Econ 101: Managerial Economics
Solutions to Homework Chap 2 and 3

Instructor: Aaron Meinenger       TA: Aadil Nakhoda
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Chapter 2

Answer 2a) An increase in the price of input A will cause the supply curve to shift left. As the input prices go up, it becomes more expensive to produce each unit of output. Therefore, they will be selling each unit at a greater price and thus the supply curve will shift left.

Answer 2b) An excise tax behaves similarly as an increase in input prices.

Answer 2c) An ad-volarem tax is calculated as a percentage of the price. Therefore, the supply curve will shift out, but the shift is greater at higher prices.

Answer 2d) This will have an opposite effect as an increase in input prices. Now each unit of output can be produced at a cheaper rate and this will lower its price.

Answer 4a) Y is a substitute and Z is a complement. A positive coefficient implies that as the price of Y goes up, consumption of X increases. A negative coefficient implies that as the price of Z goes down, consumption of X increases. For example, if the price of Pepsi goes up, the consumption of Coke would increase as they are substitutes. On the other hand, as the price of gas goes up, the quantity demanded of cars would decrease, making them complements.

b) X is a normal good as M has a positive coefficient. As income increases, the quantity demanded of X goes up.

c) 
\[ Q_d^x = 1200 - \frac{1}{2} P_x + \frac{1}{4} P_y - 8P_z + \frac{1}{10} M \]

\[ P_y = 5,900, \ P_z = 90, \text{ and } M = 55,000. \ P_x = 4,910. \]

\[ Q_d^x = 1200 - \frac{1}{2} (4910) + \frac{1}{4} (5900) - 8(90) + \frac{1}{10} (55000) = 5000 \]

d) The demand function is:

\[ Q_d^x = 1200 - \frac{1}{2} P_x + \frac{1}{4} P_y - 8P_z + \frac{1}{10} M \]
\[ Q^d_x = 7455 - \frac{1}{2}P_x \]

The inverse demand function:

\[ P_x = 14910 - 2Q_x \]

6a) Equilibrium price and quantity:

\[ Q^d = 50 - P \]

\[ Q^s = \frac{1}{2}P - 10 \]

Equating \( Q^s = Q^d \)

\[ 50 - P = \frac{1}{2}P - 10 \]

\[ \frac{3}{2}P = 60 \]

\[ P = 40 \]

\[ Q = 10 \]

6b) With a price floor of $42:

\[ Q^d = 50 - 42 = 8 \]

\[ Q^s = \frac{1}{2}(42) - 10 = 11 \]

The surplus is 3 units.

6c) With a price ceiling of $30:

\[ Q^d = 50 - 30 = 20 \]

\[ Q^s = \frac{1}{2}(30) - 10 = 5 \]

The shortage is 15 units.

To determine the economic price, we set the maximum price that the consumers are willing to pay for the 5 units supplied.

\[ 5 = 50 - P^e \]
The economic price is \( P^E = 45 \)

Answer 7a) At the price of 6, the quantity demanded is 4 and the quantity supplied is 1.
    The shortage is 3 units.
7b) At $12, the quantity supplied is 2.5 units and quantity demanded is 1 unit. The surplus is 1.5 units. The cost to the government is \( 1.5 \times 12 = 18 \).
7c) The slope of the supply curve is \( \frac{6-2}{1-1} = 4 \) and the price intercept is 2.
   The equation can be written as \( P = 2 + 4Q^s \).
   The slope of the demand curve is \( \frac{-14}{1-12} = -2 \)
   The price intercept is 14. The equation can be written as \( P = 14 - 2Q^d \)
   The slope of the supply curve is 4 and the slope of the demand curve is 2 (absolute value). Therefore, the supplier will pay \( \frac{4}{2} = 2 \) times the amount the consumers contribute towards tax.
Therefore, the supplier will pay $4 and the consumer will pay $2. So the supplier will receive $6 ($10-$4) and the consumer will pay ($10+$2) for each unit of good purchased.
   The number of units sold will be 1. (Look at the graph).
   d) The consumer surplus is \( (14 - 10) * \frac{1}{2} = 4 \).
    The producer surplus is \( (10 - 2) * \frac{1}{2} = 8 \).
   e) At a price ceiling of $2, consumers will demand 6 units but the suppliers will sell 0 units. There will be no goods in the market available for the consumers to purchase. Therefore, a price ceiling of $2 cannot benefit consumers.

Chapter 3

Answer 1a)
If the price is lowered from $12 to $10, the revenue increases from $12(12*1) to $20(10*2). As the revenue increases with a decrease in price, the demand is elastic.
1b) If the price is lowered from $4 to $2, our revenue would decrease from $20 to $12.
    The demand is inelastic.
1c) The revenue is maximized at $7. The elasticity at this point is -1.

Answer 2a)

\[
Q_x^d = 1000 - 2P_x + 0.02P_z
\]

where \( P_z = 400 \).
When \( P_z = 154 \), the price elasticity is calculated as follows:
\[ \frac{\partial Q_x}{\partial P_x} = -2 \cdot \frac{154}{1000 - 2(154) + 0.02(400)} = -2 \cdot \frac{154}{700} = -0.36 \]

It is inelastic as the absolute elasticity is less than 1.
So if it decides to charge a price below $154, the revenue will decrease.

b) Now the price is $354

\[ \frac{\partial Q_x}{\partial P_x} = -2 \cdot \frac{354}{1000 - 2(354) + 0.02(400)} = -2 \cdot \frac{354}{300} = -1.18 \]

It is elastic as the absolute value is greater than 1.
So it it decides to charge a price above $354, the revenue will decrease.

c) The cross price elasticity can be determined by looking at the coefficient.
As the coefficient is positive we can say the good Z is a substitute of good X.

\[ \frac{\partial Q_x}{\partial P_z} = 0.02 \cdot \frac{400}{1000 - 2(154) + 0.02(400)} = 0.02 \cdot \frac{400}{700} = 0.0114 \]