to if saved). Put differently, if the price of 1 unit of consumption today is $1, then the price of 1 unit of consumption tomorrow is $1 / (1 + r)$, which would grow to 1.

What makes someone richer?

1. More money now: $M \uparrow$ shifts the budget line out and keeps the tradeoff between today and tomorrow the same.

2. Higher rate of return: $r \uparrow$ rotates the budget line upward along the consumption tomorrow axis as money saved becomes worth more tomorrow.

3. Lower prices would also make one better off, but this is somewhat difficult to capture quickly as our graph assumes no inflation.

5. Opportunity Sets: The Production Possibilities Frontier

The first three budget line examples were applied to individual choice or individual behavior. The same model, however, can be applied to a nation. The **production possibilities frontier (PPF)** demonstrates the efficient combinations of output bundles that an entire economy can produce. Anything inside the PPF is attainable, but inefficient as more could be produced via efficient production. Anything outside the PPF is unattainable.

Just like with a budget line, the slope of the PPF reveals the cost of the y good measured in terms of the x good. If this cost is always constant, then the PPF will be a straight line. Intuitively, the tradeoffs in the production process will not be constant. (This is not the same as shopping in a grocery store with fixed prices.) Rather, it is going to be very easy (cheap) to produce a little of something, but more costly to produce more of it. This is called **diminishing marginal returns** in the production process. It is easy,

for example, to harvest a few bushels of apples in an orchard as one will pick the low-hanging fruit. It is harder to harvest 20 bushels as it requires getting a ladder. And it is even harder to harvest 100 bushels as it requires not only the ladder but getting to all parts of all trees.

How is this increased cost captured on a graph? Consider two cases – bowed toward the origin and bowed out. A little bit of thought (and trial and error) should convince you that diminishing marginal returns requires the PPF to be bowed out.

[Draw a typical PPF with good 1 and good 2.]

Lessons to take away from the PPF as drawn:

1. Diminishing marginal returns gives the PPF its convex shape.

2. The slope of the PPF reveals the cost of producing 1 more unit of the *x* good.

3. Unattainable bundles become attainable as the PPF moves out. This is called **economic growth**.

4. Efficient production requires being on the PPF. When an economy is on the PPF, it faces a tradeoff whenever it wants more of another good. That is, there is no free lunch when you are on the PPF – acquiring more of either good requires you to give up some of the other good. [Draw consumption vs. investment, and discuss the picture and growth ramifications.]

5. Any two goods can be used to conduct analysis: consumption vs. investment; guns vs. butter; education vs. consumption.

6. The PPF doesn't say anything about allocative efficiency. Take education and consumption. There are an infinite number of productively efficient points on the PPF, but people are going to disagree about which bundle is the allocatively efficient one.

7. ***PAGE 36 IS TERRIFIC!*** All budget lines – general consumption, labor/leisure, consumption today vs. consumption tomorrow, PPFs – all incorporate three ideas: **scarcity**, **tradeoffs**, and **economic efficiency**.

6. Production and Exchange: Gains to Trade

We will end this section by discussing the source of **gains to trade**. Economists generally support **free trade** – between two people, states, or nations – on the grounds that there are gains (to both sides) from voluntary trade. We now aim to show this.

To keep things simple, we will always consider two countries with straight PPFs. That is, each country faces a constant tradeoff between producing two goods. Because of this technology assumption, the PPF for each country can be fully described by telling someone the maximum amount of each good the country can produce when it **completely specializes** in the production of the good. For example, suppose the two countries are Argentina and Brazil and the two goods are coconuts and dragon Fruits. If it completely specializes in coconuts, Argentina can produce 500 coconuts (and zero dragon fruits). On the other hand, if it completely specializes in dragon fruit, Argentina can produce 750 dragon fruits (and zero coconuts). Similarly, if Brazil completely specializes in coconuts, it can produce 800 coconuts (and zero dragon fruits). On the other hand, if Brazil completely specializes in dragon fruit, it can produce 400 dragon fruits (and zero coconuts). All of this information could be given in a simple table:

Production under Specialization

	Coconuts	Dragon Fruits
Argentina	500	750
Brazil	800	400

[Draw both PPFs.]

Notice, the tradeoffs, determined solely by technology, are:

- 1 more coconut in Argentina requires giving up 1.5 dragon fruits.
- 1 more coconut in Brazil requires giving up 0.5 dragon fruits.

Given these tradeoffs, it is important to note that the tradeoff for dragon fruits are the reciprocals. In particular:

- 1 more dragon fruit in Argentina requires giving up ⅓ coconuts.
- 1 more dragon fruit in Brazil requires giving up ½ coconuts.

In this example, if there is no trade across countries, the price of a coconut in Argentina will be 1.5 dragon fruits, and the price of a coconut in Brazil will be 0.5 dragon fruits.

In this example, Argentina has an **absolute advantage** in the production of dragon fruits, while Brazil has the absolute advantage in the production of coconuts. Many people incorrectly assume that trade flows depend on absolute advantage. They don't, although it is true that if one country has an absolute advantage in one good and the other country has an absolute advantage in the other good, then trade flows (specialization) will follow along the lines of absolute advantage. For the moment, however, let's investigate possible gains to trade in this example.

Suppose, without trade, Argentina devotes 30% of its resources to producing coconuts and 70% of its resources to producing dragon fruits. In the end, then, Argentina will produce ***and consume*** 150 coconuts and 525 dragon fruits. Likewise, without trade, suppose Brazil devotes 75% of its resources to producing coconuts and 25% of its resources to producing dragon fruits. In the end, then, Brazil will produce ***and consume*** 600 coconuts and 100 dragon fruits. In total, therefore, these two economies together produced 750 coconuts and 625 dragon fruits.

