Supply & Demand

The study of economics is really the study of markets and exchange. In particular, we will examine how markets work or sometimes as to why they don't work. We will study first the case of local markets, developing key concepts that will be used later when we discuss aggregate markets, that is markets on the national scale. Another aspect of exchange is the internal organization of firms and at what point is it more efficient to engage in market transactions as opposed to handling that exchange within a firm. That decision is related to transactions costs within the firm compared to market transactions costs. More on that topic will be presented later in the microeconomics course.

In this course, we will concern ourselves only with the direct effect of events and policy actions. We cannot consider every consequence to every action. Usually the immediate effects are predominant. Considering only immediate effects is called partial equilibrium analysis. In advanced courses, general equilibrium analysis is employed. Of course, the mathematical level of sophistication required is much greater.

Overview

When we shop in a supermarket it is not unusual to wonder why some products are so expensive and others cheap. The answer may be in asking additional questions related to supply and demand. Looking at it from the supermarket's point of view, we may notice that sales are down. Again, we want to know why. Different answers will cause us to take different actions. Taking the wrong action may be very costly, leading the firm into bankruptcy.

In our exploration of supply and demand we are studying the operation of a market. Markets encompass the selling and buying of a good or service (or combination) and can exist in a physical location or in cyberspace. Anywhere that buying or selling is taking place a market transaction is ocurring. Markets can have different characteristics that shape its behavior in varying ways. Obviously a buyer that has many merchants vying for her business is in a different position than a group of buyers forced to buy from only one seller, a monopoly.

Competitive Market Assumptions

- Many buyers and sellers
- Free entry and exit
- Information
- No transactions costs
- Homogeneous goods
- No externalities

Usually the first type of market studied is the competitive market model. It has some assumptions that are necessary for it to work in establishing and maintaining equilibrium.

Many Sellers and Buyers

First, there are many buyers and sellers; which means everyone is a price taker. Let's consider an example to make this clear. As a buyer of fine milk products you walk into Publix and demand that they sell you a gallon of milk for $1.00. They laugh! Clearly, however there are plenty of buyers who will pay the market rate of $3.00 per gallon. You will not be missed.

On the other hand, Publix tries to price milk at $6.00 per gallon. Shopping now becomes a pleasure at

Winn-Dixie where milk is $3.00 per gallon, and Publix does not sell any milk. Both the customer and Publix must accept the market price. When someone can impose a price, be it the buyer or seller, she has market power. When a seller has market power she tends to price much higher than their product costs, earning an economic profit. In a competitive market, price is equal to costs (which include a normal operating profit).

Many sellers means many suppliers. For this to occur, there has to be free entry and free exit. Free entry (also known as open entry) means that any firm can enter the market to provide the good or service. For example, to enter the chicken sandwich market, Burger King needs to only buy chicken and advertise its availability. That means chicken restaurants and chicken customers can expect the quantity supplied of chicken sandwiches to increase if price increases.

Entry and Exit

In contrast, if entry is blocked, firms cannot enter the market. Therefore, there is no incentive to keep prices low, as the incumbent firms will not lose business to new entrants. For example: to manufacture and distribute televisions require an enormous outlay of capital, technical electronic expertise, and brand name recognition by consumers who would buy it. Very few firms have these capabilities, so they form effective entry barriers. In the extreme, there may be legal barriers such as patents, copyrights, etc. that prevent any firm from entry.

Free exit is just as important as open entry. Let's say that an enticing opportunity to make a profit manufacturing and distributing shoes in Brazil becomes available. So you invest $l10 million and earn $20 million within a year. You fly down to Rio to collect your profit; you party a little, and you start to board the plane to return to Florida when... the customs agent kindly tells you that you may return to Florida but not your money. Had you known that profits could not be remitted to Florida, you would have changed your mind about investing in Brazil.

Blocked exit hurts in two ways: one, it may deter entry, and secondly, it stops capital from flowing to its best use. For example, you may have been planning to use your profits from Brazil to open up a ranching operation in Argentina.

One of the factors affecting exit is the concept of sunk costs. When a mining operation begins, the firm must construct an ore processing plant at the mine site. The plant cannot used for any other purpose nor can it be moved. Funds once spent on it are lost forever. These are referred to as sunk costs. If a large amount of sunk costs are incurred upon entry into the industry, the firm may reconsider the risks of recovering their investment. If there is a risk the site may not generate enough ore or that the price of the metal may drop rendering the project unprofitable then investment may not occur. Sunk costs are the initial investment needed to finance the project. Not every initial investment may be a sunk cost. Building an Italian restaurant may not be sunk costs. The firm could sell the restaurant to someone else or elect to open it as a Mexican restaurant. In the case of the mining operation, the equipment at the site may not have a market, no one is willing to buy it. A lack of a market for the used equipment or the lack of an alternative use make the investment a sunk cost.

Sunk costs influence entry and exit in several ways. One, a firm may be reluctant to enter an industry that has high sunk costs. Secondly, once in a market, the firm with high sunk costs may be reluctant to leave. A restaurant with specialized cooking equipment may be more willing to wait out a drop in demand if for no other reason then to let other competitors drop out first.

Information

Secondly, we must have perfect information concerning prices, quantities, quality, etc. Both the consumer and producer know the market price, location, product, etc. We will also assume that there are no significant transaction cost and that the products are homogeneous (every product is the same

regardless of supplier). To understand how important are these assumptions, consider the case where they do not apply. For that we will look at the "naive tourist model."

A bus load of tourists from Germany stop at a Stuckey's here in central Florida. They have ten minutes and buy a T-shirt that reads "I Love Mickey Mouse!" They pay $35 and take it back to Munich to impress the relatives. You and I both know that the same shirt can be bought at Wal-Mart for $8. They didn't know better, and retailers were quick to take advantage of the situation.

When one party to a transaction has more information than another, asymmetric information is said to exist. In an extreme case, this may cause the market to break down. For example, let's take the case of used cars. There are two types of used cars: good cars and lemons. A good car is worth $6,000, and a lemon is worth only $3,000. The average price is then $4,500. As a buyer, you realize that this may not be a good deal. You cannot tell from mere inspection as to whether this is a good car or a lemon. At $4,500, the good car sellers will withdraw their cars, because they are not getting a fair price. As the proportion of lemons increase, the average price drops, and as it drops more, good cars are withdrawn, leaving only lemons. At $3,000 only the lemons are available, which the buyers do not want. The used car market, consequently, drys up. If credible guarantees or warranties could be offered, then buyers would be willing to buy the car and pay a better price. We will see cases of asymmetric information again in this course. Creative contracts by the market may not always solve the problem; government intervention may be necessary.

Transactions Costs

Thirdly, there must not be any significant transactions costs. Floridians like to travel for vacations to two favorite spots, North Carolina and the Carribean. In Trinidad, we get off the ship and have thirty minutes, so we buy a local trinket for $12. Upon returning to Florida we find out the kid next door has the same trinket for $3, both made in Taiwan. However, we may even be aware that there was a little shop on top of the mountain in Trinidad that had a cheaper price but chose the shop near the dock. Time has a cost here. Miss the boat and it is very expensive getting home. Time is a transactions cost. Therefore, stores that emphasize convenience can charge more. Stores that sell unique items, charge more. It is difficult to charge more for standardized products such as a gallon of milk by merely calling it leche. Milk is milk (or is it?).

Homogeneous Goods

Fourthly, we assume that the product is homogeneous. That means all products are essentially the same. Otherwise, people would pay more for certain desirable features such as vitamin charged Pepsi. Or, that the level of quality is relatively the same. With the recall of Firestone tires, customers are willing to pay more for a safer tire.

Externalities

Finally, another assumption listed frequently by economists is the absence of externalities or market failure. An externality exists when a person, other than the one consuming or producing the good, either receives a benefit or incurs a cost. When one person eats lunch, virtually no one else benefits directly. The satisfaction of hunger is a private benefit; no one else will receive relief from hunger unless the meal is shared. There is no externality in this case. Let's briefy consider the case where there is a large positive externality arising from the provision of public health services. In other words, people other than those receiving services, benefit. Having at risk children immunized from infectious diseases not only provides those children with a private benefit (freedom from disease) but prevents your children (and yourself) from contracting the illness (at least from the at risk children). Yet, if the cost is too high for low income families, then the service will then become underconsumed to society's detriment. As the at risk children become sick, they spread it (or something else that you are not

immunized against) to everyone else. Health costs increase for everyone every time an epidemic spreads. In this case, the market price system does not efficiently serve society's interest.

