

First Hour Exam  
Public Finance - 180.365  
Fall, 2004  
Answers

You must answer all parts of the exam. If you run out of space, use the back of the preceding page.

## 1 Multiple Choice (3 pt each)

- b 1. Optimal provision of a public good
- (a) Requires that everyone values the good equally
  - (b) Requires the sum of the everyone's valuations for the public good match the cost of its production
  - (c) Requires that each individual's rate of marginal substitution match the social rate of marginal substitution
  - (d) Cannot be defined if some people dislike the good and others like it
  - (e) Can normally be expected to occur without government intervention
- d 2. According to an assigned reading in the *Economist*, the biggest problem for the economy in Indonesia is
- (a) Poor natural resources
  - (b) A badly educated population
  - (c) Islamic terrorism
  - (d) Lack of a legal system that can pass and enforce good laws
  - (e) Poor transportation and infrastructure
- b 3. Which of the following statements about tradable pollution permits is *not* true?
- (a) Tradable permits can be politically easier to enact than Pigouvian taxes because the permits can be given away to existing polluters for free
  - (b) The Coase theorem says that the equilibrium price of pollution depends on who gets the permits; the price of pollution will be higher if the government auctions the permits than if it gives them away to existing polluters
  - (c) Permits are better than Pigouvian taxes when the amount of damage caused by pollution is fairly easy to measure
  - (d) Pollution permits are likely to achieve a given degree of pollution reduction more efficiently than a "command-and-control" approach
  - (e) Some environmentalists oppose pollution permits on the grounds that they are immoral because they make it seem that polluting is OK as long as you pay a certain price

- a 4. How can the argument of the assigned reading “Dreams of a Monster” best be interpreted? Saddam Hussein:
- (a) Had an organic vision of society with the overriding goal of restoring greatness to the Arab people
  - (b) Was merely a psychopathic, corrupt killer
  - (c) Justified his brutal actions by an argument that they would make his people happier in the long run
  - (d) Shared nothing in common with other Arab nationalist leaders
  - (e) Shared nothing in common with the radical Islamists who were his enemies
- d 5. Which of the following is *not* true?
- (a) According to a recent study by the Environmental Protection Agency, the benefits of new environmental regulations have greatly exceeded their costs over the last decade
  - (b) Since 1970, air pollution has declined sharply in the U.S.
  - (c) The EPA recently decided to allow utilities to extend the lifespan of older, dirtier power plants without installing new anti-air pollution equipment
  - (d) Economic theory suggests that a regulation/command-and-control approach to fixing environmental problems is worse than doing nothing
  - (e) Most public finance economists believe that appropriate government intervention in the economy can increase utility and improve the environment
- c 6. Which of the following is *not* a statement about “normative economics”
- (a) The best way to judge a society is by how it treats its poorest members
  - (b) Organic societies are undesirable because they neglect individual rights
  - (c) Large government deficits make future generations poorer
  - (d) A clean and healthy environment is a birthright of all Americans
  - (e) Taxes are justified only when they are used to pay for public goods
- b 7. Which of the following would not be a violation of the “rule of law” as defined in class?
- (a) The President refuses to enforce a law that he disagrees with
  - (b) The Congress changes a law in order to benefit known campaign contributors
  - (c) Individuals are permitted to ignore a law which is unpopular
  - (d) Corporate officials obtain secret permission from regulators to ignore certain regulations
  - (e) The government declares that because there is a “national emergency,” certain legal rights no longer apply

The following questions are related to topics that arose in the Presidential debates.

