

PRELIMINARY EXAMINATION FOR THE Ph.D. DEGREE

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- Please answer **four (4) of the following five (5) questions**. Do *not* answer all five questions. **You must answer question number five (5)**.
- Put your identifying number on your exam.

1. Concepts of Willingness-to-Pay Under Uncertainty

- Let  $i$  = the state of nature (s.o.n.) ( $i=1,\dots,N$ )
- $h$  = an index for the  $h$ -th individual ( $h=1,\dots,H$ )
- $c^h_i$  = income in s.o.n.  $i$  for individual  $h$
- $\delta$  = 1 if a proposed public project is constructed, 0 if it is not
- $U^h_i$  =  $U^h_i(c^h_i, \delta)$  = *ex post* utility in s.o.n.  $i$  for individual  $h$
- $e^h_i$  = income endowment in s.o.n.  $i$  for individual  $h$

**Begin by considering a single individual  $h$ .**

For *each* of the following definitions, (i) give the name by which the concept is known and (ii) give an intuitive interpretation of the concept.

- a. For a given s.o.n.  $i$ , the value  $A^h_i$  such that

$$U^h_i(e^h_i - A^h_i, 1) = U^h_i(e^h_i, 0).$$

- b. The value

$$B^h = E_i(A^h_i)$$

where  $E_i(\cdot)$  represents an expectation taken over all states of nature  $i$ .

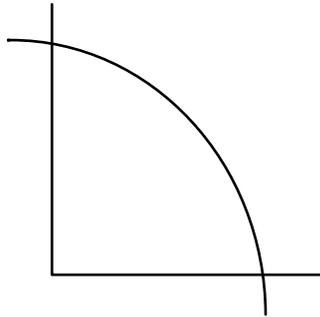
- c. For a given s.o.n.  $i$ , the value  $C^h_i$  such that

$$U^h_i(e^h_i, 1) = U^h_i(e^h_i + C^h_i, 0).$$

- d. The value  $D^h$  such that

$$E_i U^h_i(e_i - D^h, 1) = E_i U^h_i(e_i, 0).$$

- e. Is it possible for a willingness-to-pay locus to extend beyond the horizontal and vertical axes, as shown below? Explain.



Now consider a number of individuals  $h=1, \dots, H$ .

For *each* of the following definitions, (i) give the name by which the concept is known; (ii) give an intuitive interpretation of the concept; and (iii) tell in what specific setting it would be appropriate to use of the concept to assess the desirability of the public project, and explain.

- f. The value

$$F = \sum_h D^h.$$

- g. The largest value of  $G = E_i(\sum_h \gamma^h_i)$  resulting from the choices of  $\gamma^1_1, \gamma^1_2, \dots, \gamma^1_N, \gamma^2_1, \gamma^2_2, \dots, \gamma^2_N, \dots, \gamma^H_1, \gamma^H_2, \dots, \gamma^H_N$  which satisfy

$$E_i U^h_i(e_i - \gamma^h_i, 1) = E_i U^h_i(e_i, 0) \text{ for } h=1, \dots, H.$$

- h. The largest value  $J = E_i(\sum_h \gamma^h_i)$  resulting from the choices of

$\gamma^1_1, \gamma^1_2, \dots, \gamma^1_N, \gamma^2_1, \gamma^2_2, \dots, \gamma^2_N, \dots, \gamma^H_1, \gamma^H_2, \dots, \gamma^H_N$  which satisfy *both*

$$E_i U^h_i(e_i - \gamma^h_i, 1) = E_i U^h_i(e_i, 0) \text{ for } h=1, \dots, H \text{ and also}$$

$$\sum_h \gamma^h_1 = \sum_h \gamma^h_2 = \dots = \sum_h \gamma^h_N.$$

**2. Distortions From an Excise Tax on a Single Good**

Consider an economy of identical individuals in which the supply of the  $n$  goods is infinitely elastic at prices  $p$ . The government must meet its fixed revenue requirement,  $R_0$ , but is only able to impose a single tax of  $t_2$  per unit on the second good.

- a. Since there is only one tax and the revenue requirement is fixed, the tax must simply be set to satisfy

$$t_2 \cdot x_2(p_1, p_2+t_2, p_3, \dots, p_n) = R_0.$$

Nonetheless, to gain some insight into the distortions caused by this tax, set up the problem for choosing this tax to maximize consumer welfare subject to the revenue constraint, and find the first order conditions.