Demand

To understand demand, we examine buyer behavior. Obviously, the first question a buyer asks is: what is the price? Afterwards, the buyer evaluates whether or not the product is worth buying. In economics, we talk about utility. We are interested in knowing what desire is satisfied and how it relates to other choices - given constraints such as income and time. In examining the relationship between utility and buying behavior (demand), we look at marginal utility (i.e. marginal benefit). In this context, marginal benefit can be defined as the additional benefit (utility) that is derived from consuming one more unit of this product. Consumers compare this to the marginal cost, which is the price of buying that unit. If the benefit is greater than the cost, then the purchase is made.

For example, let's say that it is dinner time, and a nice pizza pie is available for $8.00. You are in a rush; you are a busy person who earns $120, and you have more work than you can handle. It doesn't pay for you to do your own cooking. And you don't want to wait 30 minutes to get a table to wait twenty minutes more before eating. You haven't had pizza in several weeks (and you haven't grown tired of eating pizza) it will satisfy your hunger; it is well within your income; substitutes are too costly (lost time equals lost earnings); and it goes well with beer.

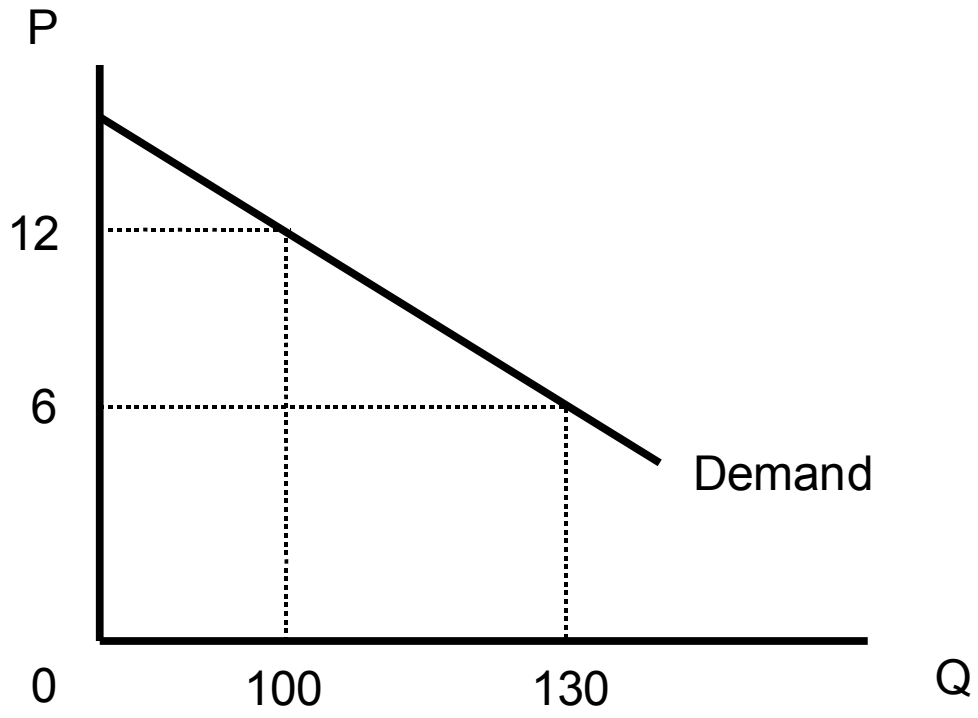
You could buy a second pizza at $8, but it doesn't interest you; you cannot eat that much pizza now. But the server announces the second pizza only costs an additional $3. OK, it wouldn't be fresh tomorrow when you eat it, but it is amazing what microwave energy can accomplish. To induce you to buy more pizza, the price had to be lowered. This is because the marginal benefit is lower: microwave pizza is not as good as fresh pizza. This is the essence of the Law of Demand and why demand curves are downward sloping. In the following discussion, we more formalize the factors that affect demand. Let's start by defining demand.

Definition: Schedule or curve that relates the various quantities of an item that a buyer is willing to purchase at any time given alternative prices, holding other factors constant.

In other words, we are interested in two variables in graphing demand: price and quantity, the relationship of which we express as the Law of Demand. But in explaining demand, we have to consider other factors which we do not vary when graphing demand, which will be called the determinants of demand.

Law of Demand: As price decreases, quantity demanded increases.

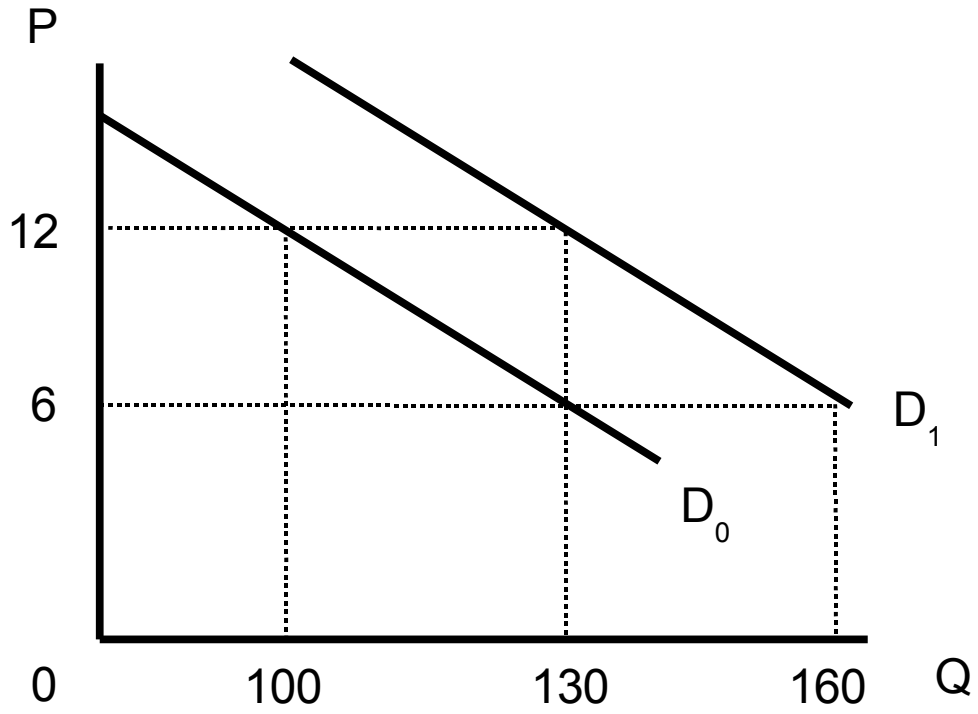
Figure 1.0



Let's say we graph the relationship between the price of pizzas and the quantity demanded. From Figure 1.0 at a price of $12 per pizza, the quantity demanded equals 100. Dropping the price to $6 per pizza causes the quantity demanded to increase to 130.

A change in price causes a change in quantity demanded. This causes movement along the demand curve. A change in demand causes the entire demand curve to shift (either to the right or left), which we will label as determinants of demand.

Figure 2.0



From Figure 2.0, demand increases as it shifts from D_0 to D_1. (The converse is that demand decreases as it moves from D_1 to D_0.) At each price, demand has increased. At $12, 100 pizzas were originally demanded. However, at D_1, demand increases to 130. When demand increases, the demand curve shifts to the right. When demand decreases the demand curve shifts to the left.

Determinants of Demand (Demand Curve Shifting Factors)

- Tastes & preferences
- Number of buyers
- Income
- Prices of related goods

Tastes & Preferences

- An increase in T&P causes the demand curve to shift to the right
- A decrease in T&P causes the demand curve to shift to the left

Let's say that the surgeon general announces that a new study proving that pizza eaters earn more money than burger eaters because of the nutritional value in pizza. Demand for pizza will rise at every price point. Conversely the surgeon general issues a report indicating that pepperoni is really, really bad for you. Consequently, sales of pepperoni pizza drop.

Tastes and preferences can, and do, shift over time. As the population demographics change (in America, there is an aging trend), demand may also shift. In this case, aging baby boomers, which constitute a large percentage of the population, may abandon pizza in favor of pasta. Tastes and preferences can be influenced by the amount and quality of advertising. Generally speaking, more advertising increases demand.

Number of Buyers

- An increase in the number of buyers causes the demand curve to shift to the right
- A decrease in the number of buyers causes the demand curve to shift to the left

The number of buyers are closely related to population size. Obviously, one will sell more pizza in Tampa rather than in Mulberry. What is also important, however, is the demographics of the population. A population that is relatively young consumes more pizza than Sun City, which is a retirement haven. As the American population is aging, this may present some problems, perhaps you would like to try some of our pizza with a the new topping, Geritol cheese?

Income

Income has two effects: Normal, Inferior

Income Normal Goods

- As income increases demand increases
- As income decreases demand decreases

Income Inferior Goods

- As income decreases, demand increases
- As income increases, demand decreases

Generally speaking, pizza is considered a relatively inexpensive meal. As income increases, customers may switch to upscale restaurants, possibly fine Italian restaurants. During times of recession they return to pizzas. This is the essence of the normal income effect.

