University of California, Davis
Department of Economics
**PUBLIC ECONOMICS**

Date: July 8, 2003
Time: 3 hours
Reading time: 20 minutes

## PRELIMINARY EXAMINATION FOR THE Ph.D. DEGREE

- Please answer **four (4) of the following six (6) questions**. Do *not* answer all six questions, as only the first four answers submitted will be graded.
- Put your answers for each question in a **separate blue book**; that is, use a total of four (4) blue books.
- Put your identifying number on each book.

**1) <u>Willingness to Pay for Pollution Control Under Income Uncertainty.</u>**

Suppose that a consumer's utility depends on income (c) and whether regional air quality is improved ($\delta=1$) or the air is left polluted ($\delta=0$), according to the utility function

$$u(c,\delta) = c^{.5} + \delta.$$

Note that for a given air quality level the consumer is risk averse, but that the marginal utility derived from air quality improvement is the same regardless of income. The consumer's exogenous income is uncertain: it is $e_1$ with probability $p_1$ and $e_2$ with probability $p_2$. Although $e_1 < e_2$, the utility *function* is the same in both states.

a) Write down an equation which defines the willingness-to-pay locus in $(\gamma_1, \gamma_2)$ space.

b) Use the implicit function theorem to find the slope of the willingness-to-pay locus, and determine whether it is concave or convex. Then illustrate the locus in a figure having $\gamma_1$ on the horizontal axis and $\gamma_2$ on the vertical axis.

c) Write down an equation for the line of the points having an expected value equal to a constant A.

d) Taking A=OP (the option price), prove that the willingness-to-pay locus at the 45° line is *steeper* than is the locus of points with expected value equal to OP. Then illustrate the locus of points with expected value OP in your figure.

e) Give an intuitive interpretation of your result in part (d).

## 2) Optimal Public Utility Pricing

A new town is considering building a hydroelectric plant. There are two goods (electricity and labor), and this plant would incur a large fixed cost and then produce electricity at a small (but increasing) marginal cost. All consumers have identical preferences for electricity and can therefore be represented by a single consumer; they have no non-wage income. The consumers' preferences are such that it is Pareto optimal to build the plant, using $L_A$ units of labor to produce $E_A$ units of electricity. Unfortunately, pricing at (the low) marginal cost would generate negative profits.

a) Write down the government's simple "first-best" optimization problem (where the government controls production and consumption directly rather than through the market). Illustrate the problem in a clearly labeled diagram, showing that the Pareto optimum described above is the solution.

b) Use your diagram to illustrate the situation where *marginal cost pricing* would not be a viable way to achieve the Pareto optimum in a market economy because a competitive firm would make negative profits. Explain.

c) Show in your diagram that *average cost pricing* (zero profits) would also not be a viable way to achieve the Pareto optimum. Explain.

d) Now write down a market-based optimization problem in this situation, where the government affects consumption only by its choice of prices and a lump-sum tax on the consumer (which covers the utility's losses). Illustrate the problem in a clearly labeled diagram, showing that the Pareto optimum described above is the solution.

e) Finally, write down a market-based problem in which the government sets prices but *cannot* charge a lump-sum tax. Illustrate the problem in a clearly labeled diagram, showing why the Pareto optimum is *not* achieved.

## 3) Title I Program

Title I is an approximately 10 billion dollar education program that is funded by the United States' federal government. Title I money is aimed at disadvantaged children attending high poverty schools. In general, schools with more disadvantaged children qualify for more Title I money, which can be spent on a variety of educational activities including small-group tutoring and special teacher aids. In spite of the fact that Title I is a large component of the federal government's education expenditures, we know very little about whether the money that is spent actually improves children's outcomes.

a) A simple way of evaluating the Title I program would be to collect data on school district test scores and per pupil Title I expenditures and run the following regression:

$$T_s = \alpha + \beta TitleI_s + \varepsilon_s$$

where $T_s$ is the average test score in school district s, $TitleI_s$ is the per pupil Title I expenditure in school district s and $\varepsilon_s$ is an error term.

The estimate of $\beta$, however, would probably be biased. Why? In what direction would you expect the estimate be biased (i.e. would you expect the estimate be too large or too small relative to the true causal effect of Title I expenditures on student test scores?) Explain your answer.

b) Another strategy for estimating the effects of the Title I program would be to estimate the following regression:

$$\Delta T_{st} = \alpha + \beta \Delta TitleI_{st} + \varepsilon_{st}$$

where $\Delta T_{st}$ is the change in test scores from one year to the next (t denotes year) and $\Delta TitleI_{st}$ is the change in per pupil Title I expenditures from one year to the next. In other words, one could regress changes in test scores on changes in Title I spending.

