

Score

Professor Valerie Ramey
Econ 130, Fall 2010

Final Exam – Version B (Yellow)

This exam has 100 points. For any numerical problems, you must show your work in order to receive credit.

1. (8 points) Suppose that the government is considering a program that involves purchasing 18 metal detectors. Use the following information to calculate (1) the direct government cost; and (2) the overall net social cost of this program, where social cost takes into account both the direct government expenditures for metal detectors as well as any net changes in consumer surplus plus producer surplus.

- Before implementation of the program, the market demand by private firms for metal detectors is given by:

$Q^D = 300 - 3 \cdot P$, where Q is the quantity of metal detectors and P is the price of a metal detector.

- The market supply curve for metal detectors is $Q^S = -30 + 3 \cdot P$.
- The market price of metal detectors before the program is implemented is $P = \$55$.
- Government demand under this program is given by $Q^G = 18$.

With govt, demand is $Q = 318 - 3 P$

Set equal to supply curve:

$318 - 3 P = -30 + 3 P$, solve $P = \$58$.

Direct cost = $58 \times 18 = 1044$

Using graph from class, there is a net gain in social surplus equal to the triangle with width 18 units and height $58 - 55 = 3$. Its area is $\frac{1}{2} 18 \times 3 = 27$

So net cost is $1044 - 27 = 672$.

Direct government cost
=
1044

Net social cost =

1017

2. Short Answers.

A. (4 points) In class, we discussed how discrimination in the labor market can be attributed to four possible sources. Match each of these sources to the outcome most likely to be associated with it.

Source of discrimination	Answer-write the letter from the correct match in the right hand column.	Possible Outcomes
1. Statistical discrimination	b	a. These firms will make lower profits than other firms because they have to pay higher wages even though their workers are no more productive than workers in the group discriminated against.
2. Customer prejudice	d	b. Individuals are less likely to be hired because the group they belong to has a higher average propensity to quit.
3. Employee prejudice	c	c. In the absence of laws, we would observe firms with completely segregated workforces resulting from this.
4. Employer prejudice	a	d. A beauty spa may discriminate against individuals who are not good-looking.

B. (4 points) Give two reasons listed in the Miller, Benjamin and North chapter (other than discrimination) for why women are paid less than men.

1. Less dangerous occupations that pay lower compensating wage differentials

2. Women choose less demanding jobs (“the mommy track”) because of childcare responsibilities

(other possible answers: women work fewer hours)

C. (3 points) Fill in each blank with **one of the terms** listed below. Rawls and Harsanyi's

criteria share the idea that judgments about which society is better should be made through

veil of ignorance, but differ in that Rawls argues for a criteria that uses

maximin whereas Harsanyi advocates a criteria that uses

expected utility.

Terms: Leaky bucket, expected utility, risk pooling, maximin, minimax, veil of ignorance, Gini coefficient.

D. (5 points) A new state joins the union in 2010. The government sends out statisticians who take a census of the population and find that the average household income is \$70,000. 10 years later in 2020, the government takes another census and finds that the average household income is \$60,000. The government then surveys the population and finds that each household says that its income is higher in 2020 than it was in 2010. How is this possible? Explain.

Note: This question was too vague. I meant to say that the census was only in the new state. If you interpreted that way then a possible explanation is that during the 10 years from 2010 and 2020 people from states or countries with lower average household income immigrated to this state and made higher incomes. However, their entrance lowered the average household income of this state overall. If you interpreted it as a census of the entire country, we accepted reasonable explanations based on that assumption.

E. (5 points) Suppose that 1 percent of employees use illegal drugs. A new drug test has been developed. If someone is using drugs, the test will be positive 85 percent of the time. The test has a false positive rate of 5 percent. If one of the employees tests positive, what is the probability that he is actually using drugs?

$$\Pr (B/A) = [0.85 \times 0.01] / [0.85 \times 0.01 + 0.05 \times 0.99] = 0.1466 \text{ or } 14.66\%$$

F. (5 points) An article in *Time* magazine several years ago entitled “The Hidden Danger of Seat Belts” presented a study showing that mandating the use of seat belts in 18 countries resulted in either no change or actually a net increase in deaths from automobiles. The author argued that having a seat belt on makes people drive less safely. What concept discussed in the context of insurance describes what is happening? Explain.