In this scenario, pizza suffers an income inferior effect while fine Italian restaurants benefit from rising income. However, it is not common for a product to have a combination of normal and inferior effects. While pizzerias are losing customers to fine restaurants; they are gaining customers who can now afford pizza.

Products can switch categories. Possibly our pizzeria now offers trendier pizzas such as California style or calzones that appeal to an upscale cliente.

Prices of related goods

There are two classifications of related goods in consumption: Substitute goods, Complementary goods

Substitute Goods

- As the price of the substitute good increases, the demand for your product increases
- As the price of the substitute good decreases, the demand for your product decreases

For many college students, a close substitute for pizza is a hamburger. If the price of burgers increase, students tend to buy more pizza. Consequently, a special on burgers at the grill will lower pizza sales.

The closeness of the substitute is important. Most people would agree that Coke is a very close substitute for Pepsi. It should come as no surprise that a change in Coke's price will affect Pepsi's sales. Any cut in Coke's price will lower Pepsi's sales and vice versa. Although beer is another drinkable product like Pepsi, changes in the price of beer have very little effect on Pepsi's sales.

Complement Goods

- As the price of the complement decreases, demand for your product increases
- As the price of the complement increases, demand for your product decreases

Complementary goods are traditionally defined as goods that are consumed together. Assume for the

moment that our pizzeria serves only Pepsi as a drink to consume with pizza. The price of Pepsi will become an issue in the consumption of pizza. If the price of Pepsi increases, then fewer customers may stop by the pizzeria causing sales of pizza to drop. Conversely, a drop in the price of Pepsi may spur pizza sales. Especially if consumers associate drinking Pepsi with eating pizza.

Let's consider another example, golf balls and green fees. Let's say that you are Wilson, a golf ball manufacturer. The question is what related products or services will affect demand for your golf balls. The average green fee that golfers pay to play determines how many golfers will play and how many holes of golf are played. That is closely related to the number of balls they lose. Hence it affects Wilson's golf ball sales.

Let's say that the State of Florida assesses an environmental impact fee on water usage. Since golf courses use an enormous amount of water, they pay high impact fees and must pass along this cost to the golfers. Consequently, as green fees are increased, only the experienced golfers are out there and of course they do not lose too many balls thereby depressing golf ball sales.

But let's say that Florida wants to increase tourism. Tourists like to play golf. So Florida grants a special exemption from real estate taxes for golf courses. Since golf courses use a lot of land, and pay a lot of taxes, this is a real break. Of course, they pass on this savings by lowering green fees, thereby attracting a horde of new golfers who promptly lose many balls in the water (unless you want to become gator bait, you don't go retrieving them; that's why we call it a water hazard). Consequently, Wilson sells many balls.

It is not always so obvious what a complementary product may be. Goods may be indirectly consumed together. Consider the case of a convenience store on I-4. Let's say that you are a gasoline jobber, and you deliver gasoline to the gas stations along I-4. You notice that in Polk County, sales are decreasing. Upon inquiry, you are told that Polk County has increased their cigarette tax. Well, when motorists stop for gas, they buy cigarettes, coffee, and beer. Nice combination, right? Rather than pay the high price in Polk they simply buy their cigarettes and gas somewhere else.

In a later section, we will examine what determines the total of demand for all goods and services in the economy, otherwise known as aggregate demand.

Supply

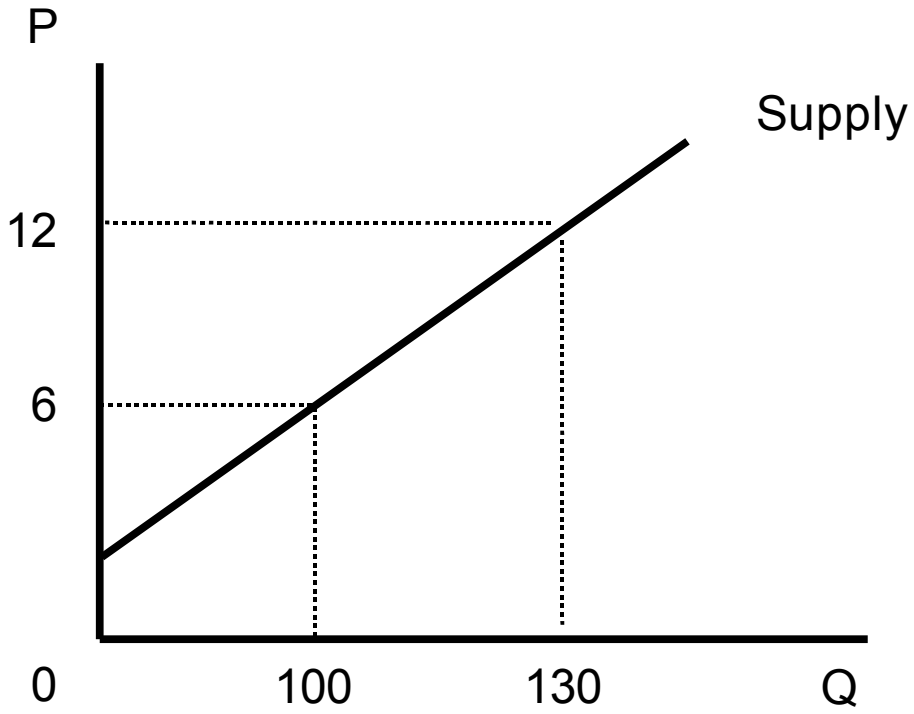
Similar to our discussion on buying behavior, suppliers also apply a marginal cost-benefit analysis. Whereas utility can be rather difficult to measure for buyers, benefits for suppliers are relatively easy; they are the revenue earned. Marginal benefit equals the additional revenue earned by producing and selling one more unit of a product or service, which is the price in a competitive market. Marginal cost reflects the additional costs of production of one more unit.

For example, let's say that selling an additional 100 pizzas at $8 (for now assume additional sales do not require a lower price) generates total revenue of $800. The pizzeria incurs an additional cost of $900, the cost of flour, sauce, cheese, toppings, labor and a normal markup on cost. In this case marginal benefit < marginal cost. The pizzeria should not bake the pizzas. But let's say that customers find out how good these pizzas really are and are willing to pay $10, netting additional revenue of $1,000 versus an additional cost of $900. The decision by the pizzeria should be to "bake'em and sell'em." Let's take a more formal look at supply starting with the definition.

Definition: Schedule or curve that relates quantities of an item that vendors are seeking to sell at any time given alternative prices, holding other factors constant.

Law of Supply: As price increases, quantity supplied increases.

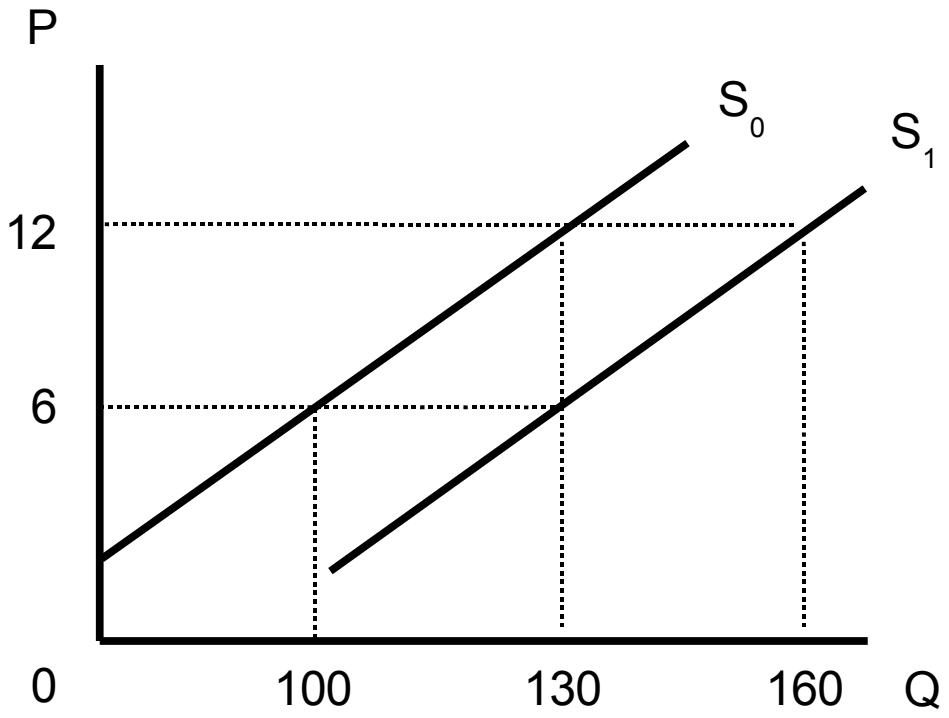
Figure 3.0



From Figure 3.0, at a price of $6, the quantity supplied is 100 pizzas. As price increases to $12, the quantity supplied increases to 130 pizzas. This graph indicates what quantity producers are able to supply at each price point. As price increases, suppliers are able to supply more. This reflects the underlying cost structure in the market. Cost behavior is explained in more detail in courses such as microeconomics, industrial organization, and management accounting. For the purposes of exposition, we are assuming linear supply curves. The results are good first approximations of market behavior.

