

Fall 2020

Shifts in Equilibrium

- 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*, e.g. inputs, preferences, technology, etc.
 - 2 Government intervention.

Using the Model: Shifts in Demand

- We will start by considering the effects of an increase in annual household income.
- Specifically, suppose that household income increases from \$100,000 to \$120,000.
- How does this affect equilibrium price and quantity?
- Recall that our demand function was:

$$Q = 30 - \frac{p}{5} + 0.1Y$$

where Y is income in thousands of dollars

Using the Model: Shifts in Demand

- In the previous examples, we didn't invert demand with income left as a variable, but we can do so:

$$Q = 30 - \frac{p}{5} + 0.1Y$$

$$5Q = 150 - p + 0.5Y$$

$$p = 150 + 0.5Y - 5Q$$

- In the previous examples, we generally used $Y = 100$, at which the inverse demand reduces to our familiar $p = 200 - 5Q$. At income of $Y = 120$,
 $p = 210 - 5Q$

Shifts in Equilibrium: Shifting Demand

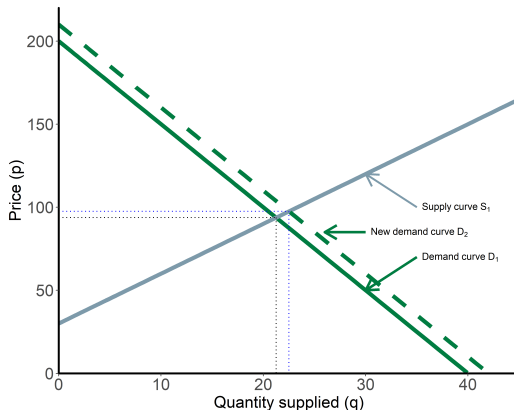


Figure: The effects of an increase in income

Shifts in Equilibrium: 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?

Shifts in Equilibrium: Shifting Demand

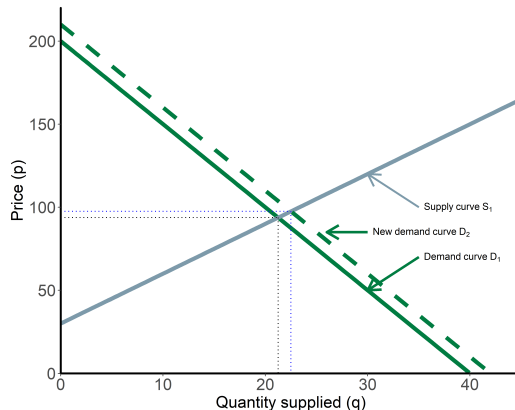


Figure: The effects of an increase in income

Shifts in Equilibrium: Shifting Demand

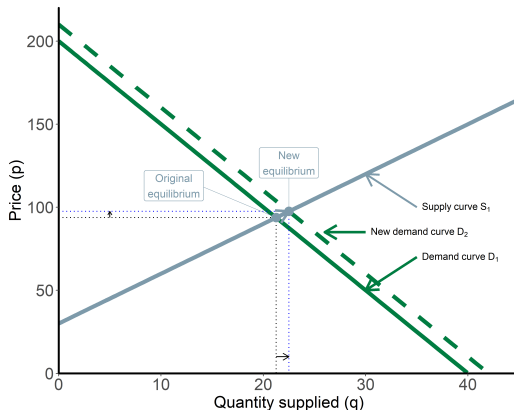


Figure: The effects of an increase in income

Shifts in Equilibrium: Shifting Demand

- We can also solve for the change in market equilibrium prices and quantities analytically using algebra. Recall our initial calculations:

$$Q_D = 40 - \frac{p}{5} \quad \text{and} \quad Q_S = \frac{p}{3} - 10$$

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

$$\begin{aligned} 40 - \frac{p}{5} &= \frac{p}{3} - 10 \\ \frac{8p}{15} &= 50 \rightarrow p &= 93.75 \end{aligned}$$

- Substituting $p = 93.75$ into Q_D or Q_S yields $Q = 21.25$.

Shifts in Equilibrium: Shifting Demand

- Recall that the underlying demand function was $Q = 30 - \frac{p}{5} + 0.1Y$, so with income of \$120,000, or $Y = 120$:

$$Q_D = 30 - \frac{p}{5} + .1(120) \quad \text{and} \quad Q_S = \frac{p}{3} - 10$$

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

$$\begin{aligned} 42 - \frac{p}{5} &= \frac{p}{3} - 10 \\ \frac{8p}{15} &= 52 \rightarrow p = 97.5 \end{aligned}$$

- Substituting $p = 97.5$ into Q_D or Q_S yields $Q = 22.5$.