Moral hazard. Seat belts are like insurance – wearing one makes you drive less safely because you feel like you are protected.

G. (5 points) State and explain the effect of the Kefauver-Harris Amendments of 1962 to the Food and Drug Act on the number of Type I errors (introducing unsafe drugs) and Type II errors (keeping beneficial drugs off the market) made by the FDA. Insert a \uparrow , a \downarrow , or 0 (for no change) in blanks and continue with explanation.

The Amendments \downarrow Type I errors and \uparrow Type II errors.

The 1962 amendments dramatically increased the amount of testing required, which led to long delays in new drug introductions. The extra testing decreased the number of cases of unsafe drugs being approved, but the long delays created by the extra testing delayed the approval of effective drugs. As a result, many lives were lost because of effective drugs kept off the market for so long.

H. (5 points) Suppose two jobs have similar qualifications, but one job has a risk of death that is 1/600 per year higher than the other. If the value of a life is \$6 million, how much more will the riskier job have to pay in annual salary to attract workers (according to the Required Compensation Method)?

Calculations =

$$6,000,000/500 = \$10,000$$

Numerical value =

\$10,000

3. Discounting problems. In all problems, assume that the interest rate is 6 %.

- A. **(2 points)** Assume we are in year 0. What is the present value of a project that yields \$300 a year starting next year (year 1) and lasting through year 8?

Formula

$$(B/r) (1 - 1/(1+r)^8)$$

Numerical Answer

$$\$1,863$$

- B. **(4 points)** In year 0, the government is deciding whether to undertake a particular project. To build the project, the government must pay \$5,000 this year (year 0) and \$5,000 next year (year 1). The annual benefits from the project begin in year 2 and last forever. What is the minimum value of this annual benefit that would make the net present value of benefits minus costs be zero?

	Formula	Numerical value
Present value of costs	$5000 + 5000/1.06$	$\$9,717$

	Formula	Value of annual benefits that makes NPV be 0.
Present value of benefits	$(1/1.06)(B/.06)$ solve for $B = (1.06)(.06)\$9717$	$\$618$

4. Suppose the inverse labor demand curve is $W = 22 - E$ and the inverse supply curve is given by $W = 2 + \frac{1}{4} \cdot E$, where W is the wage and E is the number of workers.

A. (2 points) Find the equilibrium wage and employment.

Calculations:

$$22 - E = 2 + \frac{1}{4} E$$

$$20 = \frac{5}{4} E$$

$$E = 16, W = 6$$

$$W^* = 6$$

$$E^* = 16$$

B. (2 points) Find the worker surplus

Calculations:

$$\left(\frac{1}{2}\right) 16 (6-2) = 32$$

Worker surplus

=

$$32$$

C. (4 points) Suppose the government imposes a minimum wage of \$8. Find the new level of employment and the new worker surplus.

Calculations:

$$\text{If } W = 8, \text{ and demand is } W = 22 - E, \text{ then } E = 14$$

E =

$$14$$

Calculations (area of a trapezoid – split into triangle and rectangle)

