WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

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CONSUMER BEHAVIOR and HOUSEHOLD ECONOMICS

Instructions:

- IDENTIFY YOURSELF BY CODE LETTER, not name, on all pages.

- Start each question at the top of a new page.

- You are to answer a total of FOUR questions.

- You have four hours to complete the examination.

- This is a closed book exam. No notes, articles, books or other sources may be used.
1. Veblen goods. Consumer $i$ has the following utility function that depends on an “ordinary” good ($x_i$), leisure ($\ell_i$) and consumption of a “Veblen” good ($v_i$):

$$U_i = x_i^{1/2} + \ell_i^{1/2} + (v_i - \bar{v} + k)^{1/2}$$

Note that utility from the Veblen good also depends on average consumption of that good in society, which is denoted by $\bar{v}$. The constant $k$, where $k > 0$, is added to ensure that $v_i - \bar{v} + k > 0$ even if $v_i < \bar{v}$, since we cannot take the square root of a negative number.

For simplicity, assume that the prices of both $x$ and $v$ equal 1, which is just a normalization since the units of $x$ and $v$ are arbitrary. The consumer earns a wage of $w$, which is also the price of leisure, and has a total “full” income of $wT$ ($T$ is total time available, e.g. 24 hours per day). Thus consumer $i$ faces the following budget constraint:

$$wT = x_i + w\ell_i + v_i$$

a) Set up the Lagrangian for consumer $i$’s utility maximization problem, show the first order conditions for $x_i$, $\ell_i$ and $v_i$, and find the optimal level of $v_i$, taking $\bar{v}$ as given (exogenous). Also solve for the optimal levels of $x_i$ and $\ell_i$.

b) Suppose that consumer $i$ lives in a society where everyone has the same utility function that he or she has, so that in equilibrium everyone chooses the same level of $v$. Use your answers for a) to solve for $v_i$, $x_i$ and $\ell_i$ as functions of $w$, $k$ and $T$.

c) Next, imagine that you are a social planner, and that you have the power to set $v_i$ for all members in this society. You want to maximize the average utility in society. What level of $v_i$ should you choose for every member of society? Give the intuition for your answer in terms of productive resources devoted to production of the Veblen good. [Hint: You can solve this without using any math at all. so please do not use any. And please keep your answer brief.]

d) Show that your choice in part c) will in fact increase everyone’s utility relative to the “market solutions” for $v_i$, $x_i$ and $\ell_i$ that you found in part b). You will need to use some math to show this. [Hint: First solve for optimal values of the choice variables for consumer $i$, then to compare them with your answers for b) substitute $k$ out of your answer for b) using your solution for $v_i$ in b).]
2. Utility functions and Equivalence Scales. Consider a utility function that depends on two goods \( q_1, q_2 \) and household size \( z \):

\[ u = \beta \log(q_1) + (1-\beta)\log(q_2) - \log(z) \]

where \( 0 < \beta < 1 \). Assume that total expenditure that consumer has to spend on the two goods is \( x \), and that the prices for \( q_1 \) and \( q_2 \) are \( p_1 \) and \( p_2 \), respectively.

a) Derive the Marshallian demand functions for \( q_1 \) and \( q_2 \). You can treat \( z \) as exogenous (not a choice variable).

b) Next consider the utility function \( u' = k[q_1^\beta q_2^{1-\beta}/z^{1-\alpha}] \), where \( 0 < \alpha < 1 \), and \( k \) is a constant term, \( k > 0 \). Using the same budget constraint as in part a), Derive the Marshallian demands for \( q_1 \) and \( q_2 \) using this utility function.

c) Assume that \( \beta \) in a) is the same as \( \beta \) in b). Compare the two sets of demand functions for your answers to a) and b). How are they related to each other, and why are they related in this way?

d) Recall that equivalence scale functions can be defined as follows:

\[
\frac{c(u, p, z)}{c(u, p, z_R)}
\]

where \( z \) is any \( z \) of interest and \( z_R \) is a “reference” household size.

Derive the cost functions for the utility function in part a) and show the associated equivalence scale function (which will depend on \( z \) and \( z_R \)).

e) Derive the cost functions for the utility function in part b) and show the associated equivalence scale function. Looking at your answers for all previous parts of this question, what do you conclude regarding the feasibility of estimating equivalence scales from data on consumer demand?
3. Deaton and Muellbauer (1980) proposed the unfortunately acronymed “Almost Ideal Demand System”.

   a) Write down the Almost Ideal Demand (AID) System in terms of the log cost function of the form:

   \[
   \log C(u,p) = a(p) + b(p)u
   \]

   What are the necessary properties of \(a(p)\) and \(b(p)\)? What makes the Almost Ideal System, “Almost” ideal?

   b) For some good, derive demand functions (whichever flavor you’d like) from the cost functions. Derive the own price and income elasticities. Describe an estimation strategy to recovering these quantities, including the kinds of data which might or might not be appropriate.

   c) Write the linear and quadratic approximations to the compensating (CV) and equivalent variations (EV). When are these approximations likely to work well? When are these approximations likely to work poorly?

   d) Compare and contrast methods for incorporating demand shifters into the AID model. What do you understand by the statement “Demographics have price like effects”? Show how this statement might follow from a simple utility function.
4. Deaton Paxson Revisited

a) What is Engel’s second law? What are the implications of Engel’s second law? Please write down a simple model that clearly lays out these predictions.

b) Summarize the Deaton Paxson puzzle as described in “Economies of scale, household size, and the demand for food.” *Journal of Political Economy* 1998 106 (5), 897-930

c) Various authors have offered alternative explanations for Deaton and Paxson results. Provide a coherent synthesis of these critiques. How legitimate do you think these critiques are? Explain.

d) What do you think the Deaton Paxson results mean? Describe the data you think you might need to resolve the paradox. Can you think of an experiment that might falsify the prediction?
5. Cost of Living Indices (COLI).

a) How do Cost of Living Indices relate to Cost of Goods indices?

b) When will a single cost of living index measure changes in the cost of living for an entire population? Show a Stone Price index satisfies these restrictions.

c) Prove that the Paasche and Laspeyres Indices provide bounds for a true COLI.

d) Discuss a statistical approach to dealing with quality change in a price index. Provide a direct example of how you might go about constructing such an index.

e) Explain how you might address the issue of quality change in a COLI as an economist. Are there alternative approaches? If so, discuss relative strengths and weaknesses.