

**ECONOMICS 1**  
**SECOND MIDTERM EXAMINATION**  
November 16, 2011

**INSTRUCTIONS**

**DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO BEGIN THE EXAM**

1. Please fill in the information below:

Student's Name: \_\_\_\_\_

SID #: \_\_\_\_\_

GSI's Name: \_\_\_\_\_

Section Number (Day/Time): \_\_\_\_\_

2. **This exam starts at 12:10 pm and ends at 1:00 pm.**
3. If you finish early, please remain in your seat so that you do not disturb others.
4. When time is called, please stop writing and pass your exam to the aisle. Please stay in your seats until all the exams are collected.
5. There is a total of 100 points, 5 questions, and 8 pages (including this cover sheet) points for each question are in parenthesis.
6. **NO BLUE BOOKS NEEDED.** Please answer the questions in the space provided. If you need extra room to answer the questions, use the backs of the pages.
7. **Calculators are not permitted.**
8. Best wishes!!!

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**Question 1: TRUE, FALSE, UNCERTAIN. (18 points)**

For each question explain whether the statement is false, true or uncertain. Your grade is determined by your explanation; an answer without an explanation receives no credit. Use graphs when needed to complement your answer.

a) (6 points)

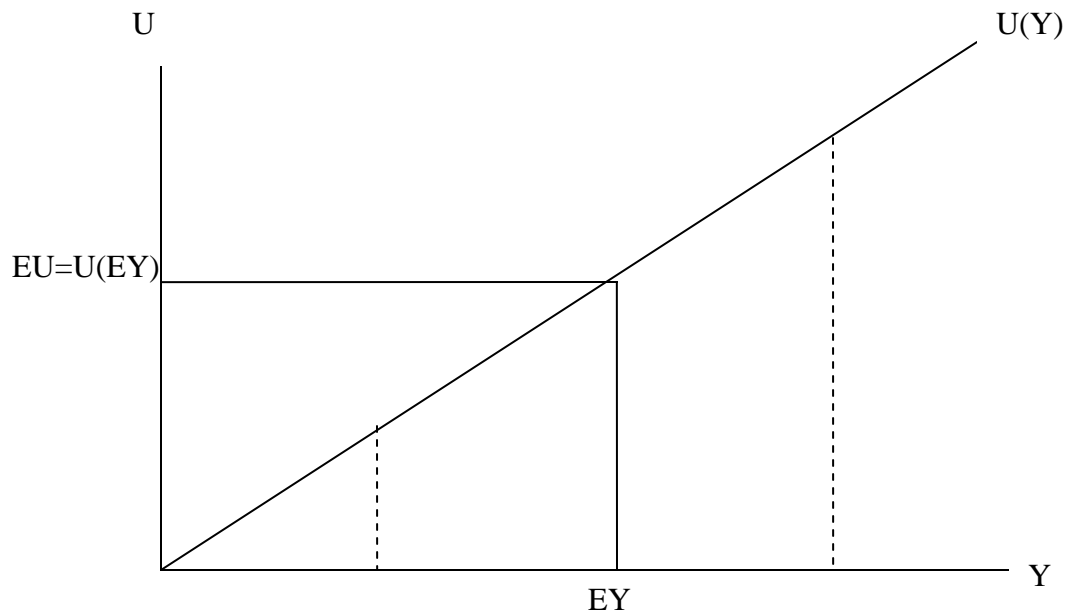
As long as the median willingness to pay for a public good exceeds its average cost (i.e., cost per person), this public good is socially beneficial.

False. The statement confuses the “median” with “average.” If the median willingness to pay exceeds the average cost, then a ballot proposition that provides the public good and divides the cost equally will pass. However, the fact that the proposition passes does not necessarily mean that it *should* pass from a social perspective. The public good should be provided (i.e., is socially beneficial) if the average willingness to pay for it exceeds its average cost, or stated equivalently, if total willingness to pay is larger than total cost.

b) (6 points)

Assume, as we have in class, that people maximize their expected utility when facing uncertain events. If people had constant marginal utility of income (instead of diminishing marginal utility of income), then people would receive no benefit from insurance.

True. If people have constant marginal utility of income, they are not hurt by risk, which means they would receive no benefit from insurance. In graph below, the expected utility EU in the risky situation is the same as the utility at the expected income  $U(EY)$  without risk, and so a fair policy provides no benefit.



c) (6 points)

The potential merger between AT&T and T-Mobile might be in violation of the Sherman Act because the two companies hold such a large share of the market.

False (or at best Uncertain.) Two merging companies being large is not, in itself, a violation of the Sherman Act. “Mere size is not an offense.” Sherman Act outlaws acts whose purpose is to gain or maintain monopoly power, and a merger can have many other purposes.

### Question 2: (20 points) Externality

Solar energy deployment increased at a record pace in the United States, mostly thanks to various government subsidies. Please use your knowledge of externalities to answer following questions.

a. (5 points)

What positive externality, if any, is associated with using solar energy instead of traditional energy such as coal or gasoline? Briefly explain.