Shifts in Equilibrium: Shifting Demand

- And now we can compare the impacts of a shift in demand caused by a change in income. In the initial equilibrium:

$$Q_1^* = 21.25$$

$$p_1^* = 93.75$$

- In the new equilibrium after the shift in income.

$$Q_2^* = 22.5$$

$$p_2^* = 97.50$$

- The change in income leads to a shift in demand, and a movement along the supply curve such that:

$$\Delta_p = 3.75$$

$$\Delta_Q = 1.25$$

Shifts in Equilibrium: Shifting Demand

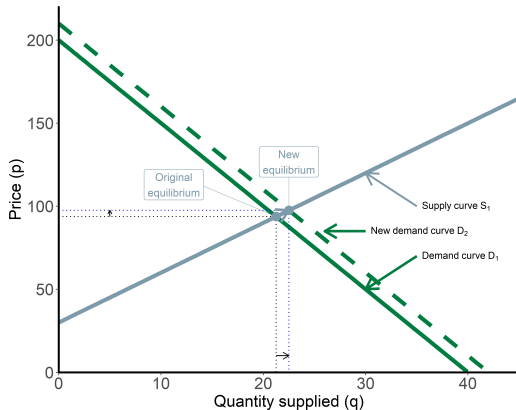


Figure: The effects of an increase in income

Shifts in Equilibrium: Shifting Supply

- Suppose instead that the price of crude oil increases from \$40 to \$60 per barrel.
- How does this affect equilibrium price and quantity?

Shifts in Equilibrium: Shifting Supply

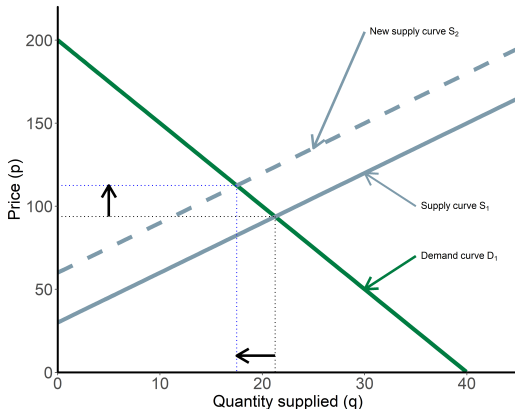


Figure: The effects of an increase in the price of crude on gasoline market equilibrium

Shifts in Equilibrium: Shifting Supply

- The increase in the price of crude oil (the key input to gasoline production) shifts the supply curve to the left (from S_1 to S_2).
- This results in a *movement along the demand curve*.
- Why?

Shifts in Equilibrium: Shifting Supply

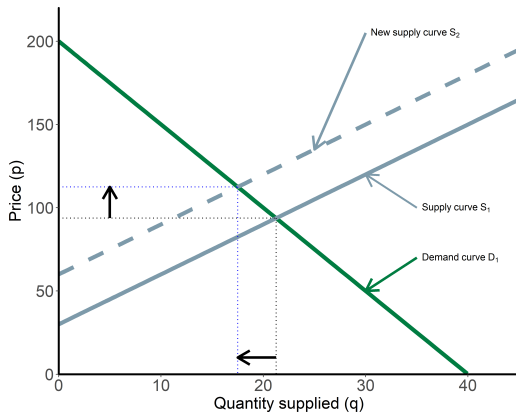


Figure: The effects of an increase in the price of an input (crude oil in this case)

Shifts in Equilibrium: Shifting Supply

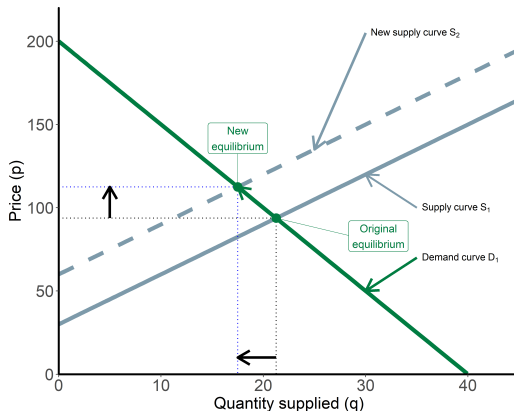


Figure: The effects of an increase in the price of an input (crude oil in this case)