Suppose, instead, that Argentina completely specializes in the production of dragon fruits, making 0 cocounts and 750 dragon fruits. Similarly, suppose instead that Brazil completely specializes in the production of coconuts, making 800 coconuts and 0 dragon fruits. Under this redistribution of production, notice that the two economies together produce 800 coconuts and 750 dragon fruits. By specializing, therefore, the two countries produce more coconuts and more dragon fruits than they did without specialization. Specifically, they produced 50 more coconuts and 125 more dragon fruits. These are the gains to trade. By specializing and then trading, Argentina can still consume 150 coconuts and 525 dragon fruits (though this combination of goods is not what it produces) and Brazil can still consume 600 coconuts and 100 dragon fruits (though this combination of goods is not what it produces) ***and*** the two countries have an extra 50 coconuts and 125 dragon fruits (the gains to trade) to share somehow.

Who will receive the gains to trade is unclear. It will depend on bargaining power in such a simple example. In the real-world, with more countries involved, the production of goods will be determined to clear the markets, and equilibrium prices will come about from supply and demand, and the gains will be distributed accordingly, depending on technology, resources, and preferences. In this simple example, all

that can be really said with certainty is that the price of a coconut will be between 1.5 and 0.5 dragon fruits (and the price of a dragon fruit will be between ⅓ and ½ coconuts). The closer the price of a coconut is to 1.5 dragon fruits (making coconuts more valuable relative to dragon fruits), the more of the gains to trade will flow to Brazil, the country that specialized in the production of coconuts.

Lastly, in such a simple example, either both countries will completely specialize in production or one country will. Put differently, at least one country will completely specialize in the production of one good. If only one country completely specializes, then the technology tradeoff of the non-specializing country will dictate market prices, otherwise this country would make a different bundle of goods. The gains to trade will

But what happens if one country has an absolute advantage in the production of both goods? There are still gains to trade, because what really matters is the **comparative advantage** in the production of goods, not the absolute advantage.

Production under Specialization

	Coconuts	Dragon Fruits
Alberta	60	75
Belize	1,200	2,000

[Draw both PPFs.]

Notice that Belize has the absolute advantage in the production in both goods.

- Does that mean that Alberta shouldn't produce? No!
- Does it mean that Belize doesn't want to trade with Alberta? No!
- Alberta is still better off producing things it doesn't intend to eat, and trading them for things it wants to eat. (As is Belize.)

Even though Belize can make more of both goods, there are still production tradeoffs in both locations. In particular, the cost of producing 1 more coconut in each area is:

- 1 more coconut in Alberta requires giving up 1.25 dragon fruits.
- 1 more coconut in Belize requires giving up 1⅔ dragon fruits.

Moreover, the cost of producing 1 more dragon fruit in each location is:

- 1 more dragon fruit in Alberta requires giving up 0.8 coconuts.
- 1 more dragon fruit in Brazil requires giving up 0.6 coconuts.

That is, the production tradeoffs are still reciprocals. Therefore, ***by the nature of reciprocals, one country will face a lower tradeoff for producing one good, and the other country will face a lower tradeoff for producing the other good***. That is, one country will have a **comparative advantage** in the production of one good, and the other country will necessarily have a comparative advantage in producing the other good.

In summary, what are the lessons for trade?

1. Regardless of production technologies, there are always gains to be had from trade – between people, states, or nations.

2. What matters is comparative advantage, not absolute advantage. (By doing something very, very poorly, it means that you must do something else fairly well *comparatively*.)

3. What are the implications of not trading with Cuba?

    a. U.S. firms don't sell their goods to Cuba.
    b. U.S. chocolate producers use corn syrup instead of sugar.
    c. U.S. chocolate lovers are forced to each lower quality chocolate or pay very high prices for real chocolate.
    d. U.S. citizens do not visit (tourism or vacation) Cuba and spend money.
    e. Beet farmers in Wyoming continue to grow beets rather than soy beans or set up wind farms.
    f. Cuba remains a communist country.

III. SUPPLY AND DEMAND (Taylor Chapters 4 & 7)

1. Demand

Consumer preferences and budgets produce consumer **demand**. The **demand function**, or simply **demand**, is usually thought of as a relationship between the price of a good and the **quantity demanded** of the good. There are two things to note:

1. There is a difference between ***demand*** (which is a function or the entire relationship between price and quantity) and ***quantity demanded*** (which is a number).

2. The relationship is actually quite complex, but we are most often interested in the relationship between price and quantity demanded, so this is what is generally graphed (and thought of).

Mathematically, we have:

$$q_D = f(p, p_{RG}, M, \text{tastes, expectations})$$

where p is the price of the good in question, p_{RG} is a vector of prices of related goods, and M is consumer income or budget. We can't graph this function, which has at least six dimensions, and since we are usually interested in the relationship between price and quantity demanded in most situations, we think of the demand function as:

$$q_D = f(p \mid p_{RG}, M, \text{tastes, expectations}).$$

Economists frequently make claims followed by "*ceterus paribus*" or "all else equal." The point is that we recognize other factors might come into play, but that the current analysis is assuming that those things are being held fixed. Thus, when graphing demand, we graph quantity demanded against price, holding the prices of related goods, income, tastes, and expectations all fixed. Changes in price, then, are represented in movements along the demand curve. Changes in the prices of related goods, income, tastes, and expectations, in comparison, will result in the entire demand curve shifting. Hence, we call the

prices of related goods, income, tastes, and expectations the **demand shifters** as they shift the location of the demand curve.

The **law of demand** claims that quantity demanded increases as price decreases (and that quantity demanded decreases as price increases). That is, the law of demand stipulates a negative or inverse relationship between quantity demanded and price.

[Graph a typical demand curve.]

Given a particular price, a specific quantity demanded comes about. Notice that hidden in the background are fixed values for the demand shifters. If price changes, quantity demanded moves along the demand curve. ***Changes in price lead to movements along the demand curve***.

When the demand shifters are held fixed, the demand function reduces to a function of two variables. We will frequently assume demand functions are linear. Moreover, the law of demand stipulates a negative relationship between the two, which accounts for the negative coefficient on price. A typical linear demand function is:

$$q_D = A - Bp, \text{ or, for example, } q_D = 400 - 4p.$$

Sometimes the same information will be represented in an **inverse demand function** by listing price as a function of quantity demanded. In this case, the inverse demand functions are:

$$p = \frac{A}{B} - \frac{q_D}{B}, \text{ or, for example, } p = 100 - 0.25q_D.$$

Suppose that, while holding price fixed, a demand shifter changes. The resulting shift can be an increase in demand or a decrease in demand.