A change in price causes a change in quantity supplied. This causes movement along the supply curve. A change in supply causes the entire supply curve to shift (either to the right or left) of which causes we will label as determinants of supply.

Figure 4.0



From Figure 2.0, supply increases as it shifts rightward from S_0 to S_1. (The converse is that supply decreases as it moves leftward from S_1 to S_0.) At each price, supply has increased. At $12, 130 units were originally supplied; at S_1, supply increases to 160.

Determinants of Supply (Supply Shifting Factors)

- Production Technology
- Resource Prices
- Number of Suppliers
- Prices of other goods related by production
- Taxes & Subsidies

Production Technology

- As the level of production technology improves, the supply curve shifts to the right (increases)
- As the level of production technology deteriorates, the supply curve shifts to the left (decreases)

As production technology improves, production costs decrease, therefore, allowing the firm to make more at the same price point. An improvement in production technology can be as simple as rearranging workflow so that a chef can cook more burgers on a grill. Industrial engineering and management science are focused on such productivity improvements by studying work habits and improving output quantity or quality.

There can be a deterioration of productivity. Suppose you have been paying your production manager $35,000 per year. One of your competitors offers her $75,000. And of course, she leaves. After her

departure, you notice that factory output drops 35%. It seems that she knew how to manage operations. With her absence, no one knows how to do things quite right. As we shall discuss later in the course, productivity improvements are a major factor in increasing the standard of living.

Input (Resource) Prices

- As resource prices increase, supply decreases
- As resource prices decrease, supply increases

Think about what is needed to make pizza: dough, toppings, tomatoes, spices, cheese, and labor. If any of these inputs increases in price, then the price of pizza will have to increase. Usually if the price of one input increases to one firm, it increases for all firms in that industry. At each price point, less pizza can be supplied. The pie will be smaller or less pies will be supplied. If there is a bumper crop of wheat, tomatoes, olives, etc, then input prices decline, and the quantity supplied can increase.

Prices of Other Goods Related by Production

- As prices of other goods related by production increase, supply for your good will decrease
- As prices of other goods related by production decrease, supply for your good will increase

When designing and building a pizzeria, it is always wise to enable it to handle other food items, such as pastas, in case the market for pizza pies shrinks. Let's say that the market for pastas heats up. Instead of earning $50,000 making pizza, you could earn $150,000 making pastas. Since you cannot make both at the same time, you give up pizzas to make pastas. Consequently, the supply of pizza pies is cut. Pasta is an example of a good related by production. The same facilities and ingredients can make pasta as well as pizza.

In more advanced courses, goods related by production can be classified further into complements and substitutes (we have just given the case of a substitute good in production). In the case of complementary goods, supply of both the original good and the complementary good increase. An example would be beef and leather production. Processing more beef necessarily generates more skin for leather products. In cost and managerial accounting courses we call these joint products. Complementary effects in production can lower costs. Called economies of scope, this is one reason why firms produce multiple products.

Number of Suppliers

- As the number of suppliers increase, supply increase
- As the number of suppliers decrease, supply decrease

As a simple mind exercise, consider what happens when Dominos moves in; the supply of pizzerias and pizzas have increased. To maintain sales you may need to drop your price.

Taxes & Subsidies

- As taxes increase, supply decreases
- As taxes decrease, supply increases
- As subsidies increase, supply increases
- As subsidies decrease, supply decreases

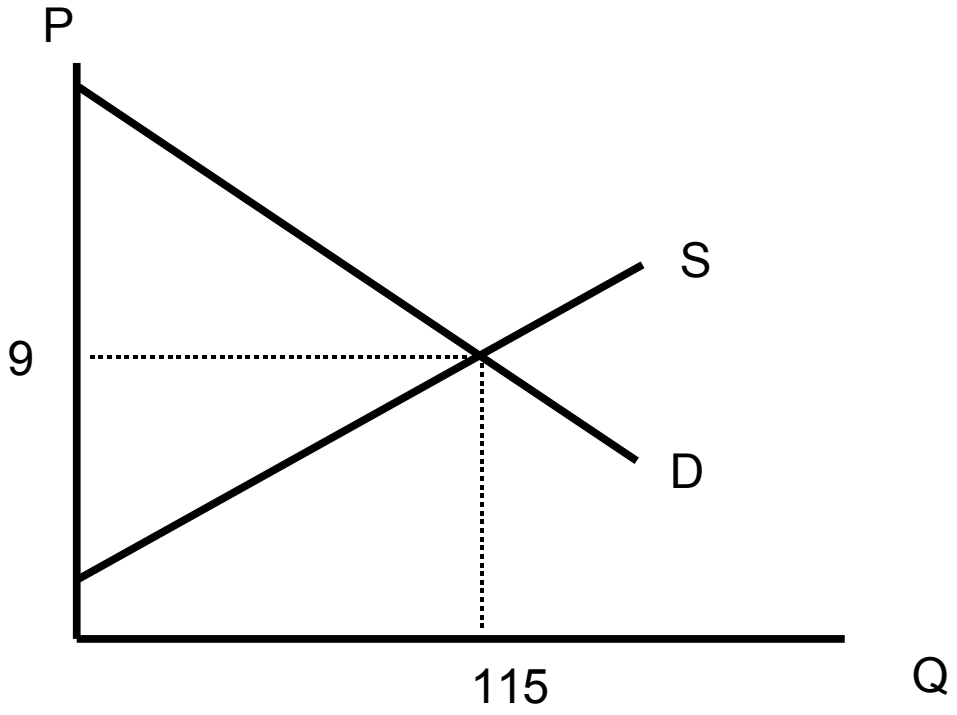
Taxes are a cost of doing business, decrease them and profitability improves as supply increases. Some people argue the best taxes are none. Keep in mind that taxes finance government services which may be needed to provide the legal protection to maintain an orderly market (and thus profitability). Have you ever lived in a neighborhood without police? How fast can you run? I rest my case.

Subsidies are direct payments from government to producers. This may be necessary to encourage production of a good or service that is highly desirable for society such as education. Or a subsidy may

reflect the political power of a special interest group. If pizzas are found to increase knowledge retention, then the government may decide to promote pizza consumption, and in order to increase supply give pizzerias a direct cash payment for each pizza they produce. This has the effect of increasing profit per pizza. More pizzerias may be built, existing pizzerias expand production or Burger King now becomes Pizza King.

Supply & Demand Equilibrium

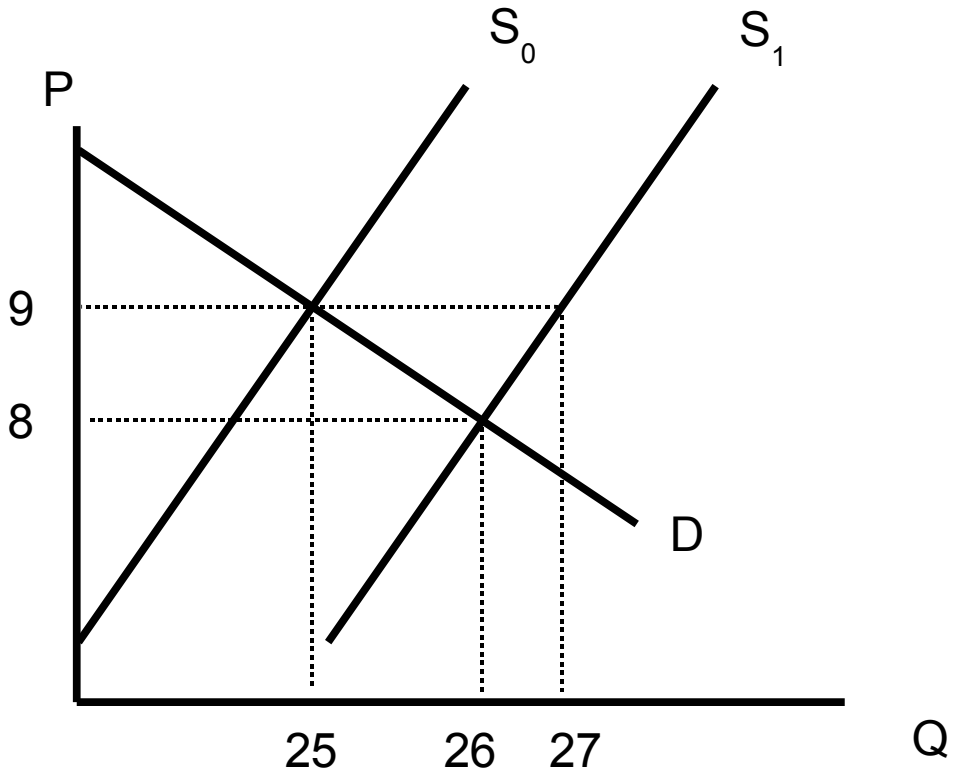
Figure 5.0



From Figure 5.0 where supply intersects demand the equilibrium price and quantity are determined. Here the price is $9 and the quantity equals 115 units. Is this equilibrium stable? How do we know it will occur?

