Faculté des sciences sociales | Faculty of Social Sciences

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Department of Economics

Eco 2144 A (A. Akbari, Spring 2015)
Mid-term test # 1
Total time: 90 minutes
May 26, 2015

1. **a)** (4 marks) If water is needed to survive and diamonds are simply for jewelry, then why are diamonds so expensive and water so inexpensive? (4 marks).
   b) (4 marks) One million automobiles have a defect that could cause the car to explode; however, only one of those cars will actually explode. Nobody knows which one car it is. When the car does explode, the victim's family will sue the automaker for $1 million and win. The defect costs $2 per car to repair. What does economics predict about the automaker's decision to repair the defect?

2. **a)** (5 marks) Use a graph to show that the incidence of a $1/lb. tax on grapes is the same whether the tax is collected from the sellers or the buyers. Under what circumstance would the incidence be split equally between buyers and sellers?
   b) (5 marks) Suppose a tax on beans of $0.05 per can is levied on firms. As a result of the tax, the equilibrium price increases from $0.20 to $0.22. What fraction of the incidence falls on consumers? On firms? Suppose the supply elasticity is 0.6. What must the demand elasticity be?

3. Suppose a consumer's utility derived from consuming bananas is described by the function $U = 10X + 3X^2 - (1/3)X^3$.
   a) (5 marks) Make a Table showing total and marginal utility for X from 0 to 7 units.
   b) (3 marks) Would this individual ever choose to consume more than 7 units? Explain.

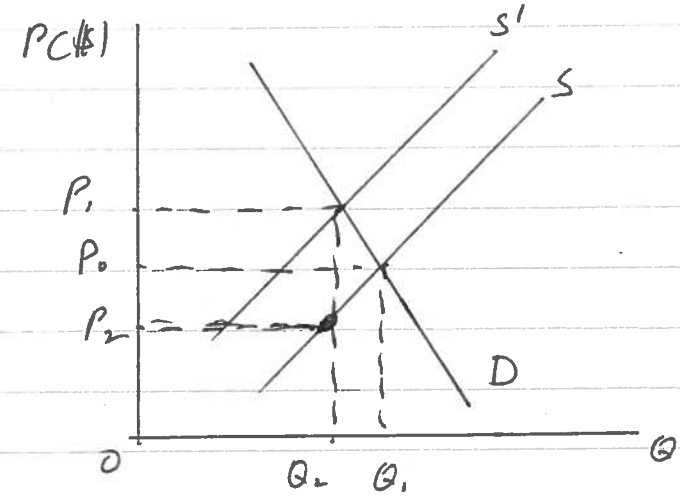
4. **a)** (5 marks) Larry and Teri allocate their consumption between hats and bats. The price of hats is $4 each and the price of bats is $8 each. For Larry, the marginal utility of last hat consumed was 8 and the marginal utility of the last bat was 24. For Teri, the marginal utility of the last hat was 6 and the marginal utility of the last bat was 12. Which consumer is not maximizing hi/her utility? How can you tell? How should he/she change their allocation?
   b) (7 marks) Suppose a consumer has income of $120 per period, and faces prices $p_x = 2$ and $p_z = 3$. Her goal is to maximize her utility, described by the function $U = 10X^{0.5}Z^{0.5}$. Calculate the utility maximizing bundle (X*, Z*) using the Lagrangian method.
   c) (5 marks) Derive the above consumer's Engel curve.

ANSWERS TO MID-TERM TEST #1 H. Akbari

1-a This problem relates to the issue of scarcity. Water is abundant in supply while diamonds are scarce making their market value much higher.

b. If the manufacturer recalls all the cars and repairs them it would cost \$2 million. But if it just lets one of the car explode it would cost \$1 million. So it would rather not recall all the cars.

2-a



If the tax is collected from the sellers, the supply curve shifts to the left (from S to S') and equilibrium price rises to P_1 from which seller receives P_2. Incidence on consumer is $P_1 - P_0$ and on seller is $P_0 - P_2$.

