BUEC 503: Economic Foundations:
Lecture 1: Supply and Demand - The Basics

Fall 2020

Outline

1. The Supply-and-Demand Model
   - Demand
   - Supply
   - Market Equilibrium

2. Using the Model
   - Changing fundamentals.
   - The effects of government intervention.

3. Applying the model in practice.
   - When it works.
   - When if fails.

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1. The Supply-and-Demand Model

- "Big Government Cheese" is an example of the "supply-and-demand" model in action.
- This model is useful for understanding many markets.
  - It works particularly well in markets with many buyers and sellers.
- Why is it useful?
  - We can use it to make clear predictions about how changes in fundamentals affect market outcomes.

1. The Supply-and-Demand Model: Demand

- The first piece of the model: **Demand**
- Demand is consumer's *desire* to purchase goods and services.
- What factors affect this desire? How?

1. The Supply-and-Demand Model: Demand

- While many factors can affect consumer's desire to purchase goods and services, economists primarily focus on how a good's *own price* affects the quantity demanded.

Definition (Quantity Demanded)

The quantity demanded is the amount of a good or service a consumer is *willing* to buy at a given price, holding other factors constant.

1. The Supply-and-Demand Model: Demand

- Empirical evidence suggests that the quantity demanded by consumers follows the *Law of Demand*.

Definition (Law of Demand)

Consumers demand a higher quantity of a good or service when the price is lower (and a lower quantity of when the price is higher), *holding all other factors that influence the amount consumers want to consume constant*.

- We can illustrate this relationship graphically using a *demand curve*.
  - To do so, we will revisit Big Government Cheese.

1. The Supply-and-Demand Model: The Demand Curve

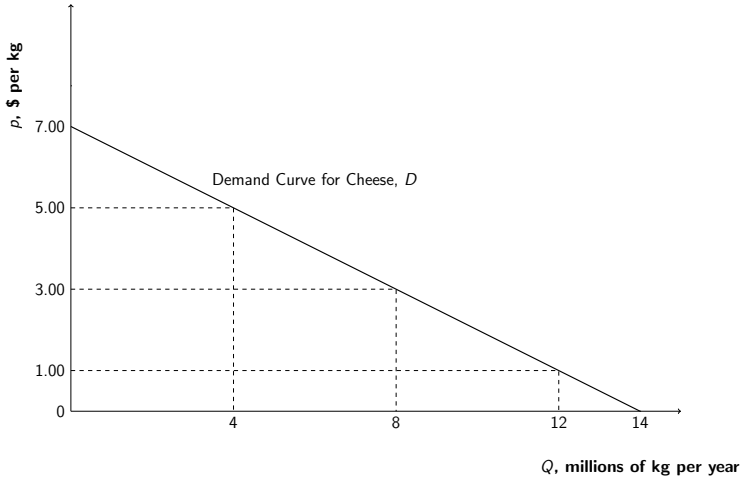

Figure: The demand for cheese

1. The Supply-and-Demand Model: The Demand Curve

- The demand curve provides a concise answer to the question of what happens to the quantity demanded as price changes, holding all other factors constant.
  - Here: what happens to the demand for cheese as the price of cheese increases or decreases.

- Changes in the quantity demanded in response to a price change are referred to as *movements along the demand curve*.

- Why is the demand curve downward sloping?

1. The Supply-and-Demand Model: The Demand Curve

- The demand curve tells us how a change in the price of a good or service affects the quantity demanded.
  - Change in $p \implies$ *movement along the demand curve*.
- Recall that other factors also affect the quantity demanded.
  - Change in these factors $\implies$ *shift of the demand curve*.
- As an example, let's consider the effect of a ten thousand dollar increase in income per capita.

1. The Supply-and-Demand Model: The Demand Curve

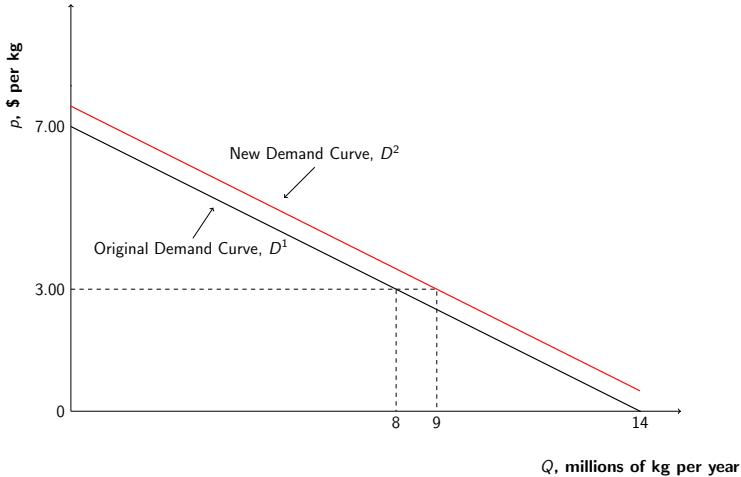

Figure: The effects of an income increase on the demand for cheese

1. The Supply-and-Demand Model: The Demand Curve

- How the demand curve shifts depends on the factor being considered.
  - Income
  - Price of substitute or compliment
  - Tastes
  - Government rules/regulations

- As another example, let's consider the effects of a 5 dollar increase in the price of a bottle of wine.