An **increase in demand** requires that more be demanded at the same price (or that people are willing to pay a higher price for the same quantity). Thus, an increase in demand is represented by the demand curve shifting to the right (or up). Sometimes this is called a shift out in demand.

[Graph an increase in demand.]

A **decrease in demand** requires that less be demanded at the same price (or that people are willing to buy the same quantity only if the price falls). Thus, a decrease in demand is represented by the demand curve shifting to the left (or down). Sometimes this is called a shift in in demand.

[Graph a decrease in demand.]

Each demand shifter can be associated with either type of shift in demand. The intuition is straightforward:

- ↓ price of a complement or ↑ price of a substitute → increase in demand (shift out).
- ↑ price of a complement or ↓ price of a substitute → decrease in demand (shift in).

- ↑ income → increase in demand (shift out) if the good is normal. (Opposite if inferior.)
- ↓ income → decrease in demand (shift in) if the good is normal. (Opposite if inferior.)

- ↑ taste for the good → increase in demand (shift out).
- ↓ taste for the good → decrease in demand (shift in).

2. Supply

The markets for inputs in the production process (**factor markets**) and technology produces firm **supply** of a good. The **supply function**, or simply **supply**, is usually thought of as a relationship between the price of a good and the **quantity supplied** of the good. There are two things to note:

1. There is a difference between ***supply*** (which is a function or the entire relationship between price and quantity) and ***quantity supplied*** (which is a number).

2. The relationship is actually quite complex, but we are most often interested in the relationship between price and quantity supplied, so this is what is generally graphed (and thought of).

Mathematically, we have:

$$q_S = f(p, p_I, \text{technology})$$

where p is the price of the good in question and p_I is a vector of prices of potential **factors of production** (i.e., inputs into the production process). We can't graph this as it is at least four dimensional, and since we are usually interested in the relationship between price and quantity supplied, we think of the supply function as:

$$q_S = f(p \mid p_I, \text{technology}).$$

When graphing supply, we graph quantity supplied against price, holding fixed the prices of potential inputs and technology. Changes in price, then, are represented in movements along the supply curve. Changes in prices of potential inputs and technology will result in the entire supply curve shifting. Hence, the **supply shifters** are the price of inputs and technology.

The **law of supply** claims that quantity supplied by firms increases as the price increases (and that quantity supplied by firms decreases as price decreases). That is, the law of supply stipulates a positive or direct relationship between quantity supplied and price.

[Graph a typical supply curve.]

Given a particular price, a specific quantity supplied comes about. Notice that hidden in the background are fixed values for the price of potential inputs and the level of technology. If price changes, quantity supplied moves along the supply curve. ***Changes in price lead to movements along the supply curve***.

When the supply shifters are held fixed, the supply function reduces to a function of two variables. We will frequently assume supply functions are linear. Moreover, the law of supply stipulates a positive relationship between the two, which accounts for the positive coefficient on price. A typical linear demand function is:

$$q_S = -a + bp, \text{ or, for example, } q_S = -20 + 2p.$$

Sometimes the same information will be represented in an **inverse supply function** by listing price as a function of quantity supplied. In this case, the inverse supply functions are:

$$p = \frac{a}{b} + \frac{q_S}{b}, \text{ or, for example, } p = 10 + 0.50q_S.$$

Suppose that, while holding price fixed, a supply shifter changes. The resulting shift can be an increase in supply or a decrease in supply. Intuitively, an increase in supply requires that the costs of production be reduced. Alternatively, a decrease in supply will result from having a more costly production process. Thus, we have the following.

An **increase in supply** requires that more be supplied at the same price (or that firms are willing to supply the same quantity at a lower price.). Thus, an increase in supply is represented by the supply curve shifting to the right (or down). Sometimes this is called a shift out in supply.

[Graph an increase in supply.]

A **decrease in supply** requires that less be supplied at the same price (or that firms are willing to supply the same quantity only if the price increases). Thus, a decrease in supply is represented by the supply curve shifting to the left (or up). Sometimes this is called a shift in in supply.

[Graph a decrease in supply.]

Each supply shifter can be associated with either type of shift in supply. The intuition is straightforward:

- ↓ price of inputs → increase in supply (shift out).
- ↑ price of inputs → decrease in supply (shift in).

- ↑ technology → increase in supply (shift out).
- ↓ technology → decrease in supply (shift in).

3. Equilibrium

A market is in **equilibrium** or comes to rest at an **equilibrium price** or a **market clearing price** when quantity demanded at the equilibrium price equals the quantity supplied at the equilibrium price. Graphically, this happens only where demand and supply intersect.

[Draw a graph of equilibrium.]

Algebraically, solving for an equilibrium price and an equilibrium quantity requires setting both prices equal and solving for the equilibrium quantity, or by setting quantity demanded equal to quantity supplied and solving for the market clearing price (also called the equilibrium price). Using the examples from above:

$$\begin{gathered} q_S = q_D \\ -20 + 2p = 400 - 4p \\ 6p = 420 \\ p^* = \$70 \end{gathered}$$

At this stage, the equilibrium quantity can be solved by plugging in the equilibrium price into either equation:

$$q_D = 400 - 4(70) = 400 - 280 = 120 \text{ units demanded.}$$
$$q_S = -20 + 2(70) = -20 + 140 = 120 \text{ units supplied.}$$

Thus, the market equilibrium quantity is $q^* = 120$ units. Notice the starring system (*) for equilibrium values.

4. Using Supply & Demand

When a market is in equilibrium, there is no reason for price (or quantity) to change. Economic analysis, however, is applied to situations when something does happen. The trick to note is that the thing that happens is not that the equilibrium price changes on its own. This is rarely interesting or provides a need for analysis. Something besides price changing provides the catalyst for the analysis.

