Written Preliminary Ph.D. Examination

Department of Applied Economics
June 2008

Policy Analysis