1. The Supply-and-Demand Model: The Demand Curve

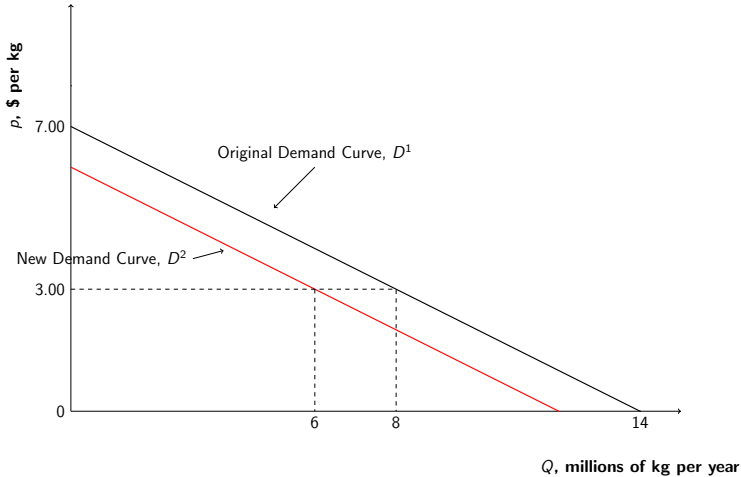

Figure: The effects of an increase in the price of wine on the demand for cheese

1. The Supply-and-Demand Model: The Demand Curve

- The demand curve gives us a precise relationship between price and quantity demanded.
- We can also express this same relationship mathematically using a *demand function*.
- The demand function is given by:

$$Q = D(p, Y, X)$$

  where Q is the quantity demanded, and $D(-)$ is the demand function that depends on the price, p, income, Y, and other factors, X.

- For simplicity, in what follows we will hold other factors (X) constant.

1. The Supply-and-Demand Model: The Demand Function

- Suppose that the estimated demand function for cheese is given by:

$$Q = 13 - 2p + 0.1Y$$

  where Q is the quantity of cheese demanded, p is the price of cheese, and Y is average household income.

- Functional form reflects available evidence about the demand for cheese:
  - p is negative.
  - Y is positive.
  - Constant term (13) reflects all other factors.

1. The Supply-and-Demand Model: The Demand Function

- We can obtain the demand curve for cheese by substituting for income, Y.
- Suppose average household income is \$10,000. Then the demand for cheese is given by:

$$\begin{aligned} Q &= 13 - 2p + 0.1(10) \\ &= 14 - 2p \end{aligned}$$

- With some algebra we can obtain the *inverse demand curve*:

$$p = 7 - \frac{1}{2}Q$$

- This is the same relationship depicted on the next slide.

1. The Supply-and-Demand Model: The Demand Function

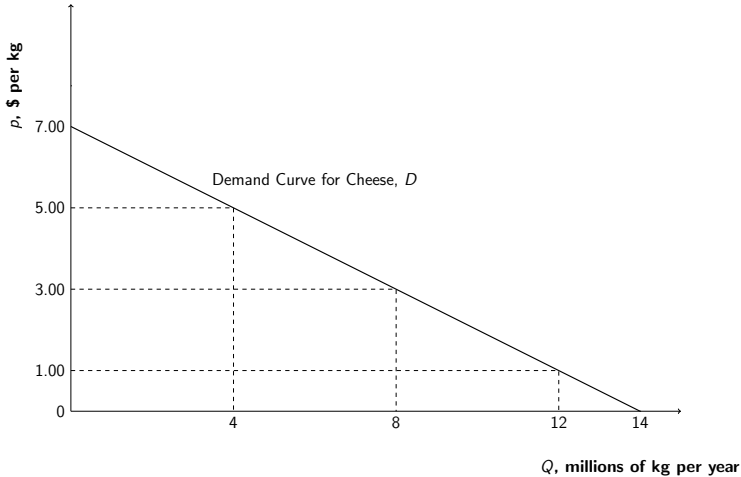

Figure: The demand for cheese

1. The Supply-and-Demand Model: The Demand Function

- The demand function is useful because it allows us to think precisely about how the quantity demanded will respond to a change in price, holding income (and all other factors) fixed.

- To see this, let p_1 denote the initial price, and p_2 denote the new price. Then the quantity demanded at p_1 is $Q_1 = D(p_1)$, the quantity demanded at p_2 is $Q_2 = D(p_2)$, and the change in quantity demanded as price goes from p_1 to p_2 is $\Delta Q = Q_2 - Q_1 = D(p_2) - D(p_1)$.

- In our cheese example, if the price changes from p_1 to p_2, the change in quantity demanded is given by:

$$\begin{aligned}\Delta Q &= D(p_2) - D(p_1) = [14 - 2p_2] - [14 - 2p_1] \\ &= -2[p_2 - p_1] = -2\Delta p\end{aligned}$$

1. The Supply-and-Demand Model: Determining Market Demand

- In many cases we might have an estimate of the demand from all consumers in a market, but in some scenarios, we may only know the demands of individual consumers or groups of consumers.
- In these cases, we need to add up the demand from each consumer (or group).
- Key point: Total quantity demanded *at a given price* is equal to the sum of individual consumer demands at that price.

1. The Supply-and-Demand Model: Determining Market Demand

- As an example, suppose there are two people in the market for cheese. They both have demand functions given by:

$$Q = 14 - 2p$$

What is the market demand for cheese in this case?