What would be the advantage of this approach?

Why would we still expect the estimate of $\beta$ to be biased?

c) In her paper "Do Federal Grants Boost School Spending? Evidence from Title I" Nora Gordon uses variation in the funding formula over time to identify the effects of Title I on school spending. Specifically, the allocation formula for each school district in each year is

Title I expenditure=0.40*state per pupil expenditure*# disadvantaged children

The key to her identification strategy is to understand that even though allocations are made every year, the count of poor children that is used in the allocation formula is only updated every ten years with the release of new Census data. By the time the new Census data are used they are often outdated and do not represent the actual number of poor children in the district.

The last Census update was in 1993. Suppose we estimate the effect of Title I expenditures by applying IV to the equation in part b) above, using data on test scores and Title I expenditures for 1992 and 1993, and with the instrument being the change in the allocation formula between 1992 and 1993.

What would be the pros and cons of using this instrument? Would you expect it to yield a consistent estimate of $\beta$? Why or why not?

4) In recent years, school voucher programs have become increasingly popular among both policymakers and voters.

a) Briefly describe how a typical voucher proposal would work.

b) Why do some policymakers believe that vouchers will improve the quality of public education? i.e. through what mechanism/process will this happen?

c) Since, until recently, very few voucher programs have actually been implemented on a large scale, it is difficult to test the hypothesis that they will lead to improvements in school quality. In the absence of data on voucher programs, how would you go about testing this hypothesis? Carefully explain the pros and cons of your approach.

## 5) EITC and Married Women

**a)** The most common model of married women's labor supply is the secondary earner model where the woman takes the husband's earnings as exogenous and part of her non-labor income. Ignoring the EITC, present the secondary earner model graphically and discuss the comparative static results associated with an increase in her wage and an increase in the earnings of her husband.

*For the rest of the problem, use the secondary earner model to analyze the impact of the EITC on the labor force participation of married women.*

**b)** Consider a woman married to a man who is not working (e.g. his earnings =0). Draw her budget constraint with and without the EITC. What is the theoretical prediction of the impact of the EITC on the labor force participation for this woman?

**c)** Now consider a woman married to a man who works and has earnings in the phase-out range of the EITC. Draw her budget constraint with and without the EITC. What is the theoretical prediction of the impact of the EITC on the labor force participation for this woman?

**d)** Lastly, what if woman is married to a man who works and has earnings <u>above</u> the phase-out range of the EITC. Draw her budget constraint with and without the EITC. What is the theoretical prediction of the impact of the EITC on the labor force participation for this woman?

**e)** Use your information in (b)-(d) to summarize the predictions for impact of EITC on the labor force participation of married women. How does this compare to incentives for single women?

## 6) Welfare reform

A long-standing criticism of the AFDC is one of moral hazard—that the program leads to a reduction in labor supply. To address this concern, two of the stated goals of the 1996 welfare reform were to (i) encourage work and (ii) reduce welfare caseloads.

a) Present an economic model of labor supply and welfare participation. Use the model to show how the AFDC (pre-reform) program leads to a reduction in labor supply.

b) Consider a state that reforms its AFDC program by adding time limits and strict work requirements. Use your model to demonstrate and discuss whether a reform of this type would be expected to meet the two goals set above.

c) Consider another state that reforms its AFDC program by adding time limits, strict work requirements, and also reduces implicit tax rate on earned income from 100% to 50% (e.g. enhances disregards). Use your model to demonstrate and discuss whether a reform of this type would be expected to meet the two goals set above.

d) Suppose you want to explore empirically how the 1996 federal welfare law affected labor force participation. You combine data from the CPS before and after 1996 and run the following regression:

$$P_{it} = \alpha + \beta X_{it} + \gamma POST96_{it} + \varepsilon_{it}$$

where P is a dummy variable equal to 1 if you work, X is a set of control variables, and POST96 is a dummy equal to 1 for years 1996 and later. Evaluate the research design in this model. Would you expect the coefficient on POST96 to be biased upward or downward? Why?

e) Propose an alternative research design to evaluate the impact of the 1996 welfare reform.