$$2.5 \times 14 + \left(\frac{1}{2}\right) 14 \times 3.5 = 59.5$$

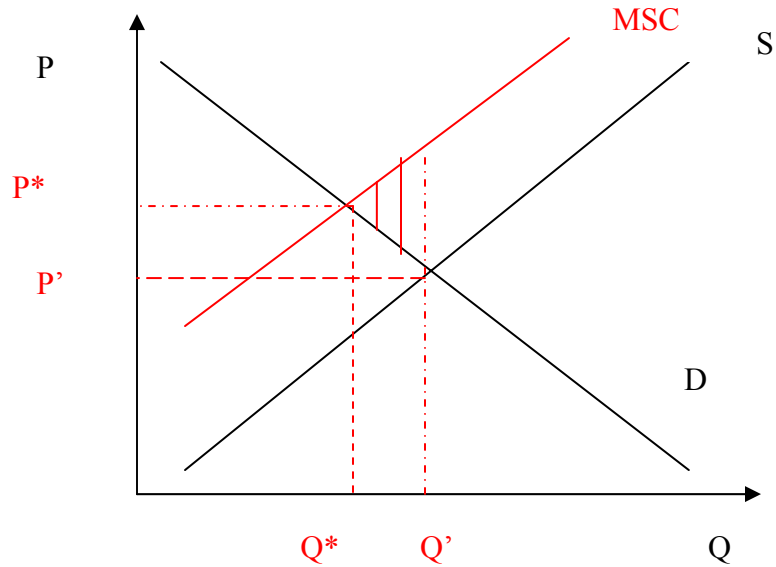
Worker surplus

=

$$59.5$$

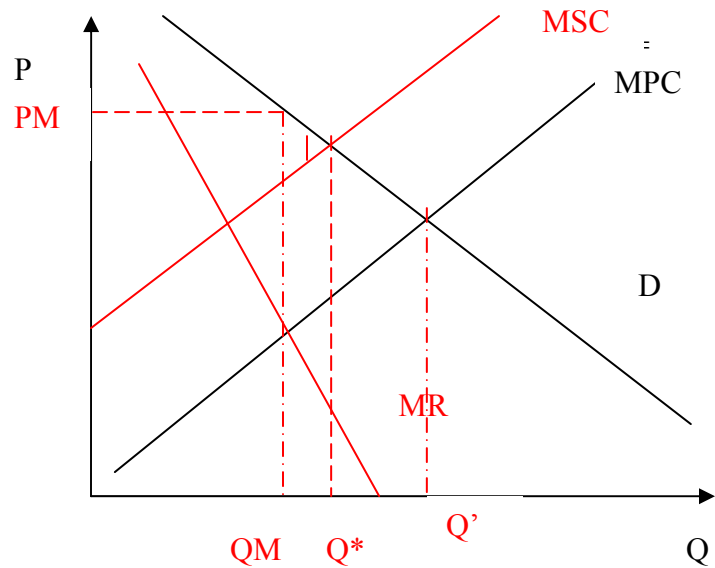
5. Consider the market for Mission Bay purple fish.

A. (3 points) Suppose there are many fishermen and no government regulation. Show the outcome on the graph below, clearly labeling the curves and the socially optimal level (Q^*) versus the outcome in the private market (Q'). Show the inefficiency triangle.



B. (4 points) Suppose that a ruthless operator drives all the other fishermen out of business, takes over all their boats and tackle and becomes the monopoly supplier of Mission Bay purple fish. Using the graph below as well as words, discuss how this event will affect (1) the quantity of purple fish sold on the market; (2) the market price of purple fish; and (3) the inefficiency of the market relative to the situation before.

Explanation: The monopolist will produce at the Q where $MR = MPC$ (QM). This QM is lower than Q' so the market will supply less fish. Price will rise to the monopolist price, PM . The effect on inefficiency depends on the position of the curves, but it is very likely that inefficiency will be decreased because the monopolist output is probably closer to the social optimum than the competitive market output.



6. (6 points) Consider the market for a rivalrous good. Suppose that the first 6 consumers each has a marginal benefit schedule for this good of:

$$\begin{aligned} MB_i &= 20 - 2 \cdot Q_i \text{ for } 0 \leq Q_i \leq 10 && \text{for } i = 1, 2, \dots, 6. \\ &= 0 && \text{for } Q_i > 10 \end{aligned}$$

The second 6 consumers each has a marginal benefit schedule for this good of:

$$\begin{aligned} MB_i &= 30 - 3 \cdot Q_i \text{ for } 0 \leq Q_i \leq 10 && \text{for } i = 7, 8, \dots, 12. \\ &= 0 && \text{for } Q_i > 10 \end{aligned}$$

If the market price is \$25, what is the market demand (Q)?

Solve equations:

Note that if $P = \$25$, the first 6 consumers will not buy since their highest MB is 20. Thus, we only need to pay attention to the second 6 consumers.

$$Q_i = 10 - 1/3 P \text{ for } i = 13, \dots, 24.$$

Multiply by 6:

$$Q = 60 - 2 P. \text{ If } P = 25, Q = 10.$$

Q =

10

7. (8 Points) The EPA has determined that the marginal social benefit of reducing pollution in an area is:

$MSB = 40 - Z$, where Z is the total amount of abatement.

Two factories account for all of the pollution in the area. The marginal cost of abatement for each factory is:

$$MC_1 = \frac{1}{4}Z_1, \quad MC_2 = \frac{1}{5}Z_2$$

where Z_1 is abatement by factory 1 and Z_2 is abatement by factory 2.