If the tax is collected from the buyer, the demand curve shifts to the left, demand drops from D to D' and new equilibrium price would be P_2 — received by seller as before. The effective price is P_1 so the incidence on buyer is $P_1 - P_0$ (same as before) and on the seller is $P_0 - P_2$ (same as before) b- Burden on the consumer is the amount by which price rises $\left(\frac{\Delta P}{\Delta T}\right)$ which here is \$0.02 per can which is 40% of the tax (of \$0.05). The remaining 60% is on sellers (or firms). To find demand elasticity (ϵ) use the formula $\frac{\partial P}{\partial T} = \frac{\eta}{\eta - \epsilon}$

$$\therefore \quad 0.4 = \frac{0.6}{0.6-(\epsilon)}$$

$$\Rightarrow 0.6 - \epsilon = \frac{0.6}{0.4}$$

$$-\epsilon = \frac{0.6}{0.4} - 0.6 = 1.5 - 0.6$$

$$\Rightarrow \epsilon = 0.6 - 1.5$$

$$= \underline{\underline{-0.9}}$$

3- $U = 10x + 3x^2 - \frac{1}{3}x^3$

a

x	Total Utility (u)	Marginal Utility (u_x)
0	0	—
1	12.67	12.67
2	29.33	16.66
3	48.00	18.67
4	66.67	18.67
5	83.33	16.66
6	96	12.67
7	102.67	6.67

b. It will choose more than 7 units as long as $MU > 0$

(2')

$u(0) \qquad u(1) = 12.67; \quad u(2) = 20 + 12 - \frac{1}{3}(2)^3$

$= 32 - 2.67$

$= 29.33$

$u(3) = 10(3) + 3(3)^2 - \frac{1}{3}(3)^3$

$= 57 - \frac{1}{3}(3)^3 = 57 - 9 = \underline{48}$

$u(4) = 10(4) + 3(4)^2 - \frac{1}{3}(4)^3$

$= 40 + 48 - \frac{1}{3} 64 = 88 - 21.33 = 66.67.$

$u(5) = 10(5) + 3(5)^2 - \frac{1}{3}(5)^3$

$= 50 + 75 - 41.67 = 83.33$

$u(6) = 10(6) + 3(6)^2 - \frac{1}{3}(6)^3$

$= 60 + 108 - 72 = 96$

$u(7) = 10(7) + 3(7)^2 - \frac{1}{3}(7)^3$

$= 70 + 147 - 114.33 = 102.67$

4-a $P_H = \$4$ $P_B = \$8$

$MU_H = 8$ $MU_B = 24$ Fore Larry

$MU_H = 6$ $MU_B = 12$ Fore Teri

For Larry $\frac{MU_H}{P_H} = \frac{8}{4} = 2 < \frac{MU_B}{P_B} = \frac{24}{8} = 3$

For Teri $\frac{MU_H}{P_H} = 6/4 = 3/2 = \frac{MU_B}{P_B} = \frac{12}{8} = 3/2$

Teri is maximizing utility but Larry is not. He can buy more utility by spending more on bats than hat so he should consume more hats.

b- $U = 10 X^{0.5} Z^{0.5}$

Set up Lagrange function; $\mathcal{L} = 10 X^{0.5} Z^{0.5} + \lambda(120 - 2X - 3Z)$

First-order conditions for maximizing $\mathcal{L}$ (and hence utility) are :-

$\frac{\partial \mathcal{L}}{\partial X} = 0 \quad \therefore 5\left(\frac{Z}{X}\right)^{0.5} - 2\lambda = 0 \Rightarrow \frac{5}{2}\left(\frac{Z}{X}\right)^{0.5} = \lambda$ (i)

$\frac{\partial \mathcal{L}}{\partial Z} = 0 \quad \therefore 5\left(X/Z\right)^{0.5} - 3\lambda = 0 \Rightarrow \frac{5}{3}\left(X/Z\right)^{0.5} = \lambda$ (ii)

& $\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \quad \therefore 120 - 2X - 3Z = 0 \Rightarrow 120 = 2X + 3Z$ (iii)

From (i) & (ii)

$$\frac{5}{2}\left(\frac{Z}{X}\right)^{0.5} = \frac{5}{3}\left(\frac{X}{Z}\right)^{0.5}$$

$$\therefore \quad \frac{Z}{X} = 2/3 \quad \text{OR } Z = 2/3\, X$$
$$\& \ X = 3/2\, Z$$

Sub. in (iii) one-by-one.

$$\therefore 120 = 2X + 3Z \Rightarrow 120 = 2\left(\tfrac{3}{2}Z\right) + 3Z \Rightarrow \underline{\underline{Z = 20}}$$

$$\& \ 120 = 2X + 3\left(\tfrac{2}{3}X\right) \Rightarrow \underline{\underline{X = 30}}$$

c. Engel Curve? gives the relationship between quantity and income. Replace 120 with Y

$$\therefore \ Y = 2X + 3Z \Rightarrow Y = 2X + 3\left(\tfrac{2}{3}X\right)$$

$$\Rightarrow \boxed{Y = 4X} \quad \boxed{\cancel{\text{or } X = Y/4}}$$

Also $Y = 2X + 3Z \Rightarrow Y = 2\left(\tfrac{3}{2}Z\right) + 3Z$

$$\Rightarrow \boxed{Y = 6Z}$$