Process of Adjustment

Figure 6.0



Let's work through an example to see how the competitive market finds a new equilibrium. From Figure 6.0 is a graph of the local pizza market. A new restaurant, Pizza R Us, has opened in town. A manager of a competing pizzeria, Dough Pizza, notices his sales are a little lower and his inventory is a little higher. The cause of this is the increase in supply. At P = $9: $Q_d < Q_s$ causing inventory to increase. Retailers will reduce price to reduce excess inventory. As the price is reduced, quantity demanded increases and quantity supplied decreases. At new equilibrium, the price has decreased and quantity increased

The key to understanding this process of adjustment is the concept of inventory management. First consider the question of too much inventory. What are the costs? There are storage costs such as rent (which is charged as per square foot), utilities, security, insurance, and taxes. Next are the costs of obsolescence (Vegetarian is in and you only make ham pizzas). Finally, and one of the main costs, interest. Most inventories are financed and each day interest is paid on the stock carried. In short, carrying inventory is expensive.

Secondly, consider the consequences of too little inventory - lost sales. When people are hungry, they will not wait until your supplies arrive; they go to one of your competitors.

Inventory management techniques is studied in more detail in a course on operations management but a

simple example will give you an idea. Let us say that the delivery truck comes every two weeks. How many days sales in inventory of flour should you keep? At least 14 days supply and possibly plus a little extra in case the truck is late.

Insert Graph here

Let's examine the graph above to illustrate another view of the process of adjustment for the situations of excess supply and excess demand. At a price of $10, quantity demanded equals 300 pizzas, and quantity supplied equals 500 pizzas. Therefore, excess supply is 200 pizzas. With an excess supply, prices are bid down to $8. Again two effects operate to obtain equilibrium, as suppliers drop price to increase quantity demanded, it also decreases quantity supplied.

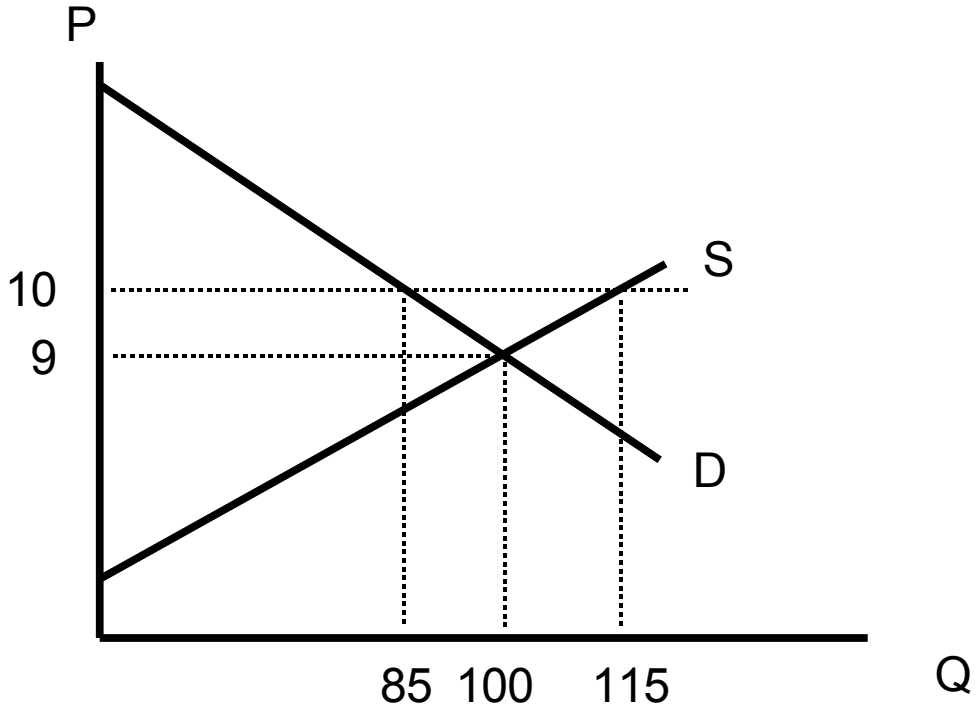
At a price of $5 per pizza, quantity demanded equals 600 pizzas while quantity supplied is 200. In this case, there is an excess demand of 400 pizzas. With an excess demand, prices are bid up to $8 from $5. Quantity demanded decreases and quantity supplied increases to bring the market into equilibrium.

Price Controls

Some people feel the market is not functioning as well as it should, and that it needs some correction. Instead of leaving the determination of price to impersonal and sometimes erratic market forces, have the government set the price. We will explore the cases where the government's price is above the market level and where it is below market pricing. In both cases money will be spent to maintain the status quo. As we will see, the allocation function still has to be performed, but now it becomes a political issue.

Price Floors

Figure 7.0



Let's say Figure 8.0 represents the market for pizza. At $9 a pie, the quantity demanded equals 100

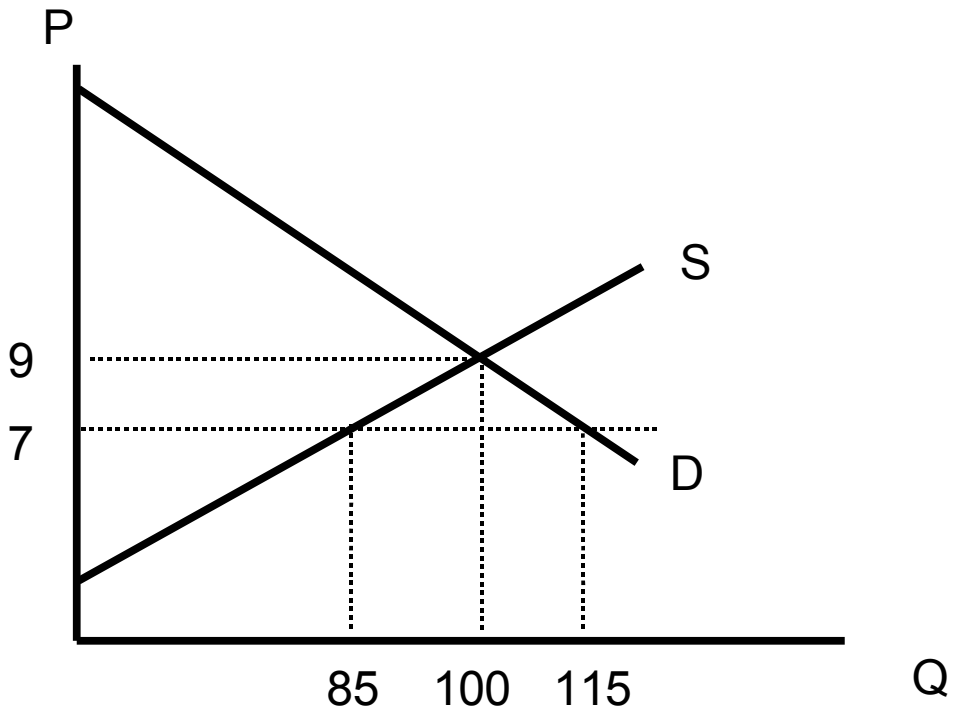
pizzas. Pizzerias want a higher price to earn more profit. They petition Congress to put into place a law to commit the government to maintain a price support so pizza will be $10. The price may rise above $10 but cannot fall below $10, hence the term price floor. At a price of $10, quantity demanded equals 85 pizzas. Quantity supplied equals 115, resulting in a surplus inventory of 30 pizzas, which at $10 which will cost the government $300 to buy.

This is an example of a price control. Here the price is set above the market price in order to help producers. To maintain that price, the government will have to buy up the surplus or the price will fall. The surplus arises because, at the higher price, quantity demanded has fallen, and quantity supplied has risen. Consumers really are paying twice. Once, at the pizzeria by buying at a higher price. Secondly, they pay again on April 15 through higher taxes to finance this government operation.

