**Department of Economics** 

February 2, 2014

# Economics 205 UNIVERSITY OF VICTORIA Managerial Economics Spring 2014 Solutions <u>Assignment 2</u>

**Due:** Friday, February **7, 2014**, **3 pm.** (In the box marked "ECON 205" near the Economics Department

Office)

**Question 1:** A private research firm is asked to predict what will happen to the price and output of electric-powered vehicles under the conditions below. What are your predictions? For each part, sketch a graph showing the appropriate demand and supply analysis. (*4 marks*)

a) A major natural disaster destroys a large hydro producing dam in B.C.

The supply of hydro electricity will suddenly fall. The supply curve will shift to the left. Price of electricity will increase to P2 from P1 and output will decrease from Q1 to Q2. New Equilibrium E2.



Since electric cars will be more expensive to operate, the demand for cars will shift to the left.

b) The scientists at the University of California discover a way to double the efficiency of battery powered vehicles.

The opposite of A will occur. The price of complement has fallen, making electric cars more appealing. The supply curve will shift to the right. Price will decrease to P1 from  $P_0$  and output will increase from  $Q_0$  to Q1. New Equilibrium E1. In the car market, The demand curve will shift to the right as the demand for cars increases.



Cars

c) The CMA announces that inhaling fossil fuel emissions can increase the risk of cancer.

The demand for electric cars will increase. The demand curve will shift to the right. Price will increase to P2 from P1 and output will increase from Q1 to Q2. New Equilibrium E2.



d) The price of gasoline falls.

Gasoline is not a substitute for electricity. However, it is the fuel source for the substitute car. If gas prices fall, the cost of driving a gas powered car falls relative the electric car. If the price of gas fell because there is an increase in supply of gas, the demand curve for gas powered cars will shift to the right, and the demand curve for electric cars will shift to the left.



#### Question 2: (3 marks)

a) How does imposing a price ceiling affect the number of new cancer preventing drugs in the pharmacological market? (Suppose there is a legal limit as to the amount a drug company can charge for its product.)



#### shortage

With a price ceiling, supply of drug manufacturing may not keep up with demand. Suppose a new drug is developed that will stop a certain cancer, but it is very expensive to manufacture. If price is not allowed to rise above a certain limit, demand will be greater than supply.

Shortages will occur. Initially, we have equilibrium in the market. When demand for drugs increases, demand equals Q2 at price P1 (original price) but quantity of drugs supplied is at Q1. At a fixed price, more manufacturing will not occur.

Restriction on price may also discourage new suppliers of the drug from entering the market. Even research and development may be affected by restrictions in the market.

## b) When there is a price ceiling, can all potential cancer patients get the medication?

No. This will happen only if demand equals supply. If price is fixed and demand increases, the number of units will not increase.

## c) Who loses with price fixing in this market?

Families that are lucky enough to get a supply of the drug will gain; those that cannot will lose. Black market may enter the situation.

**<u>Question 3:</u>** (6 marks) The demand and supply functions for a product are determined to be:

$$Q_d = 275 - 15P + 0.55M + 22P_r$$
$$Q_r = 50 + 12P - 20P_r + 25F$$

where

P is price per unit of time M is consumer income  $P_r$  is price of the good related in consumption  $P_I$  is the price of an input used in producing the good and F is the number of firms in the industry.

a) Initially M=56,365 and Pr=100. Determine the equation for the demand function.  $Q_d = 275 - 15P + 0.55M + 22P_r$   $Q_d = 275 - 15P + (0.55)(56,365) + 22(100)$   $Q_d = 275 + 31,000.75 + 2200 - 15P$  $Q_d = 33,475.75 - 15P$ 

b) Determine the inverse demand function. (Re-arrange the demand equation in terms of P:  $Q_d = 33,475.75 - 15P$  15P = 33,475.75 - Q $P = \frac{33,475.75}{15} - \frac{Q_d}{15}$ 

 $P = 2231.72 - 0.067Q_d$ 

c) Initially assume Pi=15, F=25. Determine the equation for the supply function.