1. The Supply-and-Demand Model: Supply

- The second piece of the model: **Supply**
- Supply is producers' willingness to sell goods and services.
- What factors affect this willingness? How?

1. The Supply-and-Demand Model: Supply

- As with demand, economist focus on how the *price* of a good or service affects the quantity supplied.

Definition (Quantity Supplied)

The amount of a good or service that producers *want* to sell at a given price, *holding other factors that influence supply decisions constant*.

1. The Supply-and-Demand Model: Supply

- Is there a Law of Supply?
- We can illustrate the relationship between the price of a good or service and the quantity producers want to sell via a *supply curve*.

1. The Supply-and-Demand Model: The Supply Curve

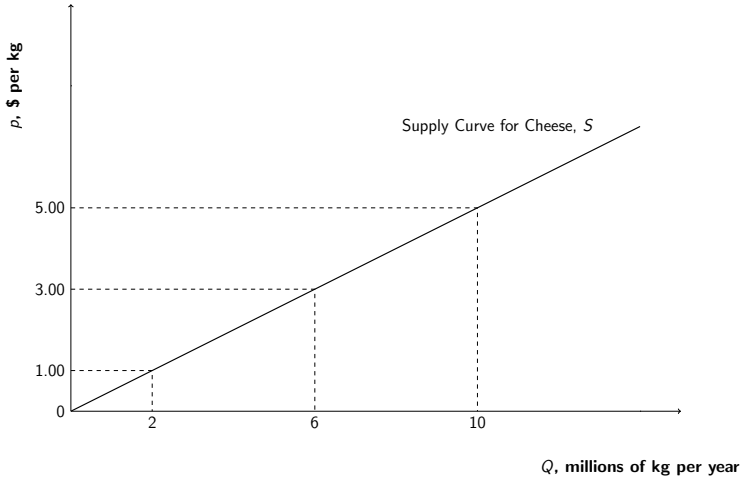

Figure: The supply of cheese

1. The Supply-and-Demand Model: The Supply Curve

- The supply curve provides us an answer to the question of what happens to the quantity supplied as price changes, holding all other factors fixed.
  - Here: what happens to the supply of cheese as the price of cheese increases or decreases.

- Changes in the quantity supplied in response to a price change are referred to as *movements along the supply curve*.

- Do supply curves always need to slope upward?

1. The Supply-and-Demand Model: The Supply Curve

- The supply curve tells us how a change in the price of a good or service affects the quantity supplied.
  - Change in $p \implies$ *movement along the supply curve*.
- Recall that other factors also affect the quantity supplied.
  - Change in these factors $\implies$ shift of the supply curve.
- As an example, let's suppose that the price of an alternative product, yoghurt, increases in price from \$2.00 per kg to \$4.00 per kg.

1. The Supply-and-Demand Model: The Supply Curve

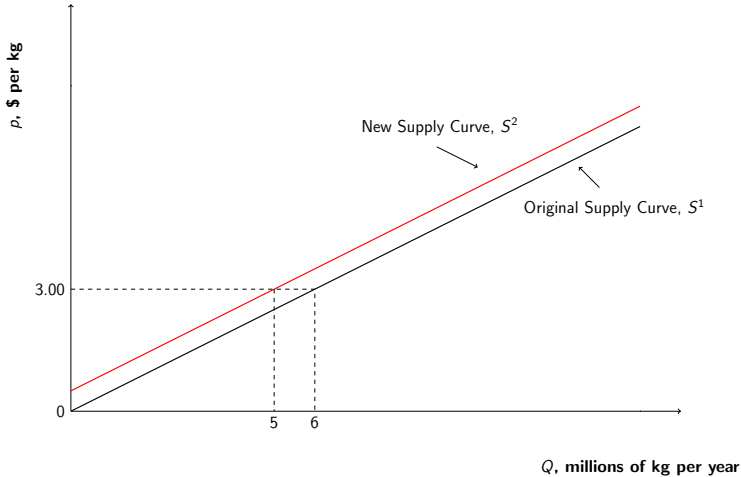

Figure: The effect of a yogurt price increase on the supply of cheese

1. The Supply-and-Demand Model: The Supply Curve

- How the supply curve shifts depends on the factor being considered.
  - Prices.
  - Production costs.
  - Technological change.
  - Government regulation.

- As another example, let's consider the effects of a decrease in the price of milk.

1. The Supply-and-Demand Model: The Supply Curve

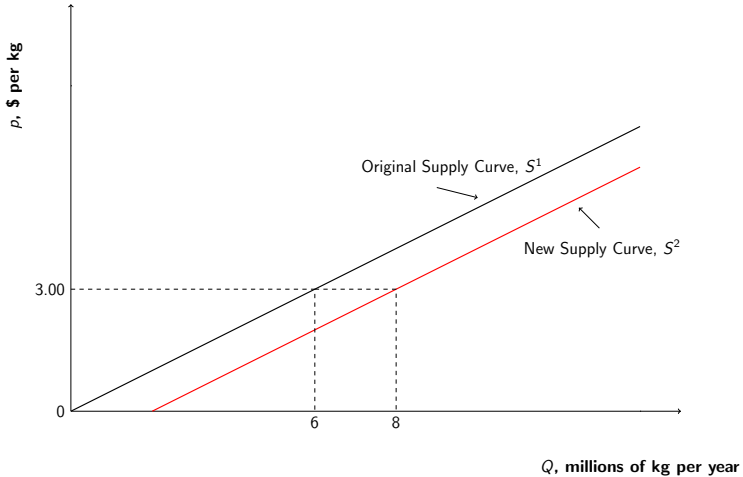

Figure: The effect of a decrease in the price of milk on the supply of cheese

The Supply-and-Demand Model: The Supply Curve

- The supply curve displays a precise relationship between price and quantity supplied.
- We can also express this same relationship mathematically using a *supply function*.
- The supply function is given by:

$$Q = S(p, p_y, X)$$

  where Q is the quantity supplied, and $S(-)$ is the supply function that depends on the price, p, the price of other possible outputs p_y, and other factors, X.