Compared to traditional energy, solar energy is generated without air pollution. So cleaner environment would be positive externality associated to solar energy. Solar energy is re-usable, which means that we will never run out of it, while the reserve of fossil fuels shrinks as we use them. (Lots of different explanations are fine here)

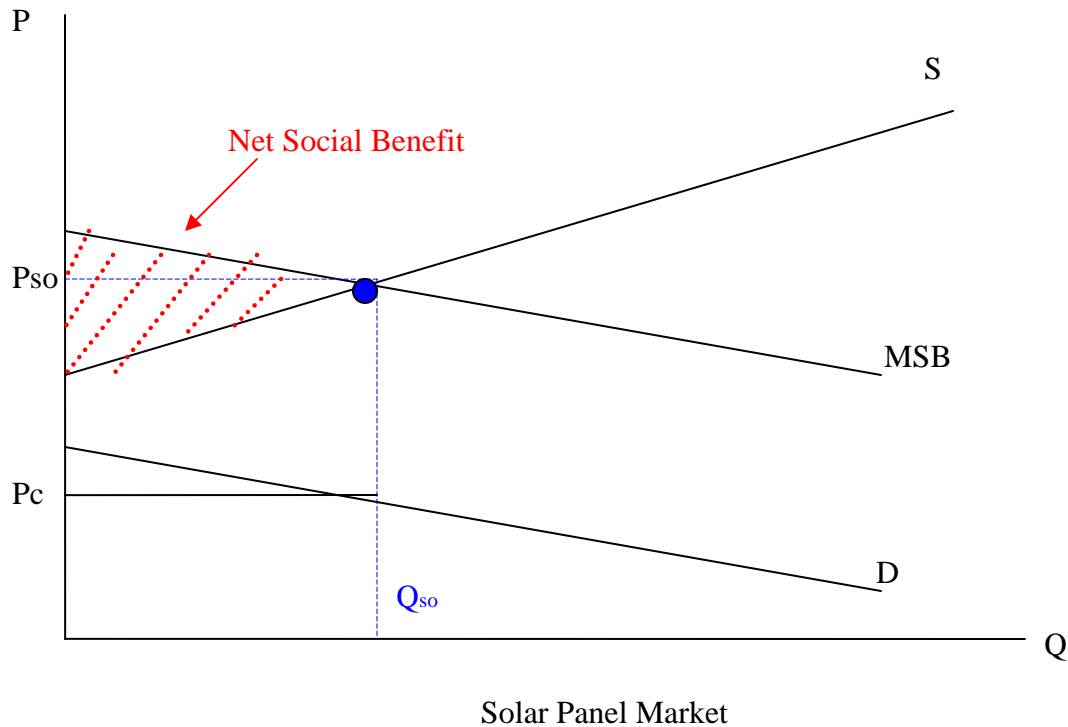
b. (15 points)

Consider the market for solar panel in US. The graph below gives the demand and supply curves for solar panels, labeled D and S. Note that, as drawn, the equilibrium quantity of solar panels is zero in a competitive market without government intervention: without subsidy, no consumer is willing to pay enough to induce suppliers to provide panels. The graph also gives the marginal social benefit curve for solar panels, labeled MSB.

- i) Label on the graph the socially optimal quantity of solar panels. No need to discuss it: just label it.
- ii) Label on the graph the area that denotes the social gain from being at the social optimum compared to the market outcome. Explain briefly why this area is a net benefits to society.

Answer: The market provides output of 0, and the social optimum is  $Q_{so}$ , and so the benefits are sum of the marginal benefits of each unit between 0 and  $Q_{so}$ . The net benefits of each marginal unit are the MSB minus the MC of each unit. The supply curve gives the MC of producing an extra unit. So the area between MSB and S, from  $Q=0$  to  $Q= Q_{so}$ , is the net benefit.

- iii) The government currently subsidizes solar panels for 30% of their cost (e.g., if a person pays \$1000 for panels, the person gets \$300 back from the government.) From looking at the graph below, does this subsidy seem to be the right size, too large, or too small. Explain briefly.



Answer to iii: The 30% subsidy is too small. The difference between  $P_{so}$  and  $P_c$  is the optimal subsidy, i.e., the amount of subsidy that will induce consumers to purchase  $Q_{so}$  quantity of panels. However, just by looking at the graph,  $P_s$  is much less than 30% below  $P_{so}$ . In fact,  $P_c$  is less than half of  $P_{so}$ , which means that the optimal subsidy is more than 50%. The 30% subsidy will attain less than the optimal amount of panels.

### Question 3 (20 points) Monopolistic Competition

Consider a firm in a monopolistically competitive industry. In stage 2 equilibrium, the demand curve that this firm faces for its product is:

$$P = 2700 - 30 \cdot Q$$

where  $P$  is its price and  $Q$  is the quantity demanded. The firm's average cost curve is

$$AC = 3600 - 90 \cdot Q + Q^2$$

Note that the slope of this average cost curve is given by:  $-90 + 2 \cdot Q$ .

What output level does the firm choose? Show your work.