Generally, there are three sources of market effects in which using **supply and demand analysis** is appropriate: (1) a demand shifter has changed, (2) a supply shifter has changed, or (3) the government has imposed a policy, perhaps a new tax or regulation, on the market. Even under (3), however, the government action ultimately affects demand or supply shifters or both.

What happens to the equilibrium price and quantity if: [draw]

- Demand increases? Answer: $\uparrow p^*$ and $\uparrow q^*$.
- Demand decreases? Answer: $\downarrow p^*$ and $\downarrow q^*$.
- Supply increases? Answer: $\downarrow p^*$ and $\uparrow q^*$.
- Supply decreases? Answer: $\uparrow p^*$ and $\downarrow q^*$.

Example 1. What is likely to happen to the price of beef in England (and the quantity bought and sold in England) if English authorities ban U.S. raised beef due to concerns regarding the use of growth hormones?

Analysis. While the ban does not affect the demand for beef in England, the ban does decrease the supply of beef in England. This decrease in supply of beef leads to an increase in the price of beef paid by English consumers and a decrease in the quantity of beef purchased in England.

Example 2. What is likely to happen to the price of medical services in the United States if registered nurses are allowed to administer prescription drugs and conduct routine medical services in addition to doctors?

Analysis. Demand for medical services such as these is not likely to respond to who is performing the service. When nurses can perform more medical services, however, the cost of medical services falls as nurses cost less than doctors. When the cost of inputs in the production of medical services falls, the supply of medical services will increase (i.e., the supply of medical services shifts to the right). The result is that the price of medical services is likely to fall if nurses are allowed to perform more tasks.

Example 3. What is likely to happen to the price of bottled water (and the quantity bought and sold) if the government imposes a 50¢ tax on plastic bottles?

Analysis. The government is imposing a 50¢ tax on each plastic bottle of water purchased. As consumers must pay this tax when they purchase the bottles of water, demand for bottled water decreases. As a result, the price of bottled water (net of the tax) will decrease and the number of bottles of water purchased will decrease. Note three things.

1. The equilibrium responses are more likely to be greater in the short run than in the long run. In the long run, firms will package wager differently – in glass bottles, cardboard boxes, pouches, etc.

2. If the tax applies to all containers of liquid beverages, and not just plastic containers, the changes may not be all that severe as consumers might find it difficult to not purchase any beverage containers.

3. The end result is the same if the tax is paid by producers. (This is a huge result in economics.)

Example 4. What is likely to happen to the price of fast food (and the quantity bought and sold) if the government raises the minimum wage to $12 per hour?

Analysis. Increasing the minimum wage, which is what many workers at fast food restaurants earn, increases the production costs of fast food restaurants. In response to these increased costs, the supply of fast food will decrease. However, the increased minimum wage will also increase the income of many low-wage workers, who spend money at fast food restaurants. Thus, the increase in the minimum wage will also increase demand for fast food. The joint effect is that the price of fast food will increase. The effect on quantity is unclear, as seen in the graph. It depends on which effect is greater. In this example, it is likely that the shift in supply dominates the shift in demand, so quantity is also likely to fall.

5. Efficiency

A free and competitive market that is allowed to attain its **competitive equilibrium** is **efficient** (**Pareto efficient**) in that no economic agent can be made better off without hurting someone else. Economists measure economic gains with the word **surplus** For firms, **producer surplus** is very close to the idea of **profits**. For consumers, **consumer surplus** is the dollar value of the gains to trade they have received. The point is that a competitive equilibrium cannot increase the sum of both surplus values (called **total surplus**: TS = PS + CS). It is possible, though economists wouldn't support it, however, for consumer surplus to be increased at the expense of producer surplus or for producer surplus to be increased at the expense of consumer surplus.

[Draw an equilibrium picture with surplus values.]

The graph above shows that there is no way to help producers or consumers without hurting the other group. In fact, there are no "good trades" left untraded in a competitive equilibrium (and no "bad trades" are transacted either).

6. Inefficiency: Bad Government Intervention

If a competitive market maximizes surplus (and is efficient), then almost anything the government does to the market is going to be bad. (We will handle the good things government can do later.)

For example, if the government mandates a maximum price (called a **price ceiling**) to benefit consumers by keeping prices low, the result will be a **quantity shortage** of the good as the government can mandate the maximum price but cannot force firms to produce goods for sale at that price. Examples include price supports for agricultural goods.

[Graph a price ceiling.]

Notice several things that are revealed by the graph:

1. The quantity shortage of the good.
2. The marginal trade not transacted would be a good trade.
3. Producer surplus has fallen.
4. Consumer surplus might be larger or smaller than without the price ceiling.
5. Deadweight loss arises.
6. Price ceilings are placed low on the graph.

If the government mandates a minimum price (called a **price floor**) to benefit producers by keeping prices high, the result will be a **quantity surplus** of the good as the government can mandate the minimum price but cannot force consumers to purchase the good at that price. Examples include rent control and the minimum wage.

[Graph a price ceiling.]

Notice several things that are revealed by the graph:

1. The quantity surplus of the good.
2. The marginal trade not transacted would be a good trade.
3. Consumer surplus has fallen.
4. Producer surplus might be larger or smaller than without the price floor.
5. Deadweight loss arises.
6. Price floors are placed high on the graph.

In both cases, under a price ceiling or under a price floor, therefore, the economy as a whole is worse off (i.e., deadweight loss arises, which must come from somewhere). Put differently, the economy is no longer efficient. But what happens in the real world when the government fixes prices rather than letting the market determine prices? In all economies, scarce goods must be **rationed** somehow. Some possibilities are:

1. Goods are rationed on the **black market**, meaning that consumers and firms break the law and allow economic forces to set the price.
2. Politicians choose who receives the scarce goods. (Members of the Kremlin never starved.)
3. The good is rationed by whoever values the good the most as revealed by whoever is willing to wait the longest in line. (This is never efficient as the time spent waiting in line is wasted.)
4. A worse quality good is produced, for which a competitive economy will produce a market clearing price that satisfies the government's price controls.

Policy Analysis: What has been the result of rent controls in New York City?