What is the socially optimal amount of total abatement Z and how should it be allocated across firms?

With efficient allocation:

$Z_1 = 4 \text{ MSC}$ and $Z_2 = 5 \text{ MSC}$, so $Z = 9 \text{ MSC}$ and $MSC = 1/9 Z$

Set equal to MSB to get $Z = 36$. At $Z = 36$, $MSC = 4$. Plug into Z_1 and Z_2 equations to get rest.

$$Z^* = 36$$

$$Z_1 = 16$$

$$Z_2 = 20$$

8. (8 Points) Suppose an individual has utility of income given by $U = \sqrt{\text{Income}}$.

The individual must choose between two situations. In situation A, the individual receives income $Y = X$ with certainty, where X is some amount. In situation B, the individual receives $Y = \$144$ with probability $\frac{1}{2}$ and $Y = \$225$ with probability $\frac{1}{2}$.

A. What is the expected value of income in Situation B?

$$\frac{1}{2} 144 + \frac{1}{2} 225$$

Numerical
answer:

184.50

B. What is the variance of income in Situation B?

$$\frac{1}{2} (144 - 184.50)^2 + \frac{1}{2} (225 - 184.50)^2$$

Numerical
answer:

1640.25

C. What value of X gives the individual the same expected utility in Situation A as he receives in Situation B?

$$\text{Expected utility in B} = \frac{1}{2} \text{square root}(144) + \frac{1}{2} \text{square root}(225) = 13.5$$

$$(13.5)^2 = 182.25$$

Numerical
answer:

182.25

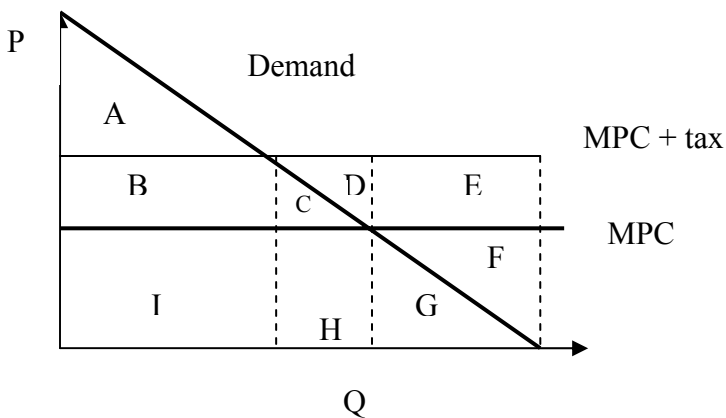
D. Suppose the individual must be in Situation B, but that there are also 500 individuals in the identical situation. Assume that the income outcomes are independent across all individuals. Suppose the individuals decide to form an insurance company with the following characteristics. Individuals pool all of their incomes and each individual gets $1/500^{\text{th}}$ of the outcome of the pooled income. What will be the variance of income of each individual under risk pooling and how is it related to your answer in B?

1640.25/600 or 1640.25/601

Numerical answer:

2.73

9. (8 points) Consider the market for a good with a negative externality. Suppose that the marginal private cost (MPC) of suppliers is perfectly elastic as shown in the graph below. Suppose the government imposes a tax on this good equal to MEC. Using the letters indicating on the graph, write which area represents the change relative to the case with no tax below. (if there is no change, write “no change.”)



Change in government revenue = **B**
 Change in consumer surplus = **- B - C**
 Change in producer surplus = **no change**
 Change in external cost = **- D**

10. (5 Points) Suppose that there are 15 people with the identical marginal benefit schedule for a pure public good:

$$\begin{aligned} MB_i &= 50 - 2 \cdot Q && \text{for } 0 \leq Q \leq 25 \\ &= 0 && \text{for } Q > 25 \end{aligned} \quad i = 1, 2, \dots, 15$$

There is a 16th person who has the following MB schedule:

$$\begin{aligned} MB_{16} &= \theta - Q && \text{for } 0 \leq Q \leq \theta \\ &= 0 && \text{for } Q > \theta \end{aligned}$$

where θ is a positive number.

Suppose that someone tells you that if the price of the good is \$500, the socially optimal quantity is $Q^* = 20$. What is the value of θ ?

$$MSB = 750 - 30Q + \theta - Q = 750 + \theta - 31Q$$

$$\text{Thus, } \theta = 370$$

$\theta =$

370