- For simplicity, in what follows, we will hold other factors (X) constant.

The Supply-and-Demand Model: The Supply Function

- Suppose that the estimated supply function for cheese is given by:

$$Q = 1 + 2p - 0.5p_y$$

  where Q is the quantity of cheese supplied, p is the price of cheese, and p_y is the price of alternative outputs (yoghurt).

- Functional form reflects available evidence about the supply of cheese:
  - p is positive.
  - p_y is negative.
  - The constant term (1) reflects all other factors.

The Supply-and-Demand Model: The Supply Function

- We can obtain the supply curve by substituting for p_y.
- Suppose the price of yoghurt is \$2.00. Then the supply of cheese is given by:

$$\begin{aligned} Q &= 1 + 2p - 0.5(2) \\ &= 2p \end{aligned}$$

- Rearranging we can obtain the *inverse supply curve*.

$$p = \frac{1}{2}Q$$

- This is the same relationship depicted on the next slide.

1. The Supply-and-Demand Model: The Supply Function

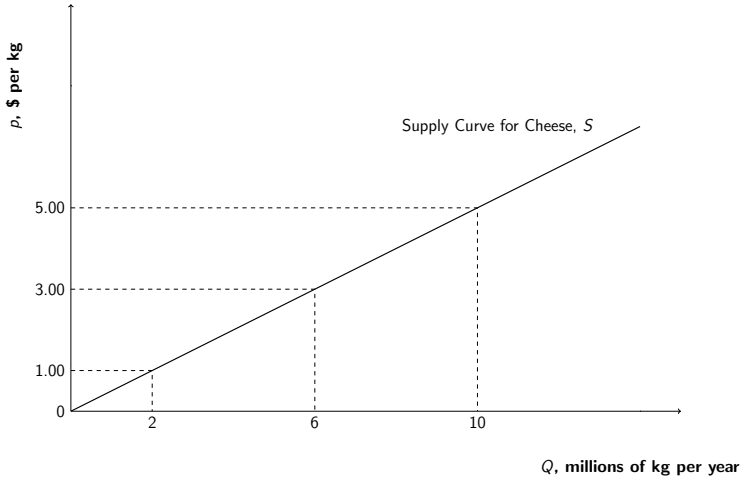

Figure: The supply of cheese

1. The Supply-and-Demand Model: The Supply Function

- The supply function allows us to think precisely about how price changes affect the quantity supplied, holding all other factors fixed.

- To see this let p_1 denote the initial price, and p_2 denote the new price. Then the quantity supplied at p_1 is $Q_1 = S(p_1)$, the quantity supplied at p_2 is $Q_2 = S(p_2)$, and the change in quantity supplied as price goes from p_1 to p_2 is $\Delta Q = Q_2 - Q_1 = S(p_2) - S(p_1)$.

- In our cheese example, if the price changes from p_1 to p_2, the change in quantity supplied is given by:

$$\begin{aligned} \Delta Q &= S(p_2) - S(p_1) = [2p_2] - [2p_1] \\ &= 2[p_2 - p_1] = 2\Delta p \end{aligned}$$

1. The Supply-and-Demand Model: Determining Market Supply

- In some cases, we may not have an estimate of total market supply, but rather estimates of the supply curves of each producer in the market.
- To obtain total market supply, we need to add up the supply from each producer.

1. The Supply-and-Demand Model: Determining Market Supply

- As an example, suppose there are 3 producers in the market for cheese. They both have supply functions given by:

$$Q = 2p$$

what is the market supply of cheese in this case?

1. The Supply-and-Demand Model: Market Equilibrium

- Once we know supply and demand in the market, we can determine the *market equilibrium*.

Definition (Market Equilibrium)

The market is in equilibrium when all market participants are able to buy or sell as much as they want; no participant wants to change its behaviour given what other market participants are doing.

1. The Supply-and-Demand Model: Market Equilibrium

- How can we determine the market equilibrium from the supply and demand curves?

