

# Problem Set #3

## 14.41 Public Economics

DUE: October 29, 2010

### 1 Social Security

Discuss the validity of the following claims about Social Security. Determine whether each claim is True or False and present a concise explanation for your answer:

1. Social security is inefficient because it provides an annuity. Welfare would be improved if it paid out a lump-sum at retirement and allowed individuals to purchase annuities on their own in the free market.
2. Programs like social security, provide a work dis-incentive that is identical to the dis-incentive from an income tax because they tax individual's earnings while working
3. Many economists have found that an individual's consumption expenditure declines at the onset of retirement. Since consumption is not perfectly smoothed, this proves that agents are not fully insured against leaving the labor force.

### 2 Social Security Example

Consider an economy that is composed of identical individuals who live for two periods. Individuals maximize:

$$U_{patient} = \frac{3}{5} \ln(c_1) + \frac{2}{5} \ln(c_2), \quad (1)$$

where  $c_i$  is consumption in each period  $i$ . In each period there are  $N$  young individuals and  $N$  old individuals. Each individual receives an income of \$300 in period 1 (their "youth") and no income in period 2 (their "retirement"). Individuals do not want to leave behind any money. They can save from Period 1 to Period 2 at interest rate  $r$ , and the price of consumption in each period is one.

1. Write down the individual's lifetime budget constraint, and solve to find personal savings ( $s^*$ ).

2. Now suppose that the Federal government institutes a social security system. The government takes \$50 from each agent in Period 1, saves it, and gives it back with interest  $r$  in Period 2. Individuals are still able to privately save at interest rate  $r$ .

- (a) What is the terminology for this social security system?
- (b) What is the new equilibrium individual savings?
- (c) What is the effect of this social security system on social welfare?

3. Suppose that some individuals do not care about their retirement very much, and have utility functions:

$$U_{impatient} = \frac{9}{10} \ln(c_1) + \frac{1}{10} \ln(c_2). \quad (2)$$

The social security system still forces them to save \$50.

- (a) If the agents can save *and* borrow at  $r$ , then what will their response be?
- (b) Suppose that these impatient agents cannot borrow because credit markets are imperfect. In that case, show that the social security system has actually made them worse off.
- (c) In the real world, we often observe very low savings rates. Some pundits have used this fact to justify the existence of social security, arguing that savings rates are too low. Explain how the preferences (2) versus (1) refute this story.

4. Ignore for the rest of the problem the impatient agents above. The Great Depression hits this economy, and wipes out the savings of an entire generation. Consequently, the government decides to change the system so that the money coming from the younger generation is immediately given as benefits to the older generation. So it takes \$50 from each young agent and gives it directly to an older agent.

- (a) What is the terminology for this social security system?
- (b) How much do individuals privately save now?
- (c) How does national savings now compare to national savings with the original social security system?

5. Finally, suppose that after the Great Depression, there is a baby boom. So where all generations were the same size, now one and only one generation is twice as large as the others. (We are still using the same social security system as in part (d).)

- (a) When the baby boom generation is young, what are the social security benefits of the older generation as compared to the usual benefits?
- (b) Once the baby boom generation is old, what social security benefits does it receive compared to the usual social security benefits?

- (c) What could the government do to “smooth out” the effect of the baby boom? Assume that the government has no other funds that it can use to solve the problem.
6. We looked at two social security systems here: one described in part (b) and one described in part (d).
- (a) Which system would handle the baby boom better? Explain.
- (b) Why not just switch to that system today? (Brief explanation.)