1. Side payments for housing units.
2. Too few housing units built.
3. Poor maintenance.
4. Sublets – winners were determined a long time ago.

7. Responding to Changes in Demand and Supply Shifters

If price increases, how will quantity demanded or quantity supplied respond? In some sense, of course, this is asking about the slope of the demand or supply curve. But we want the answer more generally. What is the intuition?

Quantity demanded responds more sharply:

1. The less necessary the good is.
2. The more substitute goods are available.
3. The more specific the good is.
4. In the long run than in the short run.

8. Elasticity

There are benefits to having a universal way of talking about the price and quantity effects from demand shifters, supply shifters, or government interference in a market. Given this objective, clearly we cannot use slope as slope is sensitive to the product involved, the change being considered, and units of measurement.

Economists have developed the idea of **elasticity**. The elasticity of MEASUREMENT NUMBER ONE with respect to MEASUREMENT NUMBER TWO, regardless of what the two measurements, is always the same. It is the **percent change in the first measurement relative to the percent change in the second measurement**. Typically the first measurement is a quantity and the second measure is something measured in money currencies such as prices or income.

The elasticity measure that receives more attention than any other in economics is the **price elasticity of demand** or simply **elasticity of demand**, though it is better stated as the **elasticity of demand with respect to price**. The elasticity of demand is represented by ε so we have that:

$$\varepsilon = \frac{\%\Delta q_D}{\%\Delta p}.$$

The next most important elasticity measure is the **price elasticity of supply** or simply **elasticity of supply**, though it is better stated as the **elasticity of supply with respect to price**. The elasticity of supply is represented by η so we have that:

$$\eta = \frac{\%\Delta q_S}{\%\Delta p}.$$

Because of the law of demand, we know that the two changes work in opposite directions when measuring the elasticity of demand. Officially the elasticity of demand is negative, therefore, but the convention is to drop the negative sign. Empirical estimates include:

- Elasticity of demand for housing = 0.12.
- Elasticity of demand for beer = 0.8.
- Elasticity of demand for premium cable TV services = 1.8.
- Elasticity of demand for lamb = 2.7.

The interpretation is *very important*. First, there are no units of measurement on elasticities because the % signs cancel out. Second, a 1% increase in price leads to an ε% decrease in quantity demanded, or a 10% increase in price leads to a 10ε% decrease in the quantity demanded, and so on.

- If the price of housing increases by 1 percent, the quantity of housing demanded falls by 0.12%.
- If the price of beer increases by 10 percent, the quantity of beer demanded will fall by 8 percent.
- If the price of premium cable TV services increases by 5 percent, the quantity of premium cable service will fall by 9 percent.
- If the price of lamb decreases by 10%, the quantity of lamb demanded will increase by 27%.

Empirical measures of the elasticity of supply (or any elasticity) are defined similarly, but remember that the relationship is positive with supply.

Other concepts of elasticity are important and useful.

- The elasticity of hours of work with respect to the wage for teenagers is ≈ 2.5 (very responsive).
- The elasticity of hours of work with respect to the wage for males between 25 and 55 is ≈ -0.1.
- The elasticity of hours of work with respect to the wage for females between 25 and 55 is ≈ 0.2.
- The elasticity of pass rates with respect to money spent on local education is 0.3 for whites and 0.6 for blacks.

The **cross-price elasticity** between the quantity of good *x* and the price of good *y* gives the percent change in quantity demanded of good *x* when the price of good *y* changes by 1 percent. Thus, we define the two goods as **complements** whenever the cross-price elasticity is negative, and we define the two goods as **substitutes** whenever the cross-price elasticity is positive.

The **elasticity of income** is the percent change in quantity demanded given a 1 percent change in income. A good is defined to be a **normal good**, therefore, if the elasticity of income is positive. If the elasticity of income is negative, the good is said to be an **inferior good**.

Frequently economists classify elasticity measures as being **inelastic**, **unitary elastic**, or **elastic**. All three definitions refer to the response of the item in the numerator to the change in the item in the denominator. If an elasticity measure is less than 1, then it is said to be **inelastic** as there is not a corresponding change in the numerator as there was in the denominator. If an elasticity measure is greater than 1, then it is said to be **elastic** as there is more than a corresponding change in the numerator to the change in the denominator. If an elasticity measure equals 1, then it is said to be **unitary elastic** as there is a corresponding change in the numerator to the change in the denominator. In the examples above, housing and beer are inelastic while premium cable TV services and lamb are elastic.

When the government imposes a tax on a specific product, regardless of who officially pays the taxes to the government, the burden of the tax falls on consumers and producers. The more responsive consumers are to price increases ***relative to producers***, the less of the tax consumers will bear. Likewise, the more responsive firms are to price increases ***relative to consumers***, the less of the tax producers will bear. Under general conditions, the rule is:

$$\text{Percent of tax paid by consumers} = 100 \times \frac{\eta}{\eta + \varepsilon} \text{ and percent paid by producers} = 100 \times \frac{\varepsilon}{\eta + \varepsilon}.$$

Policy Analysis: Payroll taxes.

The elasticity of demand for hours of work with respect to the wage is about 1.00, while the elasticity of hours of work supplied with respect to the wage is approximately 0.15. Thus, consumers of labor (i.e., firms) bear 100 (0.15) / (0.15 + 1.00) = 13% of payroll taxes while producers of labor (i.e., workers) bear 100 (1.00) / (0.15 + 1.00) = 87% of payroll taxes. A policy change that exempted low-wage workers from payroll taxes, therefore, would be akin to increasing the wage rate by 87% of 12.4%, which equals 10.8%.

Policy Analysis: Maximizing firm revenues.

Firms are not in business to maximize revenues. Rather, they are in business to maximize profits. If costs don't depend on output, however, the two goals are one in the same. It is easy to show that maximizing revenues occurs when $\varepsilon = 1$. That is, when a percent change in price is exactly offset by the same (but opposite) percent change in output.