An allocation problem occurs, as the government has a large and growing stock of pizzas. Pizza does not remain fresh for very long, I would add. It cannot sell them as that would send prices plummeting. It must dispose of them in a way that will not diminsh demand in the retail market. There are several choices available: one, destroy them; two, pay pizzerias not to make pizzas (at least this saves on storage and disposal costs); three, give it to a school lunch program. Historically, all of these approaches have been used.

Price Ceiling

Figure 8.0



Let's say Figure 8.0 represents the market for pizza. At $9 a pie, the quantity demanded equals 100 pizzas. Consumers want a lower price so everyone can enjoy the benefits of pizza. They petition Congress to put into place a law that allows a pizza price no higher than $7. The price may fall below $7, but it cannot rise above $7, hence the term price ceiling. At a price of $7, quantity demanded equals 155 pizzas, but quantity supplied equals 85, therefore, resulting in a shortage of 30 pizzas.

What about the objective of lowering the price of pizza so that lower income classes can afford to buy

more of them. Studies have shown that well nourished people tend to get and hold jobs. Although this is a worthy objective, let's consider the consequences. Government must pass a law to lower the price. Inspectors must be hired to police the retail establishments. Additional courts and jails need to be constructed to handle violators. Taxes will need to be increased to finance these activities. Quantity demanded will increase, and quantity supplied will decrease, creating a shortage.

Again, another allocation problem emerges. Who is going to get what little pizza there is, and why? The lower income classes probably will not, but those people with connections to pizzerias and politicians, will get pizza during this shortage.

That is not the end of the story however. A mother of four is going to obtain some pizza one way or another. That other way is the black market. So on some nearly deserted corner, we find our mom is there asking, "Hey buddy, got some pizza? I have teenagers. I'll pay top dollar." Prices on the black market are considerably higher. One has to pay "transactions costs" to stay in business. That means bribing the police, costs of hiding, fines, etc. Transactions costs shift the supply curve to the left, making the black market price even higher than the free market price. Of course, the black market does not promote respect for the law. Even after the price control is lifted, old patterns of behavior persist. After the end of Prohibition, the Mafia is still around.

> The term "black market" is thought to arise from the ancient days (before Edison) in the Roman Empire when, to avoid government detection (taxes), one transacted business after sunset in the dark.

Market Efficiency

Economists focus on economic efficiency when evaluating any market structure. We have been studying what is known as the competitive market structure, which is considered the gold standard for market structures. There are, broadly, two types of efficiency that economists are interested in; one, allocational efficiency, and two, productional efficiency.

Allocational Efficiency

Allocational efficiency is achieved when consumers pay only the marginal cost of producing that product. Marginal cost is the cost of producing one more unit of that good. If a monopoly exists, that there is only one seller of a product, then the excess profit that comes from the higher price that a monopoly charges diminishes the welfare of the consumer. The higher price takes money away from the consumer that could be spent of other goods. That diminishes the consumers welfare.

Allocational efficiency emphasizes the importance of price. In a broader sense of the word, price in a market functions as an allocation mechanism. It helps determine who gets what, where, and how in a market system. Let's examine, in detail, what that implies.

Money prices reflect scarcity in a market system

When demand rises far more than supply then prices increase. Relatively abundant items are inexpensive (like water). However, rare items such as Cray supercomputers and Lamborgini's are very expensive.

It helps consumers ration a limited income among the choices of goods and services by quantifying the opportunity cost of purchasing any particular good

Let us say that you have $1,500 of take home pay per month. The first priority probably would be housing. Let us further say that a 3 bedroom townhouse costs $1,200. Obviously, it is not affordable, but a two bedroom one bath for $450 per month works for you. Telephone and utilities consume another $150. Now comes the choice of transportation. Walking is not an option. You could buy a

Corvette and pay $400 a month ...for the insurance. Instead, you settle for a Ford Escort and pay $300 per month. The remaining cash is spent on a multimedia center (TV and stereo), entertainment, and, $50 per month, on food (canned spagetti-O's). By spending less on entertainment, you could buy a more expensive car, say a Mustang and pay $400 per month. Or rent a two bedroom TWO bath in a nicer section of town for $750 per month. The point is that there are choices. By spending more on one category, you must spend less on another. There is an opportunity cost for each choice we make. More housing, less car. Based on our personal preferences (utility in economic terms) and the cost of each choice, we make our selection.

It signals to producers what goods should be produced

If everyone expresses a preference to rent two bedroom and two bathroom apartments, rents will increase or, more importantly, profits will increase. This is a signal to producers to construct more two bedroom two bath apartments. Whenever consumers express preferences in favor of a product or service that is an economic vote for that item. Suppliers make a profit only when they satisfy their customers. Yes, we have businesses that could be more friendly; but if they didn't have what we want, then we would not be buying from them.

Productional Efficiency

Productional efficiency is defined as the best use of resources from the producer's point of view. Productional efficiency occurs when firms produce at their lowest per unit cost, known as average cost. As firms strive to maximize profit, they can do so by managing both revenue and costs. Since revenues are relatively set in a competitive market, firms must lower costs to improve profits. Lower costs equal higher profits.

Firms must purchase inputs to produce goods. Input prices become costs for the firms. Within this context input prices provide incentives to firms. Let's examine, in detail, what that implies.

It helps allocate scarce resources by providing incentives for efficient producers

Let's examine the market for burgers. The basic burger sandwich goes for $1, and some change. That is the budget every restauranteur has to work with. If you can lower your production costs (and still maintain quality), then you get to keep more of that $1 as profit.

It helps producers choose between production processes by providing prices of inputs to production

Continuing with the burger example, there are many different ways of cooking (or perhaps not cooking) meat. You could pan fry it (a la McDonald's), laser bake it (I hear they do that up North), or flame broil it (a la Burger King) or make it a mystery (a la Crystal's). Let's focus on McDonald's and Burger King.

Pan frying takes a very simple sheet of metal with a heating element underneath. It is very cheap. But it is also very labor intensive. As long as labor costs are cheap, this works well. One chef must stand over the grill flipping burgers all day. To speed up production, he may decide to cook the meat less.

Open flame broiling needs a monster sized machine. But it can cook a lot of meat in an hour and warm the buns. The cooking is consistent, and it kills whatever grows on the meat. It does not take a skilled person to add the meat to the chain grill. This cooking method is an advantage when labor costs are high, or when the volume required is large.

You can see that McDonald's and Burger King have adopted two different strategies. One is labor intensive and the other is capital intensive. As labor costs increase (there is a small labor shortage currently) the advantage shifts to Burger King. Note that the Big Mac currently is more expensive than the Whopper. It should be no surprise that McDonald's has lost some business to Burger King in recent

years. Key to this strategy is the relative costs of labor and equipment, inputs into the burger making process.

Producers will move into markets earning economic profit and exit those markets experiencing economic losses

Before I give an example, we need to briefly cover the concept of Return On Sales (ROS). ROS is one measure (and not the only measure, Return On Capital is often used) of profitability (return). It is calculated as Net Income / Sales and is usually expressed as a percentage. Firms are going to invest their money where they can earn the highest return. In this simple world that would be the highest ROS.

Example: Burgers vs Chicken. Let's say burgers priced at $1.00 earn 5% ROS and chicken sandwiches priced at $3 earn 20% ROS. Let's further assume that a normal ROS% = 10%, economy wide. Now burger restaurants have an incentive to switch to chicken, reducing the supply of burgers (thus increasing burger prices & ROS) and increasing the supply of chicken sandwiches (thus decreasing chicken prices & ROS). This process will continue until burgers earn 10%, at which point, no more restaurants will exit. When chicken ROS% = 10% there will be no more incentive for firms to enter the chicken market.

We can summarize this example by saying that investors expect a minimum ROS as an element of return on their investment. Failure to achieve that return will cause that investment to be liquidated or restructured and funds diverted to more profitable uses. As a consequence, the market price system will allocate capital to the highest and best use.

