

Public Economics (ECON 131)
Section #11: Moral Hazard and Social Security (continued)

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1 Key Concepts

See last week. Additionally:

- Social Security
 - What is the **most important rationale** for social security?
- Moral hazard
 - Why does the result that full insurance is optimal **fail** under moral hazard?

2 Practice Problems

2.1 Moral Hazard

A firm has to decide an insurance plan to provide for a single worker. The worker has probability $q = 0.2$ of becoming unemployed, and $1 - q = 0.8$ of staying employed. The worker can choose his unemployment duration, D , to be maximum 1 year, i.e. $D \in [0, 1]$.

If the worker stays employed he gets an income of $w = 100$ minus the insurance premium p . If he loses his job he gets the insurance benefit bD for the part of the year that he is unemployed, and $w(1 - D) = 100(1 - D)$ for the part of the year that he is employed. In addition, he gets disutility from searching for a job. Since searching less for a job implies longer unemployment durations, this is the same as saying that he gets positive utility from a longer unemployment duration, D . With an instantaneous utility function $u(c) = \ln(c)$ this means that expected utility is

$$EU = 0.8 \ln(100 - p) + 0.2(\ln(bD + 100(1 - D) - p) + D) \quad (1)$$

where $\ln(100 - p)$ is his utility under employment and $\ln(bD + 100(1 - D) - p) + D$ is his utility under unemployment.

- (a) What is the benefit level as a function of the premium under an actuarially fair insurance program?
- (b) The insurance company expects that the worker will be unemployed for half a year on average, i.e. $D = 0.5$. Which premium and benefit level ensures full insurance under the actuarially fair insurance program in the previous question? Call this Policy #1.

- (c) It turns out that the insurance company's guess about the unemployment duration length might not have been correct. Write up an expression for the worker's utility under Policy #1, i.e. plug b and p into (1). Which D will the worker actually choose? What is his utility under Policy #1?
- (d) The firm learns that it was losing money under Policy #1. Hence, it proposes a new actuarially fair insurance plan with full insurance under the actual D . Call this policy #2. What is the new premium p and benefit b ? What is the worker's utility under this policy? Compare it to his utility under policy #1. Would he in hindsight still have chosen to change his unemployment duration rather than keep it at $D = 0.5$?

- (e) Now, suppose the firm implements a new plan (Policy #3) under which full insurance is *not* provided. In particular the firm provides a benefit of $b = 20$. Under this lower benefit the firm expects a low unemployment duration, namely $D = 0.25$. Under an actuarially fair program this means that $p = 1$ (check this!).
- (i) Which unemployment duration will the worker actually choose?
 - (ii) Will the firm lose money under this D ?
 - (iii) Compute the worker's utility. Which of the three policies does he provide?
 - (iv) Why does your answer differ from the result in class that full insurance is optimal under no behavioral responses?

2.2 Social Security

Consider the following model of social security. N people are born each period. Each person lives for two periods. In the first period of life, a person is young and in the second old. Thus, in any period after the initial period, half the population is young and half is old. Young people earn 2 chocolate bars while old people earn nothing. Assume that the chocolate melts, so there is no way for people to save privately.

(a) Give a brief (one sentence) rationale for government provision of social security in this model.

Now suppose that the government of Candyland implements a social security system in the following manner. The government taxes each young person 1 chocolate bar and redistributes it to an old person in the same period. The program starts between periods 0 and 1 and ends between periods 2 and 3, as shown below. Let c_A^g denote the chocolate consumption of an agent from generation g (generation refers to the period the agent is born) at age A (age is either young or old).

(b) Under Candyland's social security program, fill in the blanks in the following chart:

Period 0	Period 1	Period 2	Period 3
	Start SS		End SS
$c_{young}^0 = \text{---}$	$c_{old}^0 = \text{---}$		
	$c_{young}^1 = \text{---}$	$c_{old}^1 = \text{---}$	
		$c_{young}^2 = \text{---}$	$c_{old}^2 = \text{---}$

Which generation gains the most in terms of consumption? The least?

(c) What assumption does this model make about the effect of social security provision on retirement behavior? Discuss how empirical evidence on retirement decisions and social security relates to this assumption.

(d) The country of Twixland is also considering implementing social security. However, the ingenious residents of Twixland have figured out a way to freeze and save chocolate for retirement. All of them have utility over consumption when young (c_A) and old (c_B) given by $\log(c_A) + \log(c_B)$. The demographic and other aspects of the economy are as in Candyland.

Replicate the chart in (b) for Twixland, assuming that the start and end of SS are completely unanticipated by its residents.

Period 0	Period 1	Period 2	Period 3
	Start SS		End SS
$c_{young}^0 = _$		$c_{old}^0 = _$	
		$c_{young}^1 = _ \quad c_{old}^1 = _$	
		$c_{young}^2 = _ \quad c_{old}^2 = _$	
			$c_{old}^2 = _$