Shifts in Equilibrium: Shifting Supply

- Recall that the original demand function was $Q_d = 40 - \frac{p}{5}$, with income of \$100,000, or $Y = 100$. And the supply curve is $Q_s = 10 + \frac{p}{3} - 0.5p_y$. So, with crude at \$60 and income at \$100:

$$Q_D = 30 - \frac{p}{5} + .1(100) \quad \text{and} \quad Q_S = \frac{p}{3} - 20$$

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

$$\begin{aligned} 40 - \frac{p}{5} &= \frac{p}{3} - 20 \\ \frac{8p}{15} &= 60 \rightarrow p = 112.5 \end{aligned}$$

- Substituting $p = 112.5$ into Q_D or Q_S yields $Q = 17.5$.

Shifts in Equilibrium: Shifting Supply

- And now we can compare the impacts of a shift in supply caused by a change in crude costs. In the initial equilibrium:

$$Q_1^* = 21.25$$

$$p_1^* = 93.75$$

- In the new equilibrium after the shift in income.

$$Q_2^* = 17.5$$

$$p_2^* = 112.50$$

- The change in the price of an input leads to a shift in supply, and a movement along the demand curve such that:

$$\Delta_p = 18.75$$

$$\Delta_Q = -3.75$$

Shifts in Equilibrium: Shifting Supply

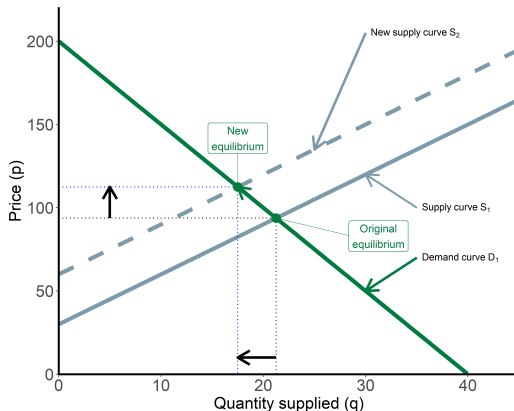


Figure: The effects of an increase in the price of an input (crude oil in this case)

Shifts in Equilibrium: Concurrent Shifts

- Sometimes, demand and supply change at the same time.
- Think of Alberta where increases in the oil price generally have substantial positive income effects (i.e. an increase in the oil price leads to an increase in household income, and vice versa).
- What would the effects of the combination of the two shifts we've just seen be on the equilibrium price and quantity in the market for gasoline?

Shifts in Equilibrium: Concurrent Shifts in Demand and Supply

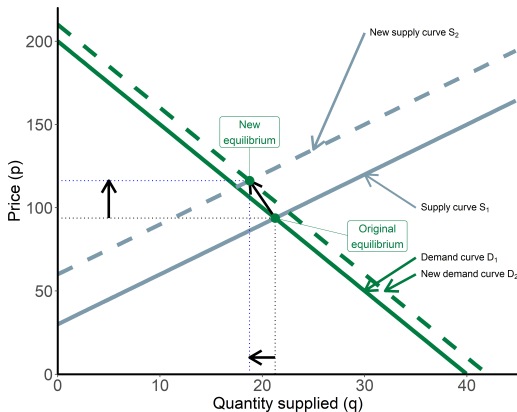


Figure: Income (demand) and input cost (supply) effects of an increase in the price of crude oil

Shifts in Equilibrium: Concurrent Shifts

- When demand and supply change at the same time, we may not be able to sign the effects on prices and quantities without further analysis:
 - An increase in demand (right shift) and a decrease in supply (left shift) could lead to any combination of increases or decreases in p and Q ;
 - If demand and supply both increase, we know that equilibrium quantities will increase, but the effect on price is ambiguous;
 - If supply decreases and demand increases, we know that price will increase, but the effect on quantities is ambiguous.