9. Calculating Elasticities

There are many "textbook" formulas for calculating elasticities. You can use any formula you want (Taylor is good), as long as you are consistent and correct. When using linear demand and linear supply functions, however, the best formulas are the calculus formulas. In particular, write supply and demand as we have done above:

$$q_D = A - Bp \quad \text{and} \quad q_S = a + bp.$$

Be sure that you solve for quantity demanded and quantity supplied if given an **inverse demand** or **inverse supply** function (e.g., $p = f(q)$).

Once in the form above, the elasticities are:

$$\varepsilon = \frac{\%\Delta q_D}{\%\Delta p} = \frac{\Delta q_D}{\Delta p} \cdot \frac{p}{q_D} = B \cdot \frac{p}{q_D} \quad \text{and} \quad \eta = \frac{\%\Delta q_S}{\%\Delta p} = \frac{\Delta q_S}{\Delta p} \cdot \frac{p}{q_S} = b \cdot \frac{p}{q_S}.$$

What is the elasticity of demand when price equals \$50 in the above example?

Answer. When price equals \$50, quantity demanded = 400 – 4(50) = 200. Thus,

$$\varepsilon = \frac{\%\Delta q_D}{\%\Delta p} = \frac{\Delta q_D}{\Delta p} \cdot \frac{p}{q_D} = B \cdot \frac{p}{q_D} = 4 \cdot \frac{50}{200} = 1.00.$$

What is the elasticity of supply when price equals $40 in the above example?

Answer. When price equals $40, quantity supplied = –20 + 2(40) = 60. Thus,

$$\eta = \frac{\%\Delta q_s}{\%\Delta p} = \frac{\Delta q_s}{\Delta p} \cdot \frac{p}{q_s} = b \cdot \frac{p}{q_s} = 2 \cdot \frac{40}{60} = 1.33 .$$

IV. FOUNDATIONS OF MICROECONOMICS (TAYLOR CHAPTERS 8 – 12).

1. Decision Making

For now, we will restrict attention to normal goods; i.e., goods that one buys more of when income increases. There are two effects in play when thinking about decision making.

The **income effect** says that when one gets wealthier or richer, which in economics is represented by an expanding budget line or opportunity set, one demands more of any normal good. Whenever the budget line expands to include all previous choices plus more, therefore, demand for a normal good increases (or at least doesn't decrease) due to the income effect.

The **substitution effect** says that, when comparing two goods and relative prices change, demand will increase for the good that has become relatively cheaper and demand will decrease for the good that has become relatively more expensive. Hint: look at p_x / p_y. Regardless of which price changes (or even if both change), if p_x / p_y increases, then the consumer will demand more of the *y* good and less of the *x* good (i.e., the consumer substitutes toward the *y* good and away from the *x* good.) Similarly, if p_x / p_y decreases, then the consumer will demand more of the *x* good and less of the *y* good (i.e., the consumer substitutes toward the *x* good and away from the *y* good.)

Example: General Price Change

Suppose the price of *x* increases. As a result, two things happen: (1) the budget line contracts and (2) good *x* has become relatively more expensive than good *y*. What are the consequences of these?

(IE) BL contracts → opportunities ↓ → buy less of good *x* and less of good *y*.
(SE) Good *x* has become relatively more expensive than good *y* → buy less of good *x* and more of good *y*.

Together, we have: ↑ p_x → ↓ quantity of good *x*.

What about good *y*? The effect on *y* is ambiguous (or unclear) as quantity of *y* falls due to being less wealthy but increases due to it being relatively cheaper. Ultimately, ↑ p_x → effect on quantity of good *y* is unclear.

Example: Change in the Price of Leisure. Do people work more when their wage increases?

Suppose the wage rate increases. As a result, two things happen: (1) the budget line expands and (2) leisure has become relatively more expensive than consumption. What are the consequences of these?

(IE) BL expands → opportunities ↑ → buy more leisure and more consumption.
(SE) Leisure has become relatively more expensive → buy less leisure and more consumption.

Together, we have: ↑ w → ↑ leisure by the income effect but ↓ leisure by the substitution effect. The total effect, therefore, is unclear. Thus, labor supply curves are not necessarily upward sloping.

[Draw a picture of a backward bending labor supply curve.]

What about consumption? The two effects work in the same direction for consumption. An expanded budget set and consumption becoming relatively cheaper both result in purchasing more consumption.

Example: Savings Will decreasing the capital gains tax rate lead to higher savings?

Decreasing the capital gains tax rate implicitly increases the rate of return, r. Recall too that the price of a dollar of consumption today is \$1 while the price of a dollar of consumption tomorrow is $1 / (1 + r)$ which is less than \$1, as saving $1 / (1 + r)$ will grow to \$1 by tomorrow. So now, what are the effects of lowering the capital gains tax rate?

(IE) The budget line expands, as more bundles are now available. With more options available, the consumer increases consumption of both goods – consumption today and consumption tomorrow due to the income effect. Notice, therefore, as consumption today increases, savings decreases due to the income effect.

(SE) The price of consumption tomorrow has fallen relative to the price of consumption today. This is seen easily as: ↓ t → ↑ r → ↓ $1 / (1 + r)$. Thus, consumption today will fall and savings increases (and consumption tomorrow increases) by the substitution effect.

The end result is that changes in consumption today and savings are unclear as the income effect and substitution effect work in opposite directions. Notice, however, that the effect on consumption tomorrow is unambiguous – consumption tomorrow will increase.

2. Costs

A firm's **cost structure** or **cost function** is labeled by $c(q)$. The idea is that costs monotonically increase with output. Generally, we think of $c(q) = F + vc(q)$ where F is **fixed costs** not depending on output and $vc(q)$ are **variable costs** that depend on output. Therefore, $vc(0) = 0$.

The two most important cost concepts are average costs and marginal costs. **Average costs** are simply total costs per unit of output: $ac(q) = c(q) \div q$. **Marginal cost** is the cost of producing the last unit of output. One way to think of marginal cost is: $mc(q) = c(q) - c(q - 1)$. For those who have had calculus, the marginal cost function is the derivative of the cost function. That is, $mc(q)$ is the slope of $c(q)$.