 $Q_s = 50 + 12P - 20P_I + 25F$   $Q_s = 50 + 12P - (20)(15) + 25(25)$   $Q_s = 50 + 12P - 300 + 625$  $Q_s = 375 + 12P$ 

## d) Determine the inverse supply function.

 $Q_s = 375 + 12P$   $P = -\frac{375}{12} + \frac{Q_s}{12}$   $P = -31.25 + 0.0833Q_s$ 

e) If price is fixed at \$900, will there be a shortage or surplus and by how much?

Price 900: P=900  $Q_s = 375 + 12P$   $Q_s = 375 + 12(900) = 11,175$   $Q_d = 33,475.75 - 15P$  $Q_d = 33,475.75 - 15(900) = 19,975.75$ 

There will be a shortage of 8800.75 units.

## f) Determine equilibrium price and output.

**Equilibrium:** -31.25 + 0.083333Q = 2231.716667 - 0.06666666Q2262.966667 = 0.149999966Q*O* = 15086.44787 P = 2231.716667 - 0.066666(15086.44787) = 2231.716667 - 1005.753133 = 1225.96

**Question 4**: (3 marks) The Tomato Grow-crop Distributors concludes that the demand function for its product is:

Q=80-97P+8P<sub>R</sub>+ 0.75 M

where Q is the quantity demanded of its product, P is the price of its product,  $P_R$  is the price of its rival's product, and M is per capita disposable income (in dollars). Currently, P=\$8, P<sub>R</sub>=\$12 and M=\$4535.

#### a) What is the price elasticity of demand for the firm's product?

Use price elasticity of demand formula for a point:  $\left(\frac{\partial Q}{\partial P}\right)\left(\frac{P}{Q}\right)$ 

Solving for O=80-97(8)+8(12)+0.75(4535)

Q=80-776+96+3401.25=2801.25

 $\left(\frac{\partial Q}{\partial P}\right)\left(\frac{P}{Q}\right) = -97(8/2801.25) = -0.277019$ 

What is the income elasticity of demand for the firm's product? b)

(Use income elasticity of demand formula for a point:  $\left(\frac{\partial Q}{\partial M}\right) \left(\frac{M}{Q}\right)$ .)

0.75 (4535/2801.25) =0.75(1.61892)= 1.21419

What is the cross elasticity of demand between its product and its rival's product. c)

(Use Cross elasticity of demand formula for a point:  $\left(\frac{\partial Q}{\partial P}\right) \left(\frac{P_R}{O}\right)$ .)

8 (12/2801.25) =8( 0.00042838)=0.03427

**Question 5:** Suppose total income to spend on two products is \$72. The price of the first product is  $P_x=$ \$4 per unit and the price of the second product is  $P_y=$ \$6 per unit. (5 Marks)

A) Determine the formula for the budget constraint. (1 Mark)  $M = P_{\rm x}X + P_{\rm y}Y$  $Y = \frac{72}{6} - \frac{4}{6}X$  $Y = 12 - \frac{2}{3}X = 12 - 0.6667X$ 

- B) What is the MRS<sub>y,x</sub>? (2 Marks)  $MRS_{y,x} = -\frac{P_x}{P_y} = -\frac{2}{3} = 0.6667$
- C) Illustrate the consumption decision with a diagram. (You will not be able to show the exact consumption bundle.) Make sure you include the intercepts of the budget constraint and an indifference curve. (2 Marks)

The consumer will consume where  $MRS_{y,x} = -\frac{P_x}{P_y} = \frac{\Delta Y}{\Delta X}$ 



**Question 6**: Diego budgets a total of \$170.25 to spend on two life comforts, foot massage and sports pedicure. Any massage he cannot undertake in combination with a pedicure is useless. Similarly, any pedicure that he cannot consume with a foot massage is useless. If the price of a massage is \$33.50 and the price of a pedicure is \$23.25, how many units of each good will he purchase? Draw the indifference curve and point of consumption that represents the consumption choice. (4 Marks)

170.25=P23.25+M33.5 33.5M=170.25-23.25P M=5.0821-0.694P Intercepts: M=5.08, P=0 M=0, P=7.3229 P=M M=5.0821-0.694M 1.694M=5.0821

1.694M=5.0 M=3=P Diego will consume 3 units of each product with his \$170.25 budget.