1. The Supply-and-Demand Model: Market Equilibrium

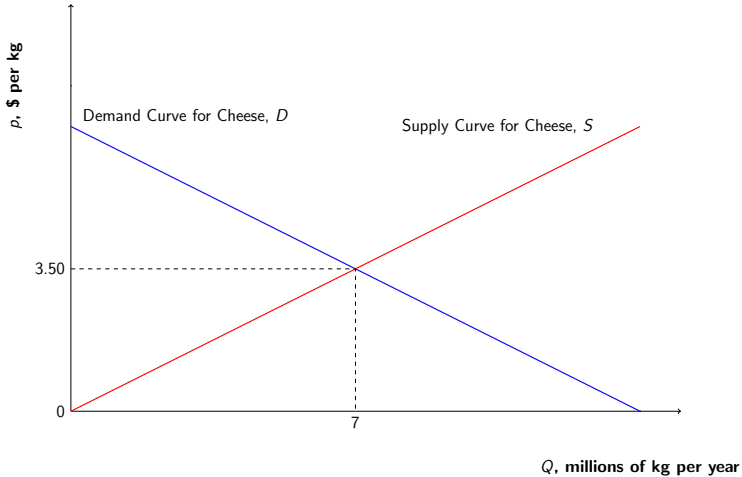

Figure: Equilibrium in the market for cheese

1. The Supply-and-Demand Model: Market Equilibrium

Definition (Equilibrium Price)

The equilibrium price is the p at which consumers can by as much as they want, and sellers can sell as much as they want.

Definition (Equilibrium Quantity)

The equilibrium quantity is the q such that the quantity demanded equals the quantity supplied.

1. The Supply-and-Demand Model: Market Equilibrium

- We can also solve for the market equilibrium analytically using algebra. Recall:

$$Q_D = 14 - 2p \quad \text{and} \quad Q_S = 2p$$

- In equilibrium $Q_D = Q_S$. Substituting yields:

$$\begin{aligned} 14 - 2p &= 2p \\ 4p &= 14 \\ p &= 3.5 \end{aligned}$$

- Substituting in the equilibrium price into Q_D or Q_S yields the equilibrium quantity of 7.

1. The Supply-and-Demand Model: Market Equilibrium

- Why must $Q_D = Q_S$ in a market equilibrium?

1. The Supply-and-Demand Model: Market Equilibrium

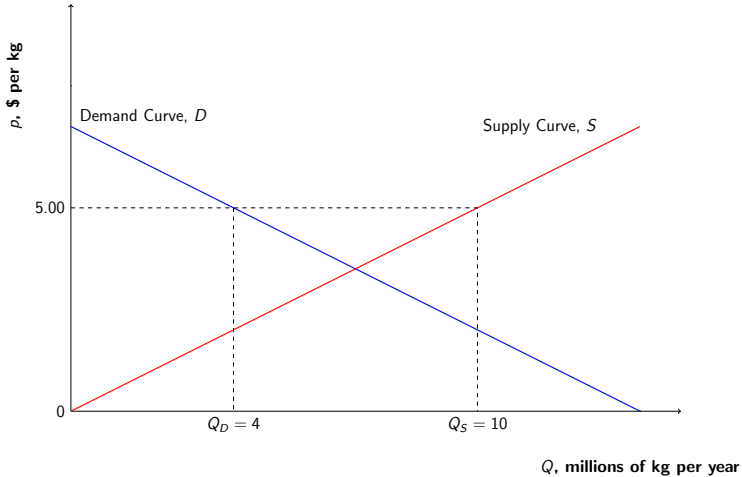

Figure: Excess Supply

1. The Supply-and-Demand Model: Market Equilibrium

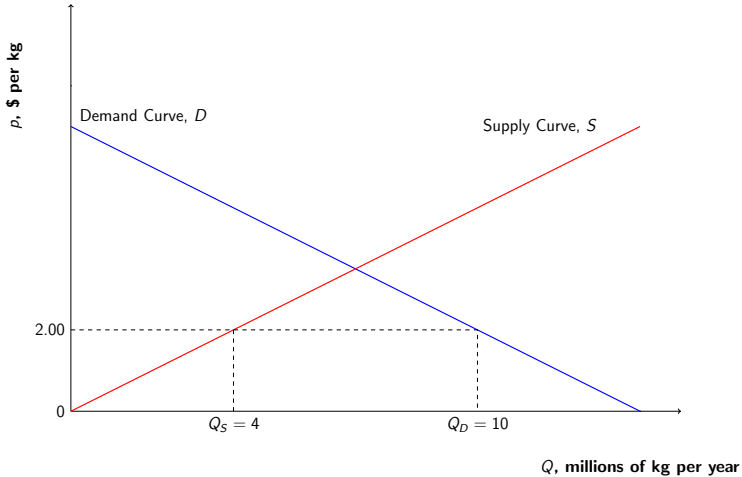

Figure: Excess Demand

Outline

1. The Supply-and-Demand Model
   - Demand
   - Supply
   - Market Equilibrium

2. Using the Model
   - Changing fundamentals.
   - The effects of government intervention.

3. Applying the model in practice.
   - When it works.
   - When if fails.

2. Using the Model

- The supply-and-demand model tells us the price and quantity that will *clear the market* holding all other factors fixed.
- Changes in these other factors will change the market equilibrium by shifting the supply and demand curves (or both!).
- We can use the model to precisely predict how changes in these other factors will alter the market equilibrium.
- We will consider two sets of factors:
  1. "Market Fundamentals."
  2. Government intervention.

2. Using the Model: Shifting Demand

- We will start by considering the effects of an increase in annual household income.
- Specifically, suppose that household income increases from \$10,000 to \$20,000.
- How does this affect equilibrium price and quantity?