Summarizing the Advantages of Competition

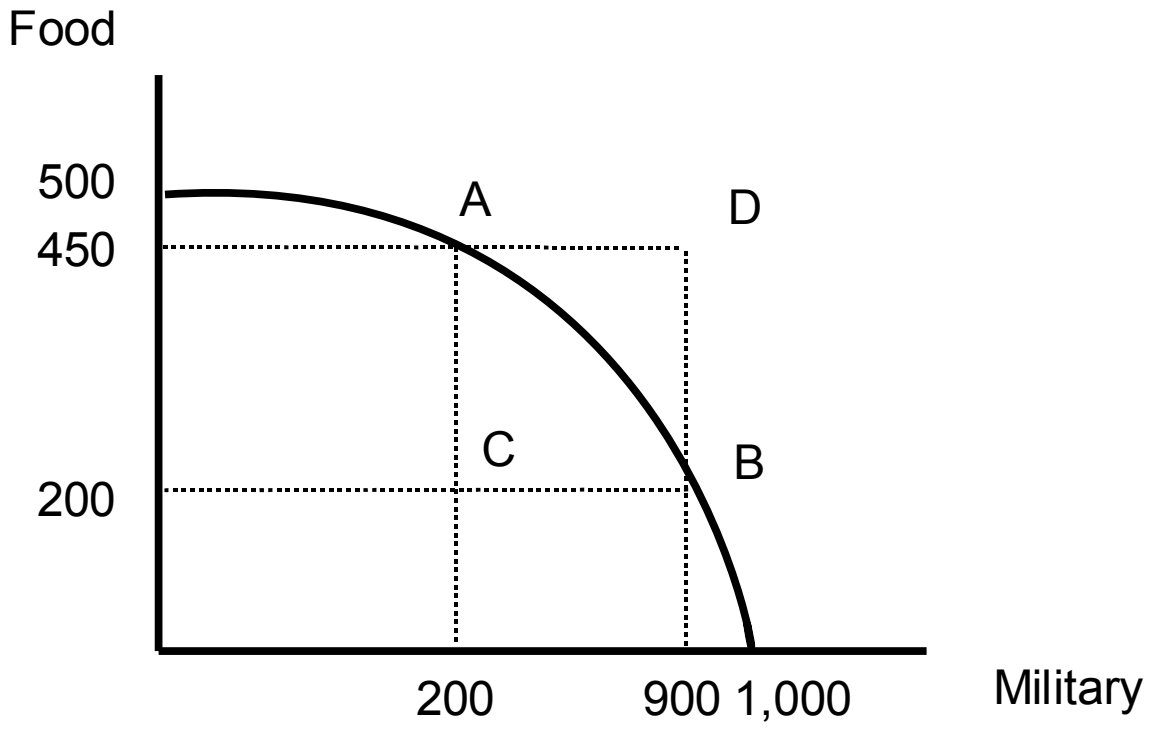
Economists are particularly fond of competitive markets because, under certain conditions, they maximize society's welfare. In fact, this is called the Fundamental Theorem of Welfare Economics. When these conditions are violated, there constitutes a rationale for government intervention. In fact, perfectly competitive markets are difficult to find. Does that make the model useless? No not really. Many markets have many buyers and sellers. Most of these markets have enough well informed customers that makes the imposition of market power difficult. Consequently, the model predicts market behavior reasonably well.

Competitive markets are thought to have economic efficiency; goods are produced at the lowest cost. Since customers pay a price that does not include economic profit, a more efficient allocation of income is possible. These criterion of production and allocative efficiency contribute to society's welfare maximization.

Production Possibilities Curve

No economy can produce unlimited quantities of everything. There is a limit imposed by available resources; capital, labor, and level of technology. Consequently, there is scarcity. Demand is greater than supply. Scarcity is relative; even a large supply of an item may be seen as scarce if there exists a very large demand. For example, as populations grow, water supplies that were once thought of as plentiful are now considered vulnerable to depletion. Scarcity forces society to make choices. To make choices society must pick the alternative that offers the highest value. If the economy produces more of one commodity then it must produce less of another. What an economy produces is what it consumes (assuming no international trade, a closed economy). The maximum production of various combinations of goods and services delineates the production possibilities curve (PPC). An economy can produce at any point on this curve (also called the production frontier) or any point within but not beyond.

Figure 9.0



From Figure 9.0 let's assume a simple two good economy, food and military hardware. As one moves from point A to point B, 250 tons of food are given up to gain 700 units of military hardware. The quantity of food given up to obtain guns reflects the opportunity cost of the military hardware. The quantity given up of food per unit of guns is called the Marginal Rate of Technical Substitution. In this case, the MRTS = 250/700 = .36. Note the MRTS is the slope of the line between points A & B. The MRTS is not constant. (Check this for yourself) One could produce at point C, but this is suboptimal as society could easily produce at point A and have more food or at point B and have more military hardware or a points in between. Point D is not feasible given current resources.

The production possibilities curve assumes a given level of capital, labor, and technology. To reach point D the curve must shift. It can shift if capital or labor are increased or if the level of technology is improved.

A country may have to produce at point B due to an external threat or actual war. As the threat recedes, production can be reallocated to food production. To emphasize, an economy cannot produce without limit, if a country spends more on military hardware, then it must produce less of something else: food or consumer items.

Opportunity Costs

The amount of production of an alternative good (such as shoes), which must be given up to gain more production of a current good (say shirts), reflects the opportunity cost of making that good. Another way to understand opportunity costs is to look at the inputs (resources) required to produce those goods and services. Two generic categories that we use in economics are capital and labor. In constructing the production possibilities curve, capital is held constant as well as the labor supply. Stating opportunity cost in terms of labor hours, allows us to compare opportunity costs of different goods and services using a common denominator.

For example, let's say that we had 250 labor hours available to produce the PPC in figure 9.0. At point B we produced 200 tons of food and 900 tons of military hardware. Assume that it took 80 labor hours to produce the food and 170 labor hours to produce military equipment. At point A, where we produced 450 tons of food and 200 tons of military hardware, the labor hours used respectively were 200 and 50. With this data we can compute opportunity cost moving from point A to point B for food as (200-80) /(450-200) = .48 labor hours / ton Food. For military hardware (170-50)/(900-200) = .17 labor hours / ton Military Hardware. It takes less labor hours to make military equipment than food.

Marginal Productivity

Stating opportunity cost in terms of labor hours can give the marginal productivity of labor: the amount of output generated by one additional unit of labor (although here I have stated it in terms of labor hour per unit of output to make computing cost easier). Traditionally, we apply a price of the labor hour to achieve the marginal cost. In the above example, if labor costs $12 per hour then one additional ton of food would cost .48 * $12 = $5.76, and an additional ton of military hardware would cost .17 *$12 = $2.04.

Does that mean more military equipment should be produced? Cost is only one part of the equation; the other part is benefit. Military hardware in the absence of war may have little benefit (it may deter potential aggressors). Food is necessary for life. The net benefit (benefit minus cost) is usually greater for food than for military hardware.

This brings up the question of how we measure benefit. For the moment, let us say that it is measured as the area under the demand curve. A change in that area, due to one more unit of consumption, will be called the marginal benefit. Marginal benefit per unit usually decreases as the number of units consumed increase. Marginal cost per unit tend to increase as the number of units produced increase. Consumers will buy up to the point that their marginal benefit equals the marginal cost. Demand curves reflect consumers marginal benefits. Supply curves reflect the marginal costs of inputs.

Sidebar: A Closer Look at Utility and Marginal Benefit

The demand curve reflects the private benefits received by consumers. An alternative way of explaining the demand curve is in terms of benefits. Take the following example:

Pizza

Number of Slices Consumed	Total Benefit	Marginal Benefit
1	20	20
2	35	15
3	45	10
4	50	5
5	50	0

If the cost of consuming pizza is 15, then 2 units will be bought. Decreasing the cost to 10 will increase the quantity demanded to 3 units. Constructing the demand curve is simple, at $15 2 pizzas are demanded, at $10 it is three.

Here we are defining benefit in financial terms. Very often benefit is spoken of in terms of utility. Marginal benefit would be marginal utility, total benefit would be total utility. At some point there has to be a translation from utility to dollars since we buy goods with cash. Cash has utility because of the goods and services it buys. In this example, this is the justification for equating marginal benefit to marginal cost.

Determinants of Production Possibilities Curve

There are three major factors that cause the production possibilities curve to either shift or rotate. They are labor, capital, and technology.

