WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

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Consumer Behavior and Household Economics

Instructions

• Identify yourself by your code letter, not your name, on each question

• Start each question’s answer at the top of a new page

• You are to answer a total of FOUR questions

• Answer Question #1 (you MUST answer this question)

• Answer THREE of the remaining FIVE questions (question 2 - 6)

• You have four hours to complete the examination
1. (Static utility maximization) Consider a consumer with a utility function that is a function of three goods: \( q_1, q_2 \) and \( q_3 \). She has a total budget \( x \) to allocate across the three goods. The prices of the three goods are \( p_1, p_2 \) and \( p_3 \). Let the Marshallian demand functions for the first two goods be:

\[
q_1 = 100 - 5\left(\frac{p_1}{p_3}\right) + \beta\left(\frac{p_2}{p_3}\right) + \delta\left(\frac{x}{p_3}\right)
\]

\[
q_2 = \alpha + \beta\left(\frac{p_1}{p_3}\right) + \gamma\left(\frac{p_2}{p_3}\right) + \delta\left(\frac{x}{p_3}\right)
\]

Assume that \( \alpha, \beta, \gamma \) and \( \delta \) are all constants.

a) Assume that the consumer spends her total budget on the three goods. Write out the Marshallian demand function for \( q_3 \) as a function of \( x \) and the three price variables (and some constants).

b) Do these three demand functions satisfy the homogeneity property of consumer demand functions? Prove your answer.

c) Explain how the assumption that this consumer maximizes her utility can be used to solve for \( \alpha, \beta \) and \( \gamma \). [Hint: Use Slutsky symmetry and focus on its implications for \( q_1 \) and \( q_2 \).]

d) Find the value of \( \delta \) that is consistent with the assumption of rationality. [Hint: What does rationality imply for the diagonal elements of the Slutsky matrix?]
2. A study of the impact on health care plans from reporting their quality scores found that no significant increase in enrollment occurred for plans that reported high quality scores. (This did not attract new customers.). However, there was a decline in enrollment in plans that reported low quality scores. In fact it was estimated that consumers were willing to pay an extra $267 per year to avoid a low quality plan. In addition older people were more responsive to high quality ratings than younger people. (They were more likely to enroll in the higher quality plans.)

a) Use the principles of behavioral economics to explain each of these phenomena. Write a paragraph about each, cite the theory you are using and use a graph and/or mathematical statement to illustrate the points you make.

b) Why might health care plans not want to reveal their quality scores if they have a high score? Explain the economic principle behind your answer and cite the literature that deals with this phenomenon.
Question 3.

3. A number of empirical studies have attempted to estimate the private rate of return to schooling from the ordinary-least-squares estimate of $\beta_1$ in the following cross-section regression of $N$ individuals:

$$\ln Y = \beta_0 + \beta_1 S + \sum \delta_k X_k + \epsilon$$

where $Y$ is annual earnings, $S$ is years of schooling, $(X_1 \ldots X_k)$ are observable socioeconomic and demographic characteristics of the individuals, and $\epsilon$ is an error term.

a) Assuming that the model is correctly specified, discuss two alternative interpretations of the finding that the estimated coefficient on schooling ($\beta_1$) is positive.

b) Discuss at least two ways in which the model may be misspecified, and state the consequences of each misspecification for the properties of the least-squares estimator of $\beta_1$.

c) Discuss at least two alternative estimation and/or data-gathering strategies that could, in principle, remedy the adverse effects of these model misspecifications.

d) How does the social rate of return to education differ from the private rate of return? Explain.
Question 4.

4. According to a recent issue of *The Economist*, one of the most cost effective ways to reduce Greenhouse gas emissions is to increase the use of compact fluorescent light bulbs, which screw into the same sockets as regular incandescent bulbs in people’s homes. In fact, they both cut emissions and save the consumer money. The article says a regular bulb costs about 1 euro and uses about 15 euros worth of electricity a year. A low-energy fluorescent one costs 5 euros and uses 3 euros of electricity. The low-energy bulbs also last much longer than regular bulbs. For many consumers, the payback on buying and installing fluorescent bulbs is less a year. In other words, the rate of return on the investment is very high. However, most homeowners have not installed these low-energy fluorescent bulbs.

a) Provide some possible explanations for this apparent irrationality by consumers.

b) You have been given a research grant to study why most homeowners have not installed the low-energy bulbs, which is seemingly irrational. The goal of the research is to help develop incentives and/or programs that would get many more homeowners to install the low-energy light bulbs. Outline the research project you would conduct to better understand why consumers are not switching bulbs and how their behavior might be changed.
**Question 5.**

5. According to the idea of the matching function, an individual will be indifferent between two alternative rewards, one that yields an amount $A$ at time $T$ or one that yields a greater amount $A'$ at a later time $T'$ when:

\[
\frac{V}{V'} = \frac{A}{A'} \cdot \frac{Z + \Gamma(T-t)}{Z + \Gamma(T'-t)} = 1
\]

a) Solve for the point in time where the individual is indifferent between the nearly immediate and delayed alternatives. (Algebraically)

b) Illustrate, both algebraically and graphically, the time of indifference and explain how that time will change as the distance between the short run reward and the long run reward lengthens.

c) Show algebraically and graphically how the indifference time will change if the later reward increases in magnitude.

d) Show algebraically and graphically how the indifference time will change if the sensitivity to time delays increases.

e) How does the sensitivity of time delay in behavioral models relate to the more standard marginal rate of time preference in investment/consumption models?
Question 6.

6. Numerous empirical studies have shown that workers with similar observable characteristics (such as years of education, work experience, gender and age) have very different earnings. Large firms and certain industries pay more (as measured by significant estimated coefficients on industry dummy variables in an earnings equation) to “observationally equivalent workers.”

a) Describe and compare three possible explanations for these inter-industry wage differentials. Discuss whether each of these explanations is consistent with the standard neoclassical competitive model of the labor market. Explain.

b) Discuss how you would test which explanation or theory best explains the inter-industry wage differentials. In particular, describe the kind of data needed, and the general approach you would use. Identify major problems you are likely to encounter (or that have been encountered) in testing the model.