2. Using the Model: Shifting Demand

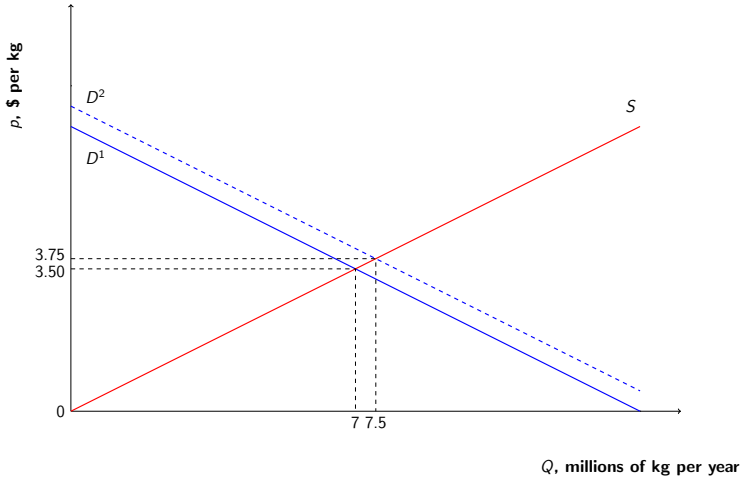

Figure: The effects of an increase in income

2. Using the Model: Shifting Demand

- The increase in income shifts the demand curve to the right (from D^1 to D^2).
- This results in a *movement along the supply curve*.
- Why?

2. Using the Model: Shifting Demand

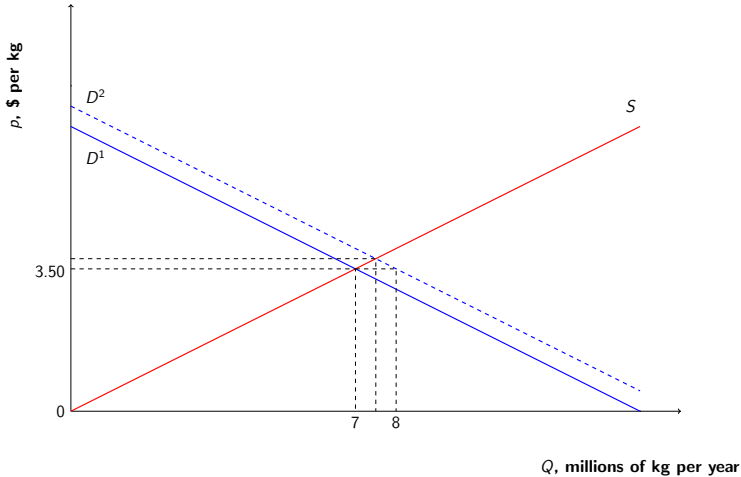

Figure: The effects of an increase in income

2. Using the Model: Shifting Demand

- We can also determine the effect of an income increase using algebra. Recall:

$$Q_d = 13 - 2p + 0.1Y$$
$$Q_s = 2p$$

- Step 1: Solve for the initial equilibrium with $Y = 10$.

$$\begin{aligned} Q_d = Q_s &\implies 13 - 2p + 0.1(10) = 2p \\ &\implies p = 3.5 \text{ and } Q = 7. \end{aligned}$$

- Step 2: Solve for the new equilibrium with $Y = 20$.

$$\begin{aligned} Q_d = Q_s &\implies 13 - 2p + 0.1(20) = 2p \\ &\implies p = 3.75 \text{ and } Q = 7.5. \end{aligned}$$

2. Using the Model: Shifting Supply

- Suppose instead that the price of yoghurt increase from \$2.00 to \$4.00.
- How does this affect equilibrium price and quantity?

2. Using the Model: Shifting Supply

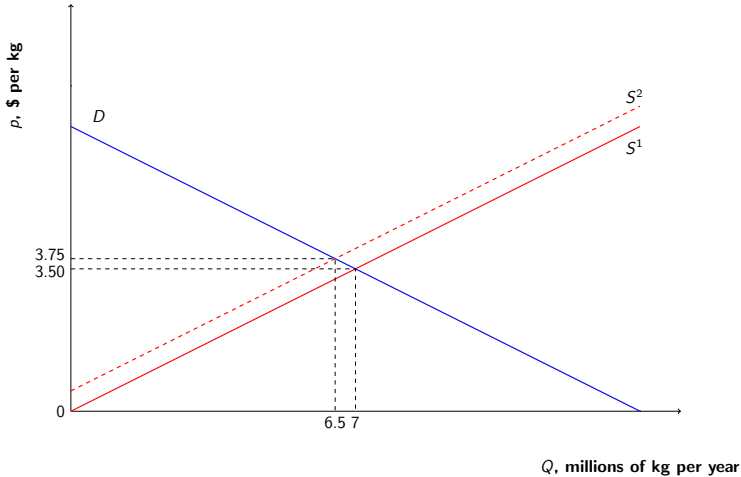

Figure: The effects of an increase in the price of yoghurt

2. Using the Model: Shifting Supply

- The increase in the price of yoghurt shifts the supply cure to the left (from S^1 to S^2).
- This results in a *movement along the demand curve*.
- Why?

