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
Question 1. All students must answer this question.

1. A Model of the Impact of Bans on Smoking. A smoker derives utility from consumption of cigarettes (c), consumption of all other goods (q), leisure time at home (TH), leisure time in bars (TB), and total time smoking (TS):

   \[ U = U(c, q, T_H, T_B, T_S) \]

   (The reason for total smoking time, TS, as a separate argument in the utility function is that smokers suffer a disutility/craving for all time not spent smoking.)

   The smoker faces time and budget constraints. Total time in one day, T_{24}, consists of time spent at work, TW, time spent at home, TH, and time spent in bars, TB:

   \[ T_{24} = T_W + T_H + T_B \]

   Assume that T_W is fixed (exogenous) for all parts of this question.

   Total smoking time equals time spent at home plus time spent in work if there is no smoking ban at work and time spent in bars if there is no smoking ban in bars:

   \[ T_S = T_H + \rho_B T_B + \rho_W T_W, \]

   where \( \rho_B = 1 \) if smoking is not banned in bars, but = 0 if smoking is banned in bars, and \( \rho_W = 1 \) if smoking is not banned at work, but = 0 if smoking is banned at work.

   Finally, there is a very simple budget constraint: \( y = q + pc \), where y is exogenous income, the price of all other goods (q) is normalized to 1, and p is the cigarette price.

   a) Let the utility function be given by \( U = c^{\alpha_c} q^{\alpha_q} T_H^{\alpha_H} T_B^{\alpha_B} T_S^{\alpha_S} \), where all the \( \alpha \) terms are > 0. Define nonworking time, T_{NW}, as the time spent at home and at bars: \( T_{NW} = T_H + T_B \). Assume T_{NW} is exogenous. Suppose there are no bans on smoking either at work or in bars, so \( \rho_B = 1 \) and \( \rho_W = 1 \). Derive the optimal amount of time spent at home, denoted by \( T_H^*(1) \), as a function of T_{NW} and some or all of the \( \alpha \) terms. [Hint: The choice variables are c, q, T_B and T_H.]

   b) What is the optimal amount of cigarettes smoked in this scenario? Denote it by c^*(1).

   c) Next, assume that smokers are banned from smoking in bars and from smoking at work, so \( \rho_B = 0 \) and \( \rho_W = 0 \). Derive the optimal amount of time spent at home for this scenario, which is denoted as \( T_H^*(0) \), as a function of T_{NW} and some or all of the \( \alpha \) terms. Also derive the optimal amount of cigarettes smoked, which is denoted as c^*(0). [Hint: What is the relationship between \( T_H^* \) and \( T_S \) in this situation?]

   d) Compare your results for \( T_H^* \) and c^* with and without the smoking bans. What happens to time spent smoking and the number of cigarettes smoked when the smoking ban is imposed? If the answer is what you would expect, give the intuition. If not, comment on the realism of the utility function.
Questions 2 through 6: Answer any three of these five questions

2. A substantial number of studies have been published over the last 25 years by economists that analyze factors affecting the health of children in developing countries. The analyses have frequently been based on cross-sectional surveys which provide data on the children, parents, households, and communities.

   a) The two basic types of equations estimated are health production and health demand functions. Describe the basic specification of each and distinguish between the two.

   b) The Becker household/time allocation model can serve as the theoretical foundation. Briefly describe the model (using equations in which the terms are clearly defined) and its relation to health production and health demand functions.

   c) Discuss some of the major econometric (estimation) issues related to health production and health demand functions, when using cross-sectional data and how they might be addressed.

   d) Why is it useful to have panel data, particularly in terms of unobservable factors such as genetic endowment?

3. In the 1950s, Allais proposed the following experiment (Allais Paradox). You must make a choice between Gamble 1 and Gamble 2 (you can interpret these dollar amounts as final wealth levels):

   Gamble 1: $1 million for sure          Gamble 2: $1 million with probability 0.89
                                                   $5 million with probability 0.10
                                                   $0 with probability 0.01

   a) Which gamble would you choose?

   b) Next, you must make a choice between Gamble 3 and Gamble 4:

   Gamble 3: $1 million with probability 0.11          Gamble 4: $5 million with probability 0.10
                                                     $0 with probability 0.89          $0 with probability 0.90

   Which would you choose?

   c) Most people choose Gamble 1 and Gamble 4. Explain why this pattern of choices violates expected utility theory. Use the probability triangle to illustrate your results.
4. In the context of Becker’s household/time allocation model, discuss the concept of “full income” and show how it is derived from the basic specification of the model. Be sure to write out the basic equations that specify the Becker model and explain each equation.

a) Discuss the data that would be necessary to estimate the “full income” of a household and any problems that might be involved with its empirical estimation.

b) Still in the context of Becker’s model, discuss the “opportunity cost of time”.

c) How is the opportunity cost of time derived for someone who does not have a job? Specifically, explain how the problem of sample selection bias is addressed.

d) As education, especially among women, rises explain what Becker’s household model suggests should happen to population growth rates in developing counties.