### 3 Unemployment Insurance

Consider the Unemployment Insurance (UI) program in the United States, which typically replaces 50% of a worker’s wages for up to 26 weeks after job loss. Evaluate the following claims by determining whether each claim is True or False and present a concise explanation for your answer:

1. The empirical observation that those receiving UI benefits remain unemployed longer than those not receiving UI benefits, conditional on unemployment, indicates that UI causes longer unemployment spells.
2. Assuming that UI causes longer unemployment spells, this clearly indicates that generosity of the program should be reduced.
3. Individual perfect experience rating - where the government effectively loans to individuals 50% of their wages while unemployed, but individuals have to repay the loan once re-employed - would result in longer unemployment durations and increased likelihood of worker layoff.
4. Assume that UI causes individuals to become more "picky" about their job choices, passing up jobs that are less pleasant or pay less wages. While everyone would like to have nice jobs, this increased picky-ness is socially inefficient.
5. Assume it is true that the extension of unemployment insurance benefits during economic downturns hinders the economy’s GDP by preventing workers from going back to work and thus prolongs the length of a recession. Then, it follows that the government should not extend unemployment benefits during an economic downturn.

### 4 Testing for Insurance

Suppose Barack Obama has asked you for your opinion on whether or not the government should raise the amount of benefits provided to individuals with a disability (aka DI). He asks you a series of questions. For each question, discuss a potential empirical method that would allow you to answer his question. Most importantly, discuss the potential limitations of your proposed approach. Assume you have access to any reasonable amount of data that would be required.

1. Obama asks: "I'm not sure if people are sufficiently insured against the onset of disability, since they potentially have access to informal sources of insurance and can also buy some insurance in the private insurance market. Can you tell me, given where we're at today, to what extent are people currently insured against the onset of a disability?"
2. Obama asks: "All of these Republicans keep telling me that if we raise the amount of disability benefits then we'll see more people stop working and claim to be disabled. I see this could be a potential problem, but how large is this effect?"

## 5 Adverse Selection

This question is difficult, but we hope it will illuminate the potential problem that markets have with dealing with adverse selection. So please do not get discouraged. Consider the Rothschild and Stiglitz model of insurance discussed in class and recitation. In particular, assume that people in the economy have the same wealth  $W$  and each face a potential loss of size  $L$ . However, individuals vary in their probability of experiencing this loss: A fraction  $\lambda$  are high risk and have a probability  $p_H$  of a loss, while a fraction  $1 - \lambda$  are lower risk and have a probability  $p_L < p_H$  of a loss. Assume that the probabilities are private information to the agent. Agents maximize their expected utility defined by their own (privately known) probabilities of having the loss,  $L$ . Suppose that there exists a competitive insurance market that consists of insurance companies attempting to maximize profit by providing insurance contracts. Recall from recitation (and 14.01) that a Nash equilibrium is a set of offered contracts such that after consumers choose their most preferred contract, we have that a) no offered contract makes negative expected profits and b) no unoffered contract could make a positive expected profits.

1. Graphically depict the maximization problem and discuss the only potential Nash equilibrium. Graphically describe why a pooling equilibrium (in which the  $L$ -type and  $H$ -type accept the same contract) cannot exist. Explain intuitively what is going on.
2. For the rest of the problem, suppose that a 3rd type enters the economy and has a 100% probability of a loss. Assume however that this type represents only a very small fraction,  $\varepsilon$ , of the total population so that the population fractions are given by

Probability of Loss	Fraction of Population
$p_L$	$(1 - \lambda)(1 - \varepsilon)$
$p_H$	$\lambda(1 - \varepsilon)$
1	$\varepsilon$

Depict the problem graphically and solve for the only potential Nash equilibrium. How does your answer depend on  $\varepsilon$ ? Why does this happen?

3. Now, think about whether or not your candidate Nash equilibrium solution in #2 above can indeed be a Nash equilibrium. In general this is difficult to prove, so we don't require that you do this. But, discuss intuitively, graphically, or prove mathematically if you can, what happens to the possibility for existence of a Nash equilibrium when  $\varepsilon$  is sufficiently close to zero. Again, no math is required but may be useful depending on how you prefer to think about the problem.
4. Discuss intuitively what contracts the agents with less risk (i.e. those with probabilities of  $p_L$  and  $p_H$ ) would like to see offered by the insurance companies. Why does the market not provide this in the Rothschild and Stiglitz model? (For thought: do you think in reality the insurance market provides these contracts?).

MIT OpenCourseWare  
<http://ocw.mit.edu>

14.41 Public Finance and Public Policy  
Fall 2010

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.