Shifts in Equilibrium: Concurrent Shifts

- When demand and supply change at the same time, the sizes of the shifts and the price elasticities of demand and supply determine the outcome.
- Recall that the price elasticity of demand is the percentage change in quantity demanded for a given percentage change in price;

$$\epsilon = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}} = \frac{\Delta Q/Q}{\Delta p/p} = \frac{\Delta Q}{\Delta p} \frac{p}{Q}$$

- The elasticity of supply is calculated similarly as the percentage change in quantity supplied for a given percentage change in price;
- Hint: more *elastic* is more responsive:
 - *inelastic* demand or supply means an elasticity less than one (i.e. the relative magnitude of the quantity response is smaller than the price change)
 - *perfectly inelastic* demand has an elasticity of zero
 - *perfectly elastic* demand has undefined elasticity

Shifts in Equilibrium: Government Intervention

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

Shifts in Equilibrium: 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 shifts the demand curves for these products to the left by shrinking the market, and thus decreases the quantity demanded at any price.
 - ② Restrictions on imports or exports.
 - Governments can restrict the flow of imports or exports. Import restrictions artificially shifts the importing country's supply curve to the left, while restrictions on exports shift the exporting country's demand 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?

Shifts in Equilibrium: 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.

Shifts in Equilibrium: Price Controls

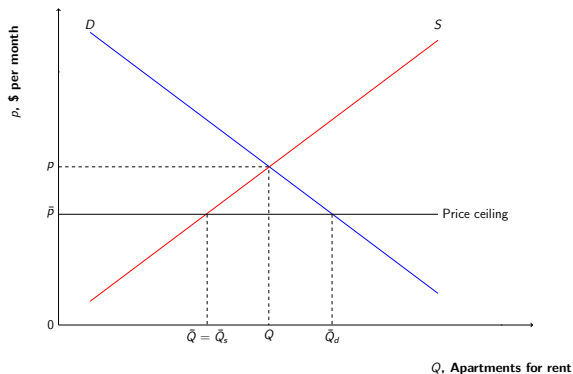


Figure: The effects of a maximum price in the market for housing.

Shifts in Equilibrium: Price Controls

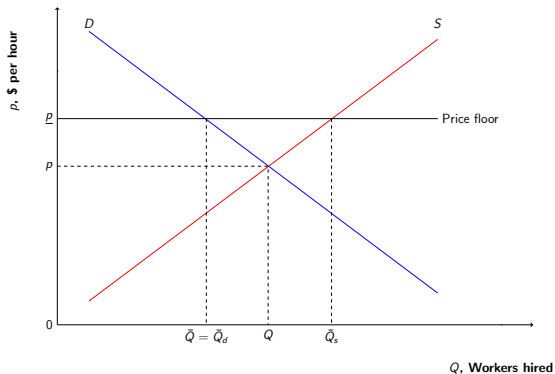


Figure: The effects of a minimum price in the market for labor.

Shifts in Equilibrium: 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.

Shifts in Equilibrium: 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 gasoline.
 - A specific tax is a tax charged per unit of output (e.g. \$/litre of gasoline).

Shifts in Equilibrium: Specific Tax Collected from Suppliers

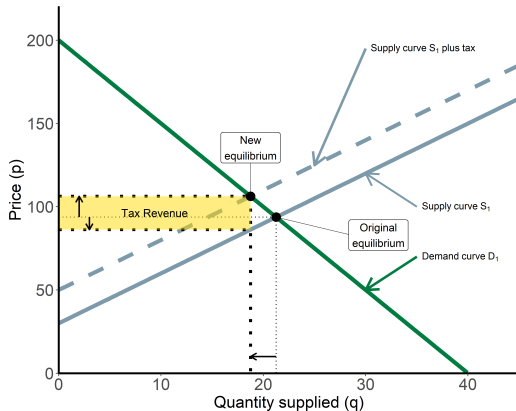


Figure: The effects of a 20c/l tax charged to gasoline producers

Shifts in Equilibrium: Specific Tax Collected from Suppliers

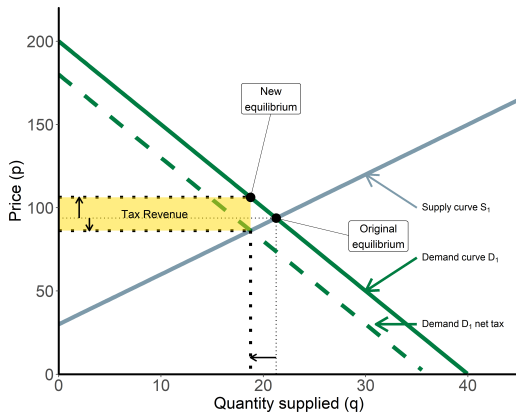


Figure: The effects of a 20c/l tax charged to gasoline consumers

Shifts in Equilibrium: 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?

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 it fails.

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*.