Answer: There are three ways to answer this. The first one is easiest, but any is fine.

Method 1: In stage 2 equilibrium, the slope of demand curve equals the slope of the AC curve:

$$-30 = -90 + 2*Q$$

$$60 = 2*Q$$

$$Q=30$$

Method 2: In stage 2 equilibrium, the profit-maximizing output provides zero profit, which means that  $P=AC$ :

$$2700-30*Q = 3600 - 90*Q + Q^2$$

$$0 = 900 - 60*Q + Q^2$$

$$0 = (30-Q)^2$$

$$0 = (30-Q)$$

$$Q=30$$

Method 3: (This is the hardest and least intuitive. But if anyone answered this way, then they get full credit.) The firm always chooses where  $MR=MC$ . We know that  $MR = 2700 - 60*Q$  (twice the slope as demand). We also know that  $TC=AC*Q=3600*Q - 90*Q^2 + Q^3$ , which implies (by calculus) that  $MC=3600 - 180*Q + 3Q^2$

So:

$$2700-60*Q = 3600 - 180*Q + 3Q^2$$

$$0 = 900 - 120*Q + 3Q^2$$

$$0 = (90 - 3Q)*(30 - Q)$$

So  $Q=30$  and  $Q=10$  are possible solutions. Calculating profit at each, we find that profit is higher at  $Q=30$  than at  $Q=10$ .

#### Question 4 (30 points) Aggregate Output

Suppose the aggregate output of the U.S. economy is characterized as follows. Assume that prices and interest rates are fixed and there are no imports or exports.

Government:  $G = 200$ ,  $T = 200$

Consumption:  $C = 100 + 0.5(Y-T)$

Investment:  $I = 300$

$Y$  is the level of income,  $G$  government purchases,  $T$  taxes,  $C$  consumption,  $I$  investment.

a) (10 points)

What is the equilibrium output? Show your calculations.

$$Y=C+I+G$$

$$Y=100+0.5(Y-200)+300+200$$

$$0.5Y = 500$$

$$Y=1000$$

b) (10 points)

Full employment output is 1200. Suppose we want to stimulate the economy by raising government spending, without changing taxes or the interest rate. Calculate the amount by which G must rise to attain full employment. Show your work.

G-multiplier method:  $G\text{-multiplier} = 1/0.5 = 2$

Change of  $Y = G\text{-multiplier} * \text{Rise in } G$

$$(1200 - 1000) = 2 * (\text{Rise in } G)$$

Rise in  $G = 100$ .

(New  $G$  is  $200 + 100 = 300$ , but this statement is not needed for full credit.)

Equilibrium output method:

new  $Y = C + I + \text{new } G$

$$1200 = 100 + 0.5(1200 - 200 + 300) + \text{new } G$$

New  $G = 300$

So rise in  $G$  is  $300 - 200 = 100$

c) (10 points)

Now suppose that investment depends on the interest rate and that the interest rate varies instead of being fixed. In particular, instead of  $I = 300$  as above, investment is determined as:

Investment:  $I = 600 - 50 * r$

where  $r$  is the interest rate in percent terms (e.g.,  $r = 10$  represents a ten percent interest rate). Suppose we want to use monetary policy to attain full employment output of 1200. Assuming that we do not change  $G$  or  $T$ , what level of  $r$  will achieve full employment? Show your work.

$$Y = C + I + G$$

$$Y = C + (600 - 50 * r) + G$$

$$Y = 100 + 0.5(Y - 200) + 600 - 50 * r + 200$$

We want  $Y = 1200$ , and so substitute in 1200 for  $Y$ :

$$1200 = 100 + 0.5(1200 - 200) + 600 - 50 * r + 200$$

Solve for  $r$

$$1200 = 100 + 500 + 600 + 200 - 50 * r$$

$$1200 = 1400 - 50 * r$$

$$-200 = -50 * r$$

$$r = 200 / 50$$

$$r = 4$$

### Question 5: Monetary Policy (12 points)

a) (6 points)

Explain in words (not graphs) how an increase of money supply can raise aggregate output.

An increase in the money supply will decrease the interest rate (given that money demand does not change.) When the interest rate decreases, firms decide to invest more, since it is cheaper for them to borrow money to invest. Also, consumers save less and consume more, since it is less valuable to save when the interest that can be earned is lower. The rise in investment and the rise in consumption both shift the AE curve upwards, which raises equilibrium output. (This need not be stated for full credit, but is useful to know: because of the multiplier effect, Y rises more than C and I rise.)

b) (6 points)

Explain in words why this process fails when the economy is in a liquidity trap.

A liquidity trap exists when firms are not willing to invest more, and consumers are not willing to consume more, even if interest rates are lowered. When the economic outlook is very grim, firms do not want to invest even when borrowing is cheap, since they do not anticipate making positive returns on their investment. And consumers are concerned about the future and so they save more, even when interest rates go down. So, in this situation, the Fed can lower interest rates, but the reduction will not stimulate the economy since the lower interest rates do not induce more investment and/or consumption.