Example: Linear Total Costs If $c(q) = F + cq$, then $ac(q) = (F / q) + c$ and $mc(q) = c$. For example, if $c(q) = 500 + 10q$, then $ac(q) = (500 / q) + 10$ and $mc(q) = 10$.

Example: Quadratic Total Costs If $c(q) = F + aq + bq^2$ then $ac(q) = (F / q) + a + bq$ and $mc(q) = a + 2bq$. For example, if $c(q) = 200 + 5q + 2q^2$ then $ac(q) = (200 / q) + 5 + 2q$ and $mc(q) = 5 + 4q$.

Lastly, it is important to know that marginals drive averages, not the other way around. Whenever $mc(q)$ is below $ac(q)$, then $ac(q)$ must be falling. Whenever $mc(q)$ is greater than $ac(q)$, $ac(q)$ must be increasing. One implication is that $mc(q)$ will always intersect $ac(q)$ at the minimum of $ac(q)$.

[Draw the standard marginal cost curve and average cost curve, emphasizing the intersection.]

3. Revenue

We will always assume that **revenue** equals price times quantity: $r(q) = p \cdot q$. Of course, this isn't always true in the real world.

When demand for a firm's product is downward sloping, then selling more units of output has two effects. First, the firm receives more revenue because it sells more units of output. Second, however, is that the firm must lower its price in order to sell more units of output, and it must do this by lowering its price on all units sold. Thus, the firm collects less money on the units it would have sold before price was lowered. The difference between these two ideas produces the firm's **marginal revenue**.

[Draw the standard demand curve with marginal revenue rectangles.]

Algebra Example: When the firm faces a linear inverse demand curve of $p = a - bq$, it will always be the case that $mr(q) = a - 2bq$. That is, marginal revenue will have the same price intercept, but it will be twice as steep, so it will intersect the quantity axis halfway between zero and the demand curve intercept.

The implication is that the firm can increase price or increase quantity which increases revenue, but when it does so the other variable falls and that lowers revenue.

The only exception to this rule is if the firm faces **perfectly elastic demand** for its product. In this case, demand is horizontal at the maximal willingness to pay, and at this price the firm can sell as much as it wants (and sells zero units at any higher price). In this case, there is always a good rectangle from increasing quantity and never the bad rectangle from lowering price because the firm does not need to lower price in order to sell more.

[Draw a picture of perfectly elastic demand and the good rectangle.]

4. Profit

For our purposes, **profit** equals revenue minus costs, so $\pi(q) = r(q) - c(q)$. There are two things to note. First, economic profit takes into account all opportunity costs. The most important of which is the price or value of labor. An independent contractor may earn an accounting profit of $90,000 for the year, but if that person would earn $75,000 in whatever job she would choose if she wasn't an independent contractor, then the contractor's economic profit is $15,000. In this way, an economic profit of $0 is acceptable, even in the long run. Second, the profit-maximizing quantity for the firm to choose to produce is where $mr(q) = mc(q)$. This is the standard economic result of doing something as long as marginal benefits exceed marginal costs.

[Draw a picture of firm demand, marginal revenue, average costs, and marginal costs.]

The above graph, therefore, can be used to determine q^*, the profit-maximizing quantity for the firm to produce. The graph, however, also can be used to graphically display profit.

$$\pi(q) = r(q) - c(q) = p \cdot q - c(q) = p \cdot q - q \cdot c(q) / q = q\,[p - c(q) / q] = q\,[p - ac(q)].$$

That is:

$$\pi(q) = q\,[p - ac(q)].$$

In other words, profit equals profit per unit times the number of units sold. This is a rectangle on the above graph.

[Draw the profit rectangle on the above graph.]

For the record, we are not going to talk about **shutting down**, which is something that will be discussed in Intermediate Micro or about **entry and exit**, which is something that is discussed extensively in Industrial Organization.

5. Perfect Competition

The general assumptions of **perfect competition**, which is the ideal **market structure**, are:

- All firms make an identical good and share an identical technology.
- There are no transportation or information costs. All consumers have perfect information.
- There are no restrictions on entry or exit in the long run. (Firms can only enter or exit in the long run, however.)

These assumptions imply that, although there is a downward sloping market demand curve, each firm faces a perfectly elastic demand curve at the market price. The assumption of free entry and exit in the long run implies that long-run profits must equal zero.

[Draw graph of market equilibrium producing individual firm demand curves.]

In this case, $mr(q) = p$, and each firm's profit-maximizing action is to choose q such that $mc(q) = p$.

[Indicate the equilibrium and profit level on the above graph.]

Long-run Analysis

So, given this state of affairs, what will happen in the long run?

Case 1. When there are positive profits in the short run, entrepreneurs will enter the market. This shifts the market supply out, which drives down price, to the point where p = minimum ac. That is, price is driven down until profits have been competed away. (Keep in mind that entry cannot happen in the short run. Entry and exit always takes place in the long run.)

Case 2. When there are negative profits in the short run, some firms will exit the market in the long run. This shifts the market supply in, which drives price up, to the point where p = minimum ac.

In the long-run, therefore, $p = mc$ and p = minimum ac. This is why perfect competition is the ideal market structure – it is **productively efficient** (or **producer efficient**) in the long run as all goods are produced at their minimum price, and it is **allocatively efficient** (or **consumer efficient**) as anyone who is willing to pay the marginal cost of producing the good can do so and receive the good.

The fact that perfect competition is producer efficient in the long run means that ***the price of the good will always tends toward (or be driven towards) the minimum average cost in the long run***, regardless of other products, consumer demand, or anything else. If the airline industry is perfectly competitive, for example, the price of airline tickets will approach the true cost of supplying seats on flights and will have nothing to do with the cost of alternative modes of transportation.

[Draw long-run perfect competition. Do an example of a short-run shock and the return to long-run equilibrium.]

6. Monopoly

The general assumptions of **monopoly**, which is frequently considered the worst **market structure**, are:

- There is only one firm.
- There are barriers to entry that prevent entry by any other firm in the long run.