- b. Now use Roy's identity to find an expression for the percentage difference between the consumer's marginal utility of income and the shadow value of government revenue. Give an intuitive interpretation of your results, including an explanation of the relevance of the "tax elasticity of demand":

$$\eta = -(\partial x_2 / \partial t_2) \cdot (t_2 / x_2).$$

## Question 3.

Suppose you are interested in the impact of deworming medicine on school attendance. You have a survey that measures whether or not someone took deworming medicine ( $Z$ ), and their average school attendance ( $Y$ ).

a. Consider comparing the attendance ( $Y$ ) of those who took the medicine ( $Z=1$ ) with those who did not ( $Z=0$ ). Briefly discuss why this is not a reasonable measure of the treatment impact of deworming medicine. Frame your discussion both in terms of the econometrics as well as in terms of the intuition.

b. Now suppose you took those people who were not taking the medicine, and randomly made 1/2 of them take the medicine. ( $R=1$  if you were forced to take the medicine). You then survey them the following year, to get a new set of  $Y$ 's. **For this part (b) only, assume there are no spillovers or externalities from deworming.** Consider comparing those who were forced to take the medicine with those who didn't take the medicine at all:  $E(Y | Z=0, R=1) - E(Y | Z=0, R=0)$ . What parameter does this estimate? Now consider comparing those who were forced to take the medicine with those took it on their own:  $E(Y | Z=0, R=1) - E(Y | Z=1)$ . What question does this answer?

c. Now assume that there may be spillovers or externalities to taking deworming medicine. How do your answers to (b) change?

d. In Manski's discussion of the "reflection problem," he discusses several reasons why you might observe that an individual's outcomes are correlated with the mean outcomes for their group. Discuss the various reasons why we might observe this correlation. (If you want to use Manski's labels for these reasons, that's fine, but you don't need to.)

e. Miguel and Kremer use randomization of deworming treatment at the school level to estimate the direct and spillover impacts of deworming. Which of the reasons in (d) are they trying to get at? Which of the reasons does randomization "solve" or control for?

f. Briefly discuss how they estimate the deworming spillovers.

## Question 4

- a. What is the "Ashenfelter dip," and why can it confound difference-in-difference estimates of the impact of job training programs on earnings?
  
- b. Discuss LaLonde's study of econometric evaluations of training programs. What conclusion emerges from this about the ability of observational methods to recover experimental estimates of treatment impacts?
  
- c. Discuss the Dehejia-Wahba (1999) study. What conclusion emerges from this study about the ability of observational methods to recover causal effects of treatment impacts?
  
- d. What are the key assumptions underlying propensity score matching methods?
  
- e. Are propensity score matching methods always preferable to regression adjustment? Suppose you are interested in the impact of a key RHS variable,  $T$ . Give one or more situations where you would prefer to use linear controls for observables ( $Y = bX + dT + e$ , with "d" the main parameter of interest) rather than matching methods, and discuss why regression adjustment is preferable in these situations..

Question 5. **You must do this question as one of your four questions.**

Suppose the government sought to introduce a new public assistance program with the goal of helping the poor obtain adequate housing. This question examines how household choices will be affected by *how the new transfer program is structured*. Assume that there are eligibility rules that are the same for each of the three cases. (For example, assume that the household has to satisfy an income and asset test.) The government is considering three choices for structuring the program:

- a) In-kind transfer: Each eligible household receives a transfer in the form of a certain level of housing (or funds that must be spent on housing). This amount can be supplemented by the household's own additional expenditure on housing. (This would be similar to the current Food Stamp program or Medicaid program.)
- b) Subsidy: Each eligible household receives matching funds at a particular rate per dollar spent on housing. For example, a 30 percent matching subsidy means that for each dollar that the household spent on housing, they would receive an additional 30 cents in housing transfers.
- c) Lump Sum: Each eligible household receives a transfer of a particular dollar amount. The transfer could be used to purchase any goods; and is not restricted to housing. (This would be like the AFDC program.)

Present an economic model to examine these different transfer programs. In particular assume that households choose housing and other goods to maximize utility subject to a budget constraint. Assume that labor supply and income are exogenous, and that utility depends on housing goods and other goods. You can ignore the determination of eligibility and make whatever assumptions are convenient about the quality and quantity of housing.

Use your economic model to examine the impact of each of these three transfer programs on (a) household consumption of housing; (b) household consumption of other goods; and (c) utility. In particular, compare the changes to consumption of housing and other goods in the three programs relative to no program at all. Argue this analytically and present this graphically.