

Homework Assignment 6 solution.

1. (2 points) In class we discussed two possible explanations of the fact that college graduates make substantially more than people with just high-school education – human capital theory and screening theory.
 - a. Briefly explain what each theory means.

The human capital theory claims that college education increases the productivity of workers by providing knowledge and skills (human capital). This increased productivity is reflected in higher wages. The screening theory on the other hand claims that college education is essentially useless in that it doesn't have to provide any useful skills and increase productivity. The important assumption underlying this model is that all individuals are different with respect to their productivity (natural ability, talent) and employers do not observe true productivity of each individual. It is also assumed that employers can learn something about each individual's ability by observing whether (s)he has a college degree. The assumption here is that individuals with high ability would be able to get through 4 years of college and individuals with low ability would not. This theory is also sometimes called "signaling" theory because people choose whether to "signal" to employers or not based on their abilities. College education in this case provides a useful test of whether an individual is high or low ability. Once again, the result may be that we observe people with college degrees earning more but not because they learning anything in the college but because they were able to get thru higher education showing their high ability.

- b. Do you think that government should act differently (in terms of policies promoting education) depending on which effect dominates? Explain.

The policy implications of these two theories are drastically different. If human capital theory is true, then government should support education due to the reasons we discussed in class (e.g., externalities). If, on the other hand, screening (signaling) explains the higher wages of college graduates, then government shouldn't support education at all. The reason is that all returns from education are private (that is there are no externalities because people don't learn anything in college and enroll only to signal their own true productivity). In other words, while individuals gain from engaging in signaling behavior because that allows them to differentiate themselves from others, the society doesn't have any additional gains from it.

2. (3 points) Read the Policy Debate on Returns to College Education at: http://www.swlearning.com/economics/policy_debates/return_to_ed.html (read only the main part; do not follow links unless you want to). Briefly summarize both sides of the debate.¹
3. (1 point) Why is it possible to observe two persons with identical preferences and incomes, one of which buys insurance and the other one does not?

There could potentially be many possible answers to this question. One possibility: two individuals may have different underlying beliefs about their own risks (different probabilities p). If insurance company has no way to perfectly differentiate among different risk types (which is almost always the case) it will offer some uniform premium to all individuals, some of which may find these premiums too high for their own (unobserved) risk class.

4. (4 points) Johnny is considering whether to buy health insurance. His utility is given by $U(I)=I^{1/2}$, where I is his yearly income equal to \$25,000. However, there is a 5% chance that he'll fall sick with a flu virus, which will cost him \$5000.
 - a. What is the expected utility of not buying any insurance?

The expected utility is by definition the weighted average of utilities of incomes in different future states of the world. The weights are probabilities of different future states of the world:

$$\begin{aligned} EU_1 &= p \cdot U(\text{income if sick}) + (1-p)U(\text{income when healthy}) = \\ &= 0.05 \cdot (25000 - 5000)^{1/2} + 0.95(25000)^{1/2} = \\ &= 157.28 \end{aligned}$$

- b. What is the actuarially fair premium for the health insurance in this case?

The actuarially fair premium by definition is the premium that allows insurance company to exactly break even (i.e., make zero profits):

Profits = revenues - costs = premium - expected cost = 0.

Therefore actuarially fair premium is equal to expected costs, which are calculated as $EC = p \cdot (\text{loss of income if sick}) + (1-p)(\text{loss of income when healthy}) = 0.05 \cdot (5000) + 0.95(0) = \250 (in percentage terms actuarially fair premium is equal to probability of flu – 5%).

- c. Assuming that the premium is actuarially fair, what is the expected utility associated with buying full insurance (i.e. insuring all \$5000 of potential loss)? What is the expected utility associated with insuring only half of the loss (\$2,500)? Is Johnny going to choose full insurance or partial insurance?

Full insurance (insure all \$5000 of potential loss):

¹ Theodore Schultz, a Nobel-prize winning economist mentioned in this debate, was the head of the economics department at Iowa State.

$$\begin{aligned} EU_2 &= p \cdot U(\text{income if sick but insured}) + (1-p)U(\text{income when healthy but insured}) = \\ &= 0.05 \cdot (20000 - 250 + 5000)^{1/2} + 0.95(25000 - 250)^{1/2} = \\ &= (24750)^{1/2} = 157.32 \end{aligned}$$

Partial insurance (insure only half of potential loss – \$2500):

$$\begin{aligned} EU_2 &= p \cdot U(\text{income if sick but insured}) + (1-p)U(\text{income when healthy but insured}) = \\ &= 0.05 \cdot (20000 - 125 + 2500)^{1/2} + 0.95(25000 - 125)^{1/2} = \\ &= 157.31 < 157.32 \end{aligned}$$

Clearly, full insurance will be bought. This illustrates the important result that if premiums are actuarially fair full insurance is preferred by risk-averse individuals.