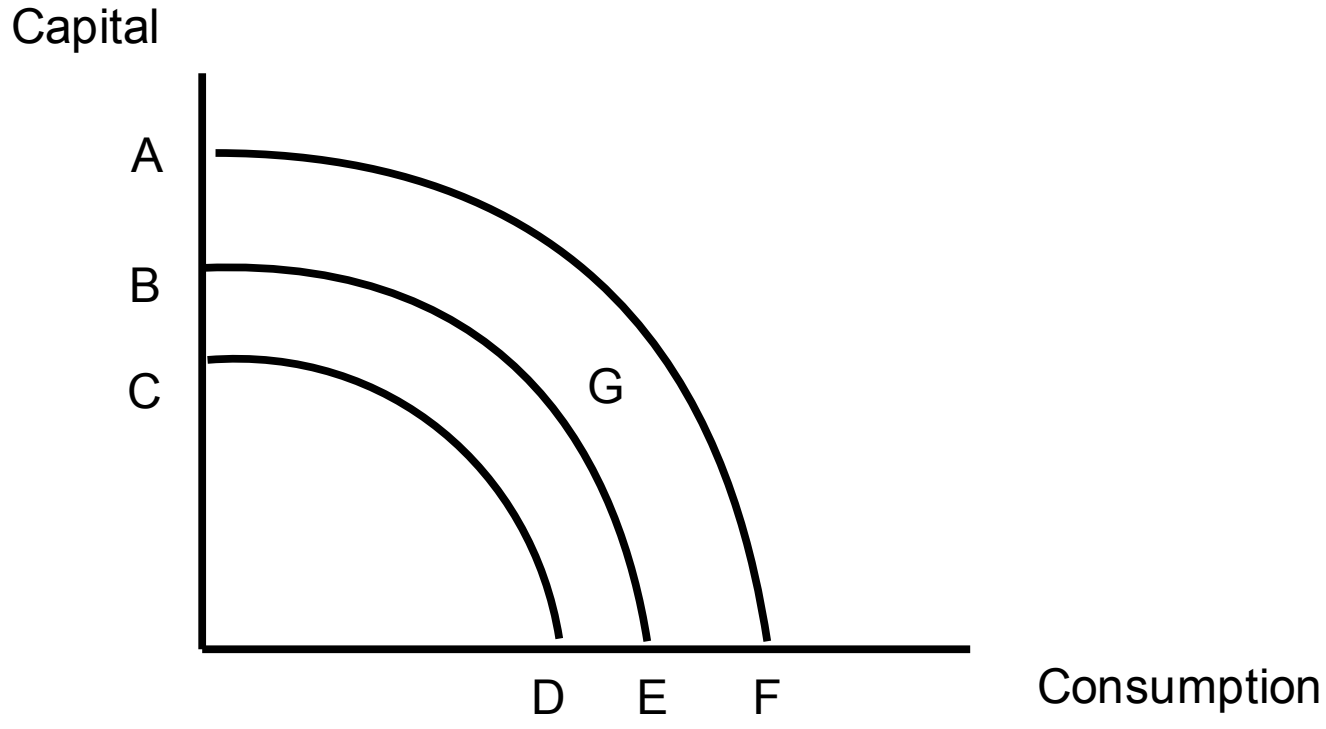
Labor

So far in our discussion, we have held the production possibilities curve constant by holding capital, labor, and technology constant. Increasing the labor supply would cause the PPC to shift outward as the quantity of an input has now been increased. But this doesn't necessarily increase the standard of living, as that output must be shared with more people. What increases the standard of living is productivity improvements. This is usually achieved by either training the workforce or increasing the amount of equipment available to the workforce.

Capital

The amount of capital determines the position of the production possibilities curve. But to increase production by increasing the quantity of equipment, society must shift production to capital goods away from consumer goods. Therefore, society faces a trade-off between current consumption and future consumption. This is evident in the trade-off between consumption and investment (that mirrors the above trade-off by producing either consumer goods or capital goods). If society increases current consumption, it must reduce investment and therefore future consumption. By increasing investment, society will have more future goods and services to consume but at a cost of reducing current consumption.

Figure 10.0



From Figure 10.0 an economy on curve BE could be expected to produce at point G. Most of the production is allocated to consumption. The amount allocated to capital goods is enough to replace capital stock that is wearing out, plus some growth in capital stock that will allow increased production next year. Consequently, next year the production possibilities curve moves to AF.

If all production had been allocated to consumption at point E, then the quantity of capital stock would have decreased since worn out capital stock wasn't replaced. In the following, output would decrease, consequently, moving the production possibilities curve inward to CD.

Let's discuss a practical example to clarify and reinforce these concepts. Consider the drive-up window to a restaurant using Burger King as an example. In ancient times, one had to drive up to the window, read the menu, place the order, pay for the food, and wait for the food, as it was being prepared. The restaurant needed someone constantly at the window in case a customer drove up. Now, when you drive up, there is a lighted menu with a FM radio speaker. As the car approaches, a signal is sent to the restaurant alerting them of a customer. This allows the order taker time to take the order, total it up, and have it ready when the customer approaches the window after stopping at the menu. Service is much faster. The cashier has a wireless FM headphones, microphone, and computer that not only totals up the order but sends it to the chef and tracks its progress. Labor is saved as the cashier can move around freely to prepare a order while she/he takes another order over the headset. The investment in equipment allows the restaurant to process more customers per hour with less labor. If the restaurant does not spend the cash to maintain the equipment or buy replacements for the menu sign, FM radio or computer equipment then it will have to go back to a manual system when the system breaks down. This can be seen periodically when computer systems go down at restaurants; chaos breaks out, long lines form, and customers become angry.<-->

Let's say that the pizzeria has a budget of 1,000 labor hours in this period and in every period. Each period 100 of these hours are spent maintaining one oven. Each labor hour can produce 1.5 pizzas. Therefore 900 labor hours are used to produce 1,350 pizzas at $10 per pizza which generates $13,500 in revenue. Let's say that a second oven is purchased. However, in the next period an additional 100 labor hours would be needed to maintain the second oven. Which means only 800 hours are available to make pizza. Now each labor hour can produce 3.0 pizzas. Total revenue is now $24,000. The change in revenue is $10,500. Adding a third oven that increases productivity to 4.5 pizzas per labor hour would increase revenue to $30,000 (700*4.5). The increase in revenue is only $6,000. Adding a fourth oven increasing productivity to 6.0 pizzas per labor hour increases output to 3,600 pizzas or total revenue to $33,600. Adding a fifth oven to increase productivity to 7.5 pizzas would allow 3,650 pizzas to be produced. Revenue gains only $500. Adding a sixth oven increasing productivity to 9.0 pizzas would allow only 3,600 pizzas to be produced. Revenue would fall $500. Clearly the costs of maintaining the additional investment in ovens reach a point that overcome the additional revenue gained by adding pizza capacity. This same concept is true with any good being produced.

Technology

Increasing investment is not the only way of increasing output, an improvement in the level of technology increases the output per unit of input of either labor or capital. In other words, productivity improves. For example, it took 30 labor hours to produce one ton of food but due to an improvement in technology only 20 hours are needed.

The productivity of capital is also affected. If it takes one oven to produce 100 pizzas but after reprograming the oven 120 pizzas can be baked then productivity has improved. The amount of additional output gained by an additional unit of input, such as adding an oven, is called marginal product. In this example the initial marginal product of capital was 100 (100 pizzas/oven) improving to

120 (120 pizzas/oven) as a result of improvement in technology.

Technology should not be confused with capital investment. Technology is the methodology of production. It is focused on how work is accomplished usually by changing the proportion of inputs or the type of inputs. How they are combined can also be changed. The analogy to be drawn here is akin to a recipe for baking a pie. One must first know what ingredients are necessary, secondly, how much of each, and finally, how and when to combine them as well as the act of baking. Similarly when making steel one must know the ingredients, their proportions, and how to combine them at the right time at the right temperatures to produce quality steel. As technology improves, not only can quality improve but the quantity of inputs needed to generate one unit of output may decrease. This is one of the driving ideas behind Just-In-Time inventory management.

Society also has a choice in determining its technological level. Spending on research and development (R&D) increases the level of technology. As before, this involves a trade-off, more spending on R&D means less funds available for consumption and capital spending. As technology improves the production possibilities curve shifts outward. Beside more efficient production, new products can be created that improve the welfare of society. While the physical production may not be increased, the quality improves. For the purposes of this course, look upon this quality as an expansion of the production possibilities curve. More advanced courses will modify this procedure.

Sidebar Discussion: The Impact of Location

Traditionally, economic principle textbooks ignore the issue of location. Yet ask any real estate professional and they will tell you that the three most important factors for success is location, location, and location. It matters in all markets. Location may be defined in ways other than merely geographical position. The internet is a good example of the latter. There are millions of websites out there but only a few attract high volume. Lifestyle, brand preferences, links, web page design, etc, all count. If your webpage is buried deep within a website, or is difficult to find by an internet search engine, then your business is finished.

Let's focus on a strictly geographical interpretation of location. Location could probably best be described as a supply factor. Locating close to you market is important as it minimizes transportation costs. The exception to this rule would be a high transportation cost bulk input compared to the processed low transportation cost output. An example, refining ore. Then location next to the input source makes sense. An example would be a power generation plant located next to a coal mine. This points out one of two perspectives to transportation cost; movement of product to the customer, such as pizza delivery, and of moving the customer to the product. An example of the latter is rushing the patient to the hospital, or to continue with our pizza example, the customer driving to our restaurant.