Introduction to Economics: Problem Set 2

Due on February 16, 2024 at 11:59pm
Tuesday/Thursday 3:30-4:45, Genome Sciences 100

Robert McDonough - ECON 101

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Question 1

Consider the daily market for a cup of coffee in Chapel Hill. Market demand for coffee is given by the equation $P = 80 - \frac{1}{2}Q_d$, and market supply of coffee is given by $P = 2 + \frac{Q_s}{37}$.

(a) If the price of coffee is \$0, how many cups would sellers want to sell?

$$\begin{aligned} 0 &= 2 + \frac{Q_s}{37} \\ -2 &= \frac{Q_s}{37} \\ Q_s &= -74 \\ Q_s &\approx 0 \end{aligned}$$

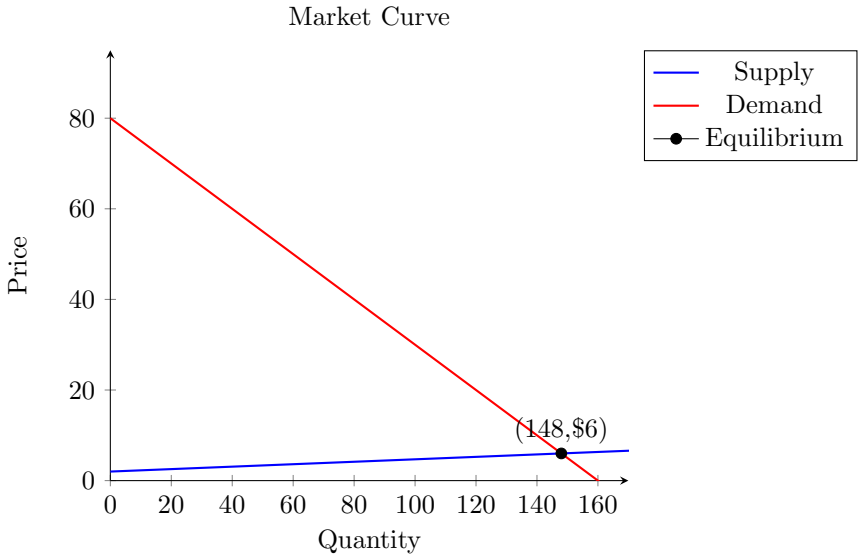
If the price of coffee is \$0, sellers wouldn't want to sell any coffee.

(b) Calculate the equilibrium price of coffee and the quantity of coffee cups sold in Chapel Hill every day.

$$\begin{aligned} Q_s &= 37P - 74 \\ Q_d &= 160 - 2P \\ 37P - 74 &= 160 - 2P \\ 39P &= 234 \\ P &= 6 \\ Q &= 160 - 2(6) \\ Q &= 148 \end{aligned}$$

The equilibrium price of coffee is \$6, and the equilibrium quantity of coffee cups sold in Chapel Hill every day is 148.

(c) Draw a properly labeled diagram for the market for coffee in Chapel Hill.



(d) Use the midpoint formula to calculate the price elasticity of demand for coffee if the price of a cup of coffee changes from \$4 to \$5.

At a price of \$4, the quantity demanded is 152. At a price of \$5, the quantity demanded is 150. Using the midpoint formula:

$$\text{Price Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$\text{Percentage Change in Quantity Demanded} = \frac{150-152}{(150+152)/2} = -\frac{2}{151} = -0.013$$

$$\text{Percentage Change in Price} = \frac{5-4}{(5+4)/2} = \frac{1}{4.5} = 0.222$$

$$\text{Price Elasticity of Demand} = \frac{-0.078}{0.222} = -0.0596$$

(e) Use the midpoint formula to calculate the price elasticity of supply for coffee if the price of a cup of coffee changes from \$4 to \$5.

At a price of \$4, the quantity supplied is 74. At a price of \$5, the quantity supplied is 111. Using the midpoint formula:

$$\text{Price Elasticity of Supply} = \frac{\text{Percentage Change in Quantity Supplied}}{\text{Percentage Change in Price}}$$

