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. Consider a household with a utility function \( u = \beta_1 \ln(c) + \gamma \ln(\ell) \), where \( c \) is consumption, \( \ell \) is leisure. \( \beta_1 > 0 \) and \( \gamma > 0 \). Let income be \( y \), and assume that all income is spent on consumption \( (c) \). Finally, assume that the “full income” budget constraint is \( Tw = w \ell + p_c c \). Without loss of generality, assume that \( p_c = 1 \).

a) Use the budget constraint to substitute \( \ell \) out of the utility function. (Note that doing this puts the budget constraint directly into the utility function, so that maximizing utility does not require use of constrained optimization methods such as setting up a Lagrangian.) Then use the fact that \( c \) equals \( y \) to write the utility function as a function of \( y, w \) and \( T \).

b) Solve for the value of \( y \) that maximizes this utility function. It should be a function of \( \beta_1, \gamma, T \) and \( w \).

c) Given your answer to b), do hours of work increase or decrease when \( w \) increases? Give the intuition for your answer.

d) Return to the original utility function and make it “more realistic” by assuming that utility depends not only on a person’s income but also on the ratio of his or her income divided by average income, where average income is denoted by \( \bar{y} \):

\[
u = \beta_1 \ln(c) + \beta_2 \ln(y/\bar{y}) + \gamma \ln(\ell), \] where \( \beta_2 > 0 \)

The intuition here is that, in addition to having higher utility from having higher own consumption and more leisure, people get higher utility if their income is higher than the average incomes of other people. Using the same procedure used for parts a) and b), derive the utility maximizing level of \( y \) for this utility function.

e) Compare your answers to b) and d). For the utility function that includes relative average income, is hours worked larger or smaller than for the utility function that does not have that “effect”?

f) Finally, consider a world with two people who have the same utility function, the one in part d). Assume that both maximize utility taking the other person’s \( y \) as given. Define “social welfare” as the sum of both persons’ utility. Let the first person be “a” and the second one be “b”. Derive the first order condition for person a, who is choosing his or her income (call it \( y_a \)) to maximize his or her utility (call it \( u_a \)). Compare it to the first order condition of a social planner, who is choosing \( y_a \) to maximize social welfare. For the value of \( y_a \) that sets person a’s marginal utility to zero, what is the marginal utility of social welfare? In a society with such preferences, do people work “too much” or “too little” for their own good? What is the intuition for this result? [Hint, denote the two people in society as “a” and “b”, so that \( \bar{y} = (y_a + y_b)/2 \). Note also that \( \bar{y} \) can no longer be considered to be exogenous.]
Questions 2 through 6: Answer any three of these five questions

2. This question focuses on natural experiments in economics.

   a) Describe the characteristics of a good natural or quasi-experiment in economics.

   b) Meyer describes nine possible internal and three external threats to the validity of the results of a natural experiment. List and discuss five of these threats.

   c) A classic work in this field is the article by David Card and Alan Krueger published in the *American Economic Review* in 1994, “Minimum Wages and Employment:…….”. Describe their study in some detail, including the results.

3. Suppose a gamble is a 25% chance of winning $30 and 75% chance of losing $10. Consider an agent with a non-decreasing probability weighting function \( \pi(p) = p \) and with the following prospect theory value function:

\[
V(x) = \begin{cases} 
  x & \text{for } x \geq 0 \\
  2x & \text{for } x < 0 
\end{cases}
\]

   a) Explain which of the following three options will be chosen by this agent:

      a1. Do not participate;
      a2. Play the gamble once;
      a3. Play the gamble twice with a single payment done at the end by adding up the two results.

   b) Explain what he will do if he also has the following fourth option:

      a4. Play the gamble once, see the result and have the option of playing it a second time. A single payment is done at the end.

For both a) and b), show how you derive your results.
4. Consider an elderly consumer who receives a Social Security check each month. This is the only income for this consumer. Let $y$ be the amount of the monthly check. There are $T$ days in a month, and the consumer chooses her consumption amounts for each day, $c_t$, $t = 1, 2, \ldots, T$, to maximize utility. For each day of the month, the consumer develops a “consumption plan” for the rest of the month. To make things interesting, the consumer may have hyperbolic preferences. On the first day of the month, the consumer develops a consumption plan for the month that maximizes the following (potentially hyperbolic) preferences:

$$u(c_1^1) + \beta \left[ \sum_{t=2}^{T} \delta^{t-1} c_t^1 \right]$$

Note that the “1” superscript on $c_1^1$ and $c_t^1$ indicates the “plan” made on day 1, which may change for later days if preferences are hyperbolic. Preferences are not hyperbolic if $\beta = 1$. In contrast, if $0 < \beta < 1$, then preferences are hyperbolic.