2. Using the Model: Shifting Supply

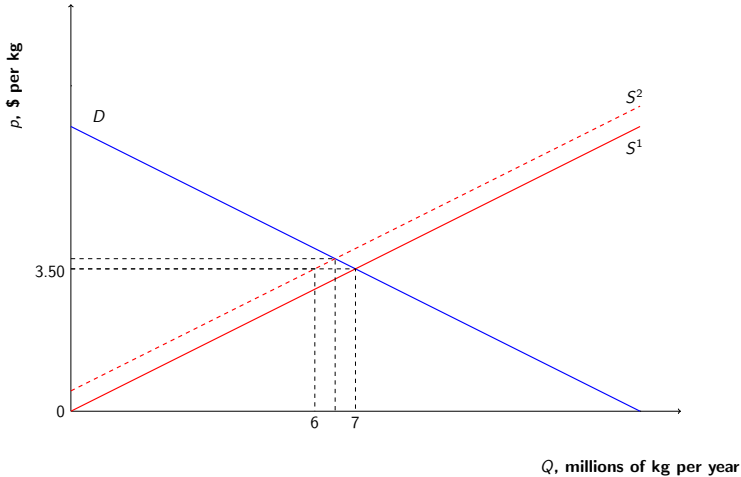

Figure: The effects of an increase in the price of yoghurt

2. Using the Model: Shifting Supply

- Again, we can also determine the effects of the price increase using algebra. Recall:

$$Q_d = 14 - 2p$$
$$Q_s = 1 + 2p - 0.5p_y$$

- Step 1: Solve for the initial equilibrium with $p_y = 2.00$.

$$\begin{aligned} Q_d = Q_s &\implies 14 - 2p = 1 + 2p - 0.5(2.00) \\ &\implies p = 3.5 \text{ and } Q = 7. \end{aligned}$$

- Step 2: Solve for the new equilibrium with $p_y = 4.00$.

$$\begin{aligned} Q_d = Q_s &\implies 14 - 2p = 1 + 2p - 0.5(4.00) \\ &\implies p = 3.75 \text{ and } Q = 6.5. \end{aligned}$$

2. Using the Model: Concurrent Shifts

- Sometimes, demand and supply change at the same time.
- As an example, consider the effects of cheesemakers switching to organic milk to produce cheese.
- What would the effects of this switch be on the equilibrium price and quantity in the market for cheese?

2. Using the Model: Government Intervention

- Government actions can also affect market outcomes.
- Three key channels:
  1. Curve shifts.
  2. Price controls.
  3. Taxes/Subsidies.

2. Using the Model: Policies that Shift Curves

- Governments use three main approaches to shift curves:
  1. Limits on who can buy.
     - Governments can restrict who can buy certain products (e.g. cigarettes to children). This decreases the quantity demanded, and shifts the demand curves for these products to the left.
  2. Restrictions on imports.
     - Governments can restrict the flow of imports. This decreases the quantity supplied, and shifts the importing country's supply curve to the left.
  3. Government purchases.
     - Governments can buy goods directly, increasing the quantity demanded at each price. This shifts the demand curve to the right.

- Why would governments enact these policies?

2. Using the Model: Price Controls

- Sometimes governments intervene by controlling prices in a market.

- Two main forms:
  1. Price ceiling.
     - Policy in which a government sets a maximum price, $\bar{p}$, that can prevail in the market.
  2. Price floor.
     - Policy in which a government sets a minimum price, $\underline{p}$, that can prevail in the market.

2. Using the Model: Price Controls

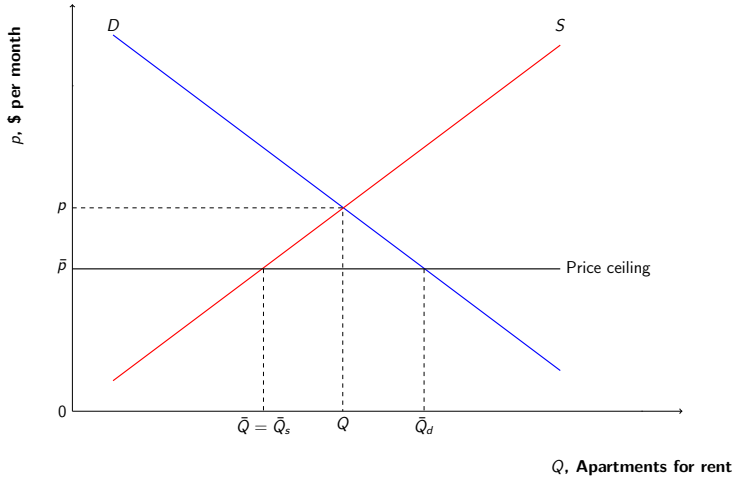

Figure: The effects of a maximum price in the market for housing.

2. Using the Model: Price Controls

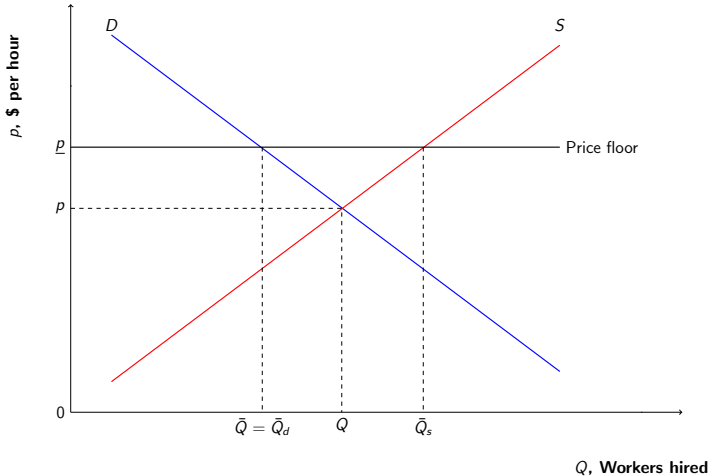

Figure: The effects of a minimum price in the market for labor.