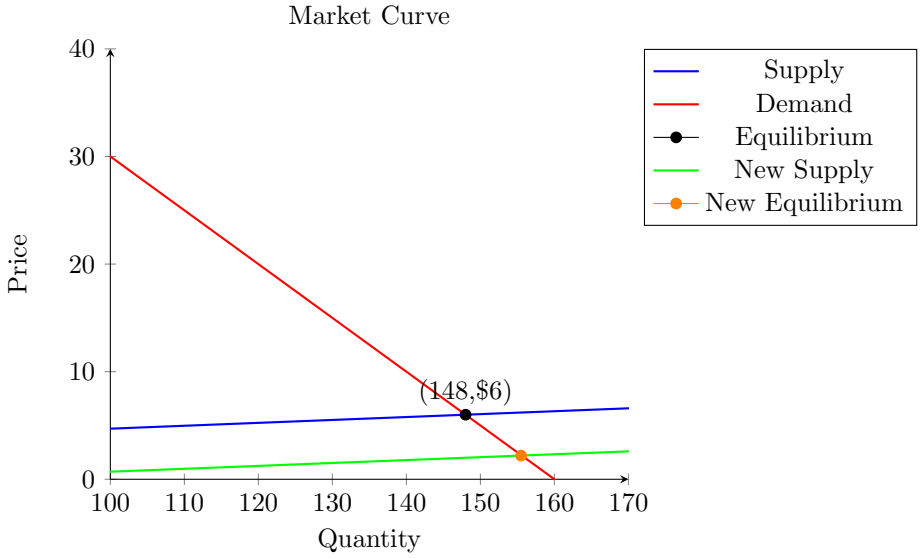
$$\text{Percentage Change in Quantity Supplied} = \frac{111-74}{(111+74)/2} = \frac{37}{92.5} = 0.4$$

$$\text{Percentage Change in Price} = \frac{5-4}{(5+4)/2} = \frac{1}{4.5} = 0.222$$

$$\text{Price Elasticity of Supply} = \frac{0.4}{0.222} = 1.8$$

(f) Imagine that two new coffee shops open in Chapel Hill. Graph how this will impact the market for cups of coffee. Be sure to clearly indicate the direction in which price and quantity have moved if equilibrium has changed.

This will cause the supply curve to shift to the right (down), as there will be more coffee available in the market. This will cause the equilibrium price to fall, and the equilibrium quantity to rise.



Question 2

Economists have been interested in markets for illegal and addictive goods for a long time. One question that many economists have asked is whether marijuana and alcohol are substitutes or complements. After Oregon legalized marijuana, Ben began to collect data on the alcohol and marijuana markets to try to answer this question. He found that in August of 2019, the price of an ounce of marijuana fell by 5%, and that alcohol sales rose by 7% directly afterwards.

(a) Calculate the marijuana cross-price elasticity of demand for alcohol.

(b) What does Ben's data indicate about the relationship between alcohol and marijuana?

Question 3

Consider the market for laptops during 2020, after the COVID pandemic began. For each of the following scenarios, graph how supply and/or demand will shift, and indicate how this will impact the equilibrium price and quantity of laptops sold in the U.S.

(a) The government provides most U.S. adults with a $1,200 stimulus check.

(b) A global semiconductor shortage causes the price of semiconductors, a crucial component used in laptops, to rise dramatically.

(c) The government provides most U.S. adults with a $1,200 stimulus check. At the same time, a global semiconductor shortage causes the price of semiconductors, a crucial component used in laptops, to rise dramatically.

(d) A large percentage of the U.S. workforce begins to work from home for the duration of the pandemic. At the same time, laptop companies develop new software that lets the machines in their factories make twice as many laptops in a day.

Question 4

Consider the market for camp coolers. The market supply of coolersis $Q_s = 4P$, and market demand is $Q_d = 240 - 4P$.

(a) Solve for equilibrium price and quantity in the market for camp coolers, and draw a graph illustrating this market.

(b) The government imposes a $5 tax on those selling camp coolers. How will this change the supply function for coolers? (Hint: you may want to rearrange the supply function so that it is in the form "P=...", like the example from our slides)

(c) Solve for the new equilibrium price and quantity sold after the tax is implemented.

(d) Modify your graph from part (a) to show the impact of the tax.

(e) Calculate how much revenue the government earns from the tax, and the deadweight loss caused by the tax.

For this question, consider the market for gasoline in North Carolina. Suppose that supply and demand for gallons of gasoline can be represented with the following supply and demand functions:

$$S(p) = 30,000P$$
$$D(p) = 120,000 - 20,000P$$

(a) Use these supply and demand functions to calculate the market equilibrium for gasoline in Oregon.

(b) Calculate producer and consumer surplus in the market for gasoline in North Carolina. For the rest of this question, assume also that each gallon of gasoline creates an external cost of \$0.50, due to increased healthcare costs for those individuals who breath in engine exhaust. Note that as a result, the social supply function for gasoline in North Carolina would be:

$$S_{social}(p) = 30,000p - 15,000$$

(c) What kind of externality is present in the market for gasoline? Will this externality cause the private market to over or underproduce gasoline?

(d) Please calculate the social optimum in Oregon's gasoline market. Remember that, since there are no external benefits, the social demand line is equal to the private demand line.

(e) Draw a graph illustrating the social optimum and the private equilibrium in the market for gasoline in Oregon. Indicate which part of your graph represents the deadweight loss caused by this externality.

(f) Now calculate the value of deadweight loss that you identified in part (e).

(g) If the government wants to solve this externality problem the 'normal' way, would it involve using a tax or a subsidy? How large would that tax or subsidy need to be?

(h) What is one alternative way that the government could try to solve this externality problem? Explain in a sentence or two how your alternate solution would cause gasoline suppliers to internalize their externality.