5. You need to finish a class project on one of four weekends. On each weekend, a different movie is shown.

   Week 1: A mediocre movie
   Week 2: A good movie
   Week 3: An excellent movie
   Week 4: Best of all, a Johnny Depp movie.

You will miss the movie shown in the week if you choose to finish the project in that week. For example, if you choose to finish the project in week 1, you will miss the mediocre move; if you choose to finish the project in week 2, you will miss the good movie…

The rewards for the four weekends are \( v = (0, 0, 0, 0) \) and the costs of missing the movie for the four weekends are \( c = (2, 3, 5, 8) \).

For all the questions below, show how you derive your results and describe the intuition of your results.

a) If you are a time-consistent agent, when would you finish the project?

b) Suppose 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 cost is immediate but the reward is delayed. For simplicity, \( \beta = 1/2 \) and \( \delta = 1 \). If you are a sophisticate, when would you finish the project?

c) If you are a naïf, when would you finish the project?
6. Cigarette bans and second hand smoke. This is a continuation of question 1, so do that problem before attempting this one.

Suppose that the smoker in question 1 lives in the same home as a nonsmoker. The nonsmoker also spends time at work and time in the same bar frequented by the smoker. More specifically, the nonsmoker spends $\tau_H$ of her time at home, $\tau_B$ of her time in bars, and $\tau_W$ of her time at work, where $\tau_H + \tau_B + \tau_W = 1$. (The $\tau$ terms are proportions of total time.) Assume that in each of these three places, if smoking occurs then the fraction of each of the smoker’s cigarettes that are “inhaled” by the nonsmoker (as second hand smoke) is equal to a proportion, $\delta$, of the number of cigarettes smoked by the smoker in those places, which can be denoted by $c_H$ (cigarettes smoked at home), $c_B$ (cigarettes smoked in bars), and $c_W$ (cigarettes smoked at work). That is, the exposure of the nonsmoker to cigarette smoke, denoted by “Expos”, is:

$$\text{Expos} = \delta[\tau_H c_H* + \tau_B c_B* + \tau_W c_W*]$$

where asterisks simply indicate that the smoker chooses cigarettes optimally.

a) Consider your answer to question 1 regarding the total number of cigarettes smoked by the smoker when there is no ban. Derive the exposure to cigarettes (Expos) of a nonsmoker who lives with a smoker. Your answer should be a function of $\tau_H$, $\tau_B$, $\tau_W$, $\delta$, $c*$ (no need to insert your answer for $c*$, just leave it as $c*$), some of the $\alpha$ terms, $T_{NW}$, $T_W$ and $T_{24}$. That is, you will need to solve for $c_H^*$, $c_B^*$ and $c_W^*$ and substitute them out of the expression for Expos given above. Important: you should assume that the proportion of the smoker’s cigarettes that are smoked in any of the three different activities is equal to the total cigarettes smoked ($c*$) multiplied by the fraction of (smoking) time spent in any given activity.

b) Suppose that smoking is banned in workplaces but not in bars, so that $\rho_W = 0$ and $\rho_B = 1$. For the smoker, calculate the optimal number of cigarettes smoked, the optimal time spent at home and the optimal time spent in bars. [Hint: Note that total hours smoking is different from the unconstrained case.]

c) Based on your answer to question b), calculate the amount of exposure to cigarettes of the smoker who lives with the nonsmoker when there is a ban on smoking in the workplace but no ban in bars. As before, you can leave $c^*$ in the expression; there is no need to substitute it out.

d) Compare your answers to parts a) and c). Calculate the change in exposure (call it $\Delta\text{Expos}$) from imposing the ban in the workplace. Does it increase or decrease? Finally, consider children, who spend all of their time at home. Does their exposure to second hand smoke increase, decrease, or stay the same?