

14.41 Public Economics  
Midterm Exam

True, False, Uncertain (25 minutes, 5 minutes each; 95% of credit is based on your explanation; limit yourself to one page per part.)

1. Since education yields private returns, which are fully captured by the person who makes the investment, the market will provide the optimal level of education and the government should not intervene.
2. The warm glow model says that government provision of public goods will not fully crowd out private provision of the public good.
3. There are 400 risk-averse individuals and 600 risk-loving individuals in a society. The individuals choose among 1000 available jobs: 500 race car driving jobs and 500 museum tour guide jobs. Race car drivers face a 5% chance that they will die on the job, but their wages are no different from the wages for tour guides. In this society, people must place zero value on their lives.
4. Over the summer, the city of Boston needed to conduct a cost-benefit analysis to determine whether or not to provide anti-mosquito spraying in order to protect its citizens from the West Nile Virus. The best way for the city determine the value of anti-mosquito spraying benefits was to directly ask a random sample of Boston residents how much they would be willing to pay for the spraying.
5. Each electric light adversely affects the ability of astronomers, working as far as 200 miles away from the lamp, to see into outer space. The Coase Theorem says that we can rely on private markets to internalize externalities, so there is no reason for the government to intervene in the market for electric lights.

Short Essay (10 minutes)

In a recent *New York Times* article, Alan Krueger cited evidence that economically disadvantaged children fall behind their more advantaged peers during summer vacation. The study found that children from all backgrounds make similar academic progress during the school year, but that higher-income children continue learning over the summer, while lower-income children don't. To help narrow this "summer learning gap", Krueger suggests that the government should provide vouchers for children to pay for private tutoring services, education-oriented camps, or public school-sponsored summer school. Currently, 9% of American students attend summer school. Discuss the arguments for and against summer learning vouchers.

### Smoking Externalities (30 minutes)

- a) Suppose that the government had not intervened in the cigarette market. In each period, a smoker derives utility equal to  $\log(P) + \log(F)$ , where  $P$  is the number of packs of cigarettes smoked and  $F$  is food. The cost of cigarettes is 3 per pack; the cost of food is 1. Smokers have an income of 150. How many packs of cigarettes will each smoker buy in each period?
- b) Cigarette smoking involves many costs. In addition to the marginal cost of producing a pack of cigarettes, there are (i) increased health care costs due to smoking, (ii) decreased job productivity due to sick days, (iii) costs from fires, (iv) costs of second-hand smoke and (v) costs of low birth-weight babies. Which of these costs should be considered an externality and why? Which of these costs might be internalized via the private market?
- c) The government has read your answer to part (b) and estimated that the total external cost from smoking equals 2 per pack. It decides to implement a corrective tax. What should that tax be? What will the new equilibrium quantity of packs per smoker smoked be? Draw a graph to illustrate the way that the tax affects the equilibrium in the cigarette market.
- d) Suppose that all smokers started smoking at the age of 15, so that their friends would think that they were cool. They all planned to quit when they graduated from high school, but didn't consider the fact that they might become addicted, unable to quit, and die 6 years earlier than they would have died if they had been able to quit. After they graduate from high school, they are fully aware of the risks of smoking and fully account for these risks in their decision-making. Suppose that they all value one year of life at 150,000 (in present discounted value) and that each pack of cigarettes increases the probability that they'll become addicted (and die 6 years early) by 0.0001. Assume that smokers are risk neutral. If the government wants to correct this "internality" with an additional corrective tax on cigarettes sold to teenagers, how much should the special "teenage buyer" tax be? What problems might there be with such a "teenage buyer" tax?
- e) Now imagine that taxes are extremely unpopular. What other policies would you suggest to the government to help address the externalities and internalities from smoking?

### Snowplows in Iceland (25 minutes)

- a) There are two residents, A and B, in the town of Reykjavik, Iceland. Their utility is defined over two goods, warm coats (C) and total snowplow services (S). Explain why snowplow services are likely to fit the formal definition of a public good.

b) Not assume that the utility functions take the following form:

$$U_A = \log(C_A) + 3\log(S_A + S_B)$$

$$U_B = \log(C_B) + 3\log(S_A + S_B)$$

Both A and B have an income of 100. The prices of coats and snowplow services are both equal to 1. Note that total snowplow services,  $S$ , equals  $S_A + S_B$ . What is the total amount of snowplow services,  $S$ , that will be provided?

c) What is the socially optimal quantity of snowplow services? Why does the socially optimal quantity differ from the quantity that was provided in part (b)?

d) Now suppose that there are two types of people in Iceland, young people (who live and work all year in Iceland) and old people (who spend the snowiest months in the Riviera). Suppose that the young people prefer  $S=40$  and the old people prefer  $S=0$ . There are two towns, Reykjavik and Njarovik; Reykjavik has 60% young people whereas Njarovik has 60% old people. The governments in Reykjavik and Njarovik want to provide the optimal amount of snowplow services for their constituents. Explain a solution that will make everyone happy with the level of snowplow services provided by their government. Why might your solution *not* work in the real world?