The budget constraint for this dynamic utility maximization problem is $y = \sum_{t=1}^{T} c_t^1$.

a) Set up the Langrangian (use $\lambda$ as the Lagrangian multiplier) and maximize it to show the relationship between the marginal utility of consumption at time 1 and time 2. Also show the relationship between the marginal utility of consumption at time $t$ and time $t+1$ for $t > 1$. For both, do this with respect to the plan made on day 1.

b) Assume that $u(c_t^1)$ takes an isoelastic form: $u(c_t^1) = (c_t^1)^{1-\rho}/(1-\rho)$, where $\rho > 0$. Use your answer to a) to derive an expression for the optimal value of $c_2^1$ (for the optimal plan made on day 1) in terms of $c_1^1$, $\beta$ and $\delta$. Also, derive an expression for the optimal value of $c_{t+1}^1$ (for the optimal plan made on day 1) in terms of $c_t^1$, $\beta$ and $\delta$.

c) Suppose that for time periods within one month, the discount rate ($\delta$) is 1. If preferences are not hyperbolic ($\beta = 1$), use your answer to b) to show what the optimal consumption path is for the entire month, as planned on day 1. Express consumption for each day as a function of $y$. If the consumer recalculates at some time $t$, $t > 1$, during the month, does her consumption plan change? You do not have to show any derivations; just give the reasoning.

d) Still assuming that $\delta = 1$, also assume $0 < \beta < 1$ (hyperbolic preferences). Use your answer to b) derive the optimal expressions for $c_1^1$, $c_2^1$, $\ldots$, $c_T^1$ as functions of $y$, $\beta$ and $\rho$. That is, derive the optimal consumption plan the consumer forms one day 1.

e) Assume that the consumer follows your answer in part d) for her planned consumption in time period 1 (day 1). How much of the budget is left for consumption in time periods 2 through $T$ (days 2 through $T$)? Continuing to assume that $\delta = 1$ and $\beta < 1$, what is the consumer’s optimal consumption path, recalculated in time period 2? That is, derive the optimal expressions for $c_2^2$, $c_3^2$, $\ldots$, $c_T^2$ as functions of $y$, $\beta$ and $\rho$. Compare your answer with planned consumption for time periods 2 through $T$ as planned on day 1 (i.e. your answer to part d)). What do hyperbolic preferences imply for how past plans are in fact carried out? Give the intuition for your answer.
5. Standard human capital theory is the dominant perspective used to analyze worker and firm investments in education and training.

   a) The theory of human capital makes a distinction between general human capital and firm-specific human capital. What is the distinction? What are the implications for worker mobility, wages, and the incidence of training costs (i.e., who bears the cost) for each of these types of human capital? Explain.

   b) Describe the major empirical finding that has been inconsistent with the prediction for general human capital in terms of which party bears the cost of training. Provide at least one alternative to standard human capital theory that would generate this finding. Explain.

   c) Recent expansions of the human capital model include non-cognitive skills as an important component of human capital. What are non-cognitive skills and how does their inclusion in Heckman’s human capital model differ from a model with (fixed) unobserved ability?

6. You have to write a paper. You can either write it on Thursday, Friday, Saturday or Sunday. You have a present-biased utility function:

   \[ U^0 = u_0 + \beta(\delta u_1 + \delta^2 u_2 + \ldots + \delta^T u_T) \]

   The rewards for the four periods are \( v = (0, 0, 0, 0) \) and the costs for the four periods are \( c = (3, 5, 8, 13) \).

   The cost is immediate but the reward is delayed. For simplicity, \( \beta = 1/2 \) and \( \delta = 1 \).

   a) If you are a time-consistent agent, when would you write the paper?

   b) If you are a sophisticate, when would you write the paper?

   c) If you are a naïf, when would you write the paper?

   Show how you derive your results, and explain the intuition for your results.