- b 8. Senator Kerry proposed rolling back President Bush's tax cuts for people earning over \$200,000 a year; he argued that these people do not "need" the tax cuts they received, and he proposes using the revenues to pay for an expansion of health insurance for people who cannot afford health insurance. The most direct translation of this into the jargon of public finance is that
- (a) Pareto efficiency would be improved by using the tax revenues for health insurance
  - (b) The social marginal utility of the tax cuts is less than the social marginal value of expanded health insurance
  - (c) The tax cuts had negative externalities and health insurance has positive externalities
  - (d) Health insurance is a public good that should be provided by the government, and this is the best way to pay for that public good
- e 9. One issue that arose in both of the last two debates was whether there will be a military draft. Which of the following would be a valid statement about philosophies of government we have discussed in class?
- (a) In an organic society, the government has the right to impose a draft whenever it believes there is an important goal that could be achieved by imposing a draft
  - (b) In a libertarian society, it is very difficult to justify a draft because it interferes with individual freedom and rights
  - (c) In a utilitarian society, a draft is hard to justify because different people have different attitudes and preferences toward military service
  - (d) Standard economic theory suggests that, if there were a draft, Pareto efficiency could be improved by allowing draftees to hire other people to perform their military service for them
  - (e) All of (a)-(d)
- c 10. In the second debate, when asked "How would you rate yourself as an environmentalist?" President Bush said "We reached an agreement to reduce pollution from off-road diesel engines by 90 percent ... I proposed a hydrogen automobile – hydrogen generated automobile. ... I'm a big proponent of clean coal technology." Senator Kerry criticized the Bush Administration's record but made no real proposals himself; elsewhere he has proposed subsidies to carmakers to make more efficient cars, and has supported giving large subsidies to the power industry to develop a "zero-emissions" power plant. Which of the following proposals would almost all public finance economists agree on for improving the environment?
- (a) Subsidies for production of fuel-efficient vehicles
  - (b) Regulations requiring the use of "clean coal" technology
  - (c) Increased taxes on sources of pollution like gasoline
  - (d) Research to develop a hydrogen powered automobile
  - (e) Research on a "zero emissions" power plants

## 2 Short Discussion Question (24 pt)

Explain why the condition  $MRS^{Adam} = MRS^{Eve}$  is necessary for Pareto efficiency in the Adam-Eve economy discussed in class (8 pt). Draw a diagram showing how the condition  $MRS^{Adam} = MRS^{Eve}$  corresponds to “horizontal addition” of demand curves (16 pt). (Label Adam’s demand curve  $D^A$ , Eve’s  $D^E$ , and the total demand curve  $D$ .)

*Answer:*

This was discussed in class and in the textbook.

## 3 Economics of the Flu (46 pt)

Suppose the cost of catching the flu is the same for everyone: \$100. If everyone were vaccinated, the probability of any particular person getting sick would be zero (nobody in the whole country would get sick). However, if nobody got vaccinated, the probability of catching the flu would be 0.04 (4 percent would get sick).

Suppose the government is the only supplier of flu vaccine, which costs \$1 a dose to make. The government is trying to decide between two policies: forcing everyone to get vaccinated (and charging each person \$1), or making no vaccine at all so that nobody can get vaccinated.

Everyone has the same utility function, which depends only the *probability*  $p$  that they will get the flu, times the \$100 cost if they get sick, minus any cost  $a$  they pay for being vaccinated. Thus, if nobody gets vaccinated,  $a = 0$  and  $p = 0.04$  so utility is

$$u = - \overbrace{p}^{=0.04} \$100 - \overbrace{a}^{=0} = -\$4 \quad (1)$$

while if everyone gets vaccinated then  $a = \$1$  and  $p = 0$  so utility is

$$u = - \underbrace{p}_{=0} \$100 - \underbrace{a}_{=\$1} = -\$1 \quad (2)$$

- 8 pt 1. Discuss which choice a strictly utilitarian government would make in these circumstances, and why. If one individual (but only one) could hide during the vaccination campaign (thus neither getting vaccinated nor paying the \$1 cost), would he want to? Why?

*Answer:*

Average utility (including the cost of vaccination) is -\$4 if nobody gets vaccinated and -\$1 if everybody gets vaccinated, so the government would choose to force everyone to get vaccinated, since everyone’s utility is higher by \$3.

However, if an individual could hide, that individual would be immune from the flu (since everyone else was vaccinated) but would not have to pay for vaccination, so his utility would be \$0, which is better than if he were vaccinated and had to pay for the vaccine. Thus, if the vaccination campaign is highly successful, individuals have an incentive to hide.

The government can pursue a policy between universal forced vaccination and no vaccination: It can offer the vaccine at \$1 and let individuals choose whether or not to get vaccinated. Suppose now there are two kinds of people: Healthy people and Vulnerable people. The cost of catching the flu is only \$20 for healthy people (they recover faster, or need less medicine), while vulnerable people's cost is \$180. Formally, the two groups have different utility functions,

$$u_h = -p\$20 - a \tag{3}$$

$$u_v = -p\$180 - a \tag{4}$$

where again  $a$  is any cost they pay for the vaccine if they choose to buy it.

Half the population is healthy and half is vulnerable. Assume that, if half the population gets vaccinated, then for any individual, getting vaccinated reduces the probability of catching the flu from  $p = 0.03$  to  $p = 0.01$  (3 percent to 1 percent - assume this is true for both healthy and vulnerable people).