The design of monopoly, therefore, is that the firm is the market. Thus, a monopolist's demand curve is the market demand curve, which is downward sloping. Therefore, the monopolist faces a downward sloping demand curve and a downward sloping marginal revenue curve.

[Draw a graph of the firm's demand, marginal revenue, average cost, and marginal cost curves. Indicate equilibrium quantity, profit, and inefficiency.]

The implications to monopoly are:

- Price is higher than under perfect competition.
- Quantity is lower than under perfect competition.
- Profit is greater than or equal to zero, even in the long run.
- The monopoly market is not productively efficient as production does not take place at minimum average costs.
- The monopoly market is not allocatively efficient as marginal benefit exceeds marginal cost at the profit-maximizing value of quantity.

There is no short-run to long-run analysis for monopoly, because the monopolist doesn't face competition from entering firms in the long run. Of course, if the monopolist loses money, it could exit in the long run.

How do monopolies come about? That is, what are the sources of monopoly power?

- Legal rights – patents, copyrights, government franchise.
- Exclusive access to resources.
- Technological advantages.
- Superior products – e.g., scrubbed plasma.
- Predatory pricing.

Predatory pricing occurs when a (large) firm sells below marginal cost in order to drive competitors out of business.

Loss-leaders are products that are sold below marginal cost in order to entice customers into one's store. Depending on location, loss-leaders may or may not be legal.

Natural Monopoly is a situation where technology is such that ***society*** is best served by having a single provider of the good. Examples like water, police, electricity, etc. are plentiful but be careful. It used to be thought that phone service, cable television, and mail delivery were all natural monopolies. Economists now generally think that none of these industries are natural monopolies.

The best way to model natural monopoly is $c(q) = F + cq$.

[Draw natural monopoly. Indicate equilibrium and inefficiency.]

How should a natural monopoly be regulated?

- **Regulated price**. The problem with a regulated price is that there is no incentive to keep quality very high. Moreover, if the regulated price is based on cost estimates, then there is no reason to keep costs down prior to the regulation inquiries.

- **Average cost pricing**. Most localities practice average cost pricing, meaning that firms with the monopoly franchise are expected to earn zero profits. Again, the problem is that there is no incentive to keep costs low or to innovate.

- **Milton Friedman's** response is to not protect the monopoly franchise too eagerly. The USPS would have been absolved long ago, instead of protected, if the government had followed his advice. Service would be much better as well.

7. Monopolistic Competition

The general assumptions of **monopolistic competition**, which is the most common **market structure**, are:

- All firms make a slightly different good.
- There are no transportation costs, and all consumers have perfect information.
- There are no restrictions on entry or exit in the long run.

These assumptions imply that each firm faces a downward sloping demand curve for its product. Because products are similar across firms, a firm may not be able to set a really high price, but the point is that it can increase price a little bit and only lose some of its customers but not all of its customers as a firm in a

perfectly competitive market would, because some of its customers would rather pay the higher price than purchase a different (though similar) good.

Still, the market demand curve and firm demand curves are different. As an example, although McDonalds faces a downward sloped demand curve, it is not the same demand curve that describes demand for fast food throughout the fast food industry.

[Draw a graph of the market vs. firm. Indicate the equilibrium, including profit.]

Long-run Analysis

So, given this state of affairs, what will happen in the long run?

Case 1. When there are positive profits in the short run, entrepreneurs will design new products and enter the market. This shifts the market supply out, which drives down price of the general product. But, what it really does to firms is to take away some of its demand. Thus, holding cost curves in place, entry by other firms reduces firm demand and marginal revenue to the point where p equals $ac(q)$ exactly above where $mr(q)$ equals $mc(q)$ as this is the only point where profit equals zero, which must be the case whenever there is free entry in the long run.

Case 2. When there are negative profits in the short run, some firms will exit the market. This shifts the market supply in, which drives price of the general product up. But, what it really does to firms is to give each firm some more demand. Thus, holding cost curves in place, exit by other firms increases firm demand and marginal revenue to the point where p equals $ac(q)$ exactly above where $mr(q)$ equals $mc(q)$ as this is the only point where profit equals zero, which must happen whenever there is free entry.

[Draw long-run perfect competition.]

The results from monopolistic competition:

- A price lower than under monopoly but higher than under perfect competition.
- A quantity greater than under monopoly but lower than under perfect competition.
- A market that is not productively efficient (producer efficient) as quantity is not produced at minimum average cost. (In fact, the problem is that there are too many firms, all producing too little output.)
- A market that is not allocatively efficient (consumer efficient) as marginal benefit exceeds marginal cost at the profit-maximizing value of quantity.

In terms of monopolistic competition, the real question of efficiency concerns the benefit society receives from having options to choose from. For example, under monopoly, there would only be McDonalds, and prices would be 50% higher. This is clearly bad for society. Under perfect competition, there would only be McDonalds, but prices would be 50% lower. This is good in that prices are lower, but it is bad in that people no longer have choices. So, just how bad monopolistic competition is depends on your tastes for variety.

8. Oligopoly

The last market structure to mention is oligopoly. Under oligopoly, there are just 2 or 3 firms, and entry is prohibited. It turns out that oligopoly can be very much like a monopoly if the firms form a **cartel**, but that oligopoly can also be very much like perfect competition if the firms compete in prices. Anything between the two is also a possibility.

There are two final points to make on oligopoly. First, the members of a cartel come together to set the monopoly price, but once they each return to their own firm (or country) they are individually responsible for restricting supply more than they otherwise would. In particular, if a member of the cartel expands quantity, that member receives the entire "good" rectangle but very little of the "bad" rectangle as all other members of the cartel sell their quantity at the lower price. Thus, the challenge of any cartel is ***enforcement of the agreement***, because each member has an incentive to deviate from the agreement. Second, the implication is that ***oligopoly isn't necessarily bad***. To get an idea of whether the oligopoly market structure is bad, ask if price is close to marginal cost. If so, then the oligopoly is likely competing in prices. If not, then the oligopoly is probably colluding and acting similar to a cartel.