2. Using the Model: Price Controls

- Examples show that supply need not equal demand if the government intervenes in the market.
- In the absence of government intervention, supply equals demand, and the market clears.
- With government intervention, the quantity demanded and quantity supplied need not equal the actual quantity that is bought and sold.

2. Using the Model: Taxes/Subsidies

- Taxes may also affect equilibrium price and quantity.
- As an example, we will examine the effects of a *specific tax* in the market for cheese.
  - A specific tax is a tax charged per unit of output (e.g. \$/litre of gasoline).

2. Using the Model: Specific Tax

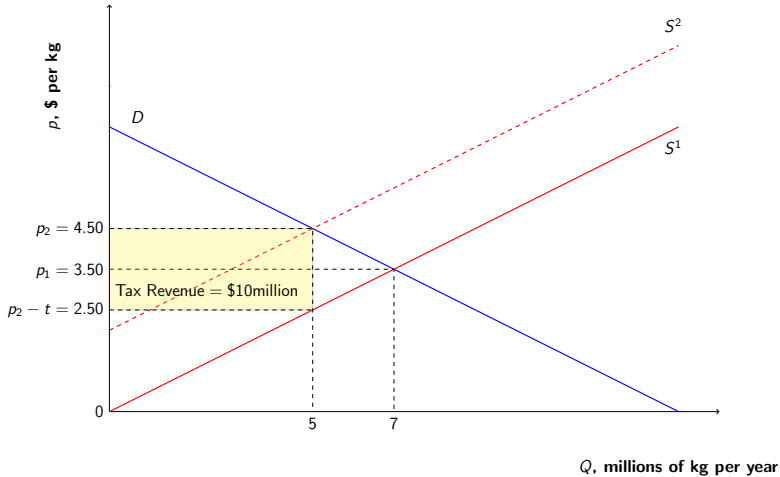

Figure: The effects of a $2.00/kg tax on cheese producers

2. Using the Model: Specific Tax

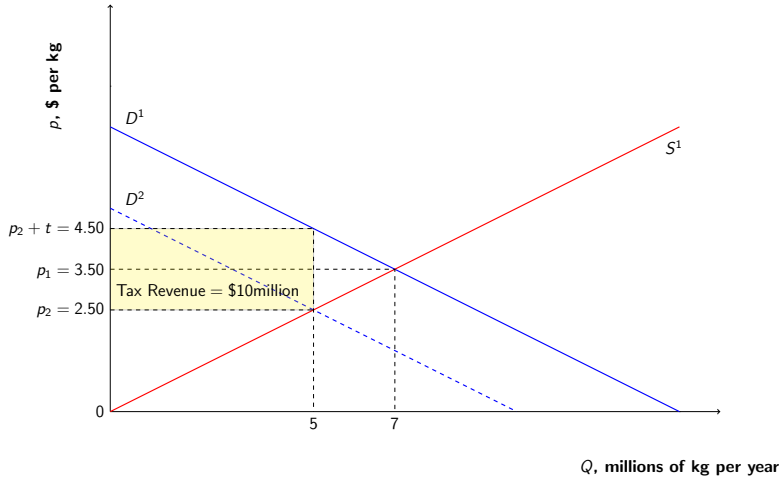

Figure: The effects of a $2.00/kg tax on cheese consumers

2. Using the Model: The Effects of A Specific Tax

- Two key points:
  1. As shown in the two figures, the imposition of specific sales tax yields the same equilibrium regardless of *who pays the tax*.
  2. The figures also show that the tax need not be fully passed on to consumers.
     - Producers may bear some of the effects of a tax.
     - What determines the extent of pass-through?

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3. Applying the Model in Practice

- The supply-and-demand model is a simple, but powerful tool for understanding how markets will change in the future in response to shocks and changes in government policy.
  - e.g. Dr. Copper, Mars Corp.
- Unleashing the power of the model requires a deep understanding of the factors that will affect demand and supply.
  - Need to understand determinants of demand and supply/possible government actions.
- We also need to know when the model is appropriate to use.

3. Applying the Model in Practice

- The supply-and-demand model works well as a tool for understanding markets that are *perfectly competitive*.

- Five characteristics of a perfectly competitive market:
  1. Many small buyers and sellers.
  2. Consumers believe all firms produce identical products.
  3. All market participants have full information about price and product characteristics.
  4. Transaction costs (expenses over and above the price) are negligible.
  5. Firms can easily enter and exit the market, so competition is high.

- The model does not work well in non-competitive markets where there are a few sellers that are price setters.
  - For these markets, we need a different model.

3. Applying the Model in Practice

- In practice, no market necessarily meets all five criteria.
- Still, the model is useful if the market is "competitive enough".
- What are some markets for which the model would work well?

Supply and Demand: Takeaways

1. The supply-and-demand model is a simple and powerful tool for understanding many markets.
2. Model relates the quantity consumers demand and the quantity producers supply to own prices and other factors.
3. Using the model requires understanding how factors other than own price may shift demand and supply, and how government intervention may affect prices in the market.
4. The model works well for understanding markets that are competitive enough.