- 10 pt 2. Fill in the blank spaces in the table below that calculates the expected utility of getting vaccinated for healthy and vulnerable people, assuming half the population gets vaccinated. (The first cell has been filled in for you: For a healthy person who gets vaccinated, utility is the cost they will pay if they get sick, -20, times the probability they will get sick, 0.01, minus the \$1 they pay for the vaccine, so -\$1.20 is their utility if they get vaccinated).

#### Individual Utility Under Free Choice

	Utility If Vaccinated ( $p = 0.01$ ) (b)	Utility If Not Vaccinated ( $p = 0.03$ ) (c)	Net Utility Value of Vaccination (b)-(c)
Healthy	$-20 \cdot 0.01 - 1 = -1.20$	$-20 \cdot 0.03 = -0.60$	$-1.20 - (-0.60) = -0.60$
Vulnerable	$-180 \cdot 0.01 - 1 = -2.80$	$-180 \cdot 0.03 = -5.40$	$-2.80 - (-5.40) = 2.60$

Explain why, under the free choice approach, assuming half the population is vaccinated, none of the healthy people will get vaccinated while all of the vulnerable people will (confirming that half the population gets vaccinated).

Utility is more negative for the healthy people if they get vaccinated than if they don't (because the amount they pay for the shot is greater than its value to them), so they won't get vaccinated.

Utility is more negative for the vulnerable people if they *don't* get vaccinated, so they will get the shots.

Assume again that if *everyone* gets vaccinated, then nobody will catch the flu, because it won't be able to spread.

- 10 pt 3. Suppose the government has an additive utilitarian social welfare function:

$$W = 0.5u_h + 0.5u_v \tag{5}$$

Would this government prefer to leave vaccination to free choice, or would it prefer to force everyone (even healthy people) to get vaccinated? (Hint: calculate  $u_h$  and  $u_v$  under the two possible policies, and calculate the corresponding  $W$  values)

*Answer:*

Policy	$u_h$	$u_v$	$W$
Free Choice	- \$0.60	- \$2.80	- 0.5 (\$0.60+\$2.80) = -\$1.70
Forced Vaccination	- \$1	- \$1	- 0.5 (\$1+\$1) = -\$1

So social welfare  $W$  is higher (less negative) if the government forces universal vaccination than if it allows free choice.

- 6 pt 4. Define externality and explain why getting vaccinated has an externality in the case of communicable diseases like the flu

*Answer:*

An externality exists when the activity of one entity (household, firm, government) directly affects the welfare of another in a way that is not transmitted by efficient (perfectly competitive) market prices.

If I get vaccinated, not only will I be less likely to get sick, but my family, friends, colleagues, students, neighbors, etc. will also benefit because they won't catch the flu from me! This satisfies the definition of an externality: My action has an effect on others that is not communicated by market prices (instead, it is communicated by a virus!) Most of our analysis in class was about negative externalities, but we also mentioned the possibility of a positive externality, which is what occurs when I get a flu shot and thereby protect others.

Because of contamination problems discovered a couple of weeks ago, there will be a severe shortage of flu vaccine this year. Last week a survey of hospitals found that some flu vaccine distributors have raised prices by up to 1000 percent in the last two weeks.

- 6 pt 5. Would a strict libertarian have any objection to such price increases? Why or why not?

*Answer:*

A strict libertarian would say that the government should not interfere with the prices that the private market wants to charge, no matter what the circumstances. The distributors are the owners of the flu vaccine and they can charge whatever price they like, no matter what the circumstances.

Children, the elderly, and certain other people are particularly vulnerable to the flu. Suppose someone proposes that the government should confiscate all doses of flu and allocate them strictly according to some measure of “need.”

- 6 pt 6. Would a strict utilitarian object to this policy or approve of it? Why or why not?

*Answer:*

A strict utilitarian would probably approve. They would say that doses should be allocated to those who need it most in some sense (like, for example, those who would be most likely to die if they caught the flu, or those who would be most susceptible to catching it).

Extra comment (not expected to be part of your answer):

A strict libertarian would strongly object to this policy. A libertarian would say that the government has no right to interfere with private property under any circumstances, even flu vaccine, in this way. An instrumental libertarian might come down on either side. They would say that in the short run utility could be raised by the policy, but they might be concerned if the government is given the right to seize private property whenever it perceives there is a “need.” They might say that in the long run utility might be lower because without strict rules to rein it in the government will ultimately abuse its power by claiming “need” all the time (they might say). On the other hand, they might say that this is such an unusual situation that seizing the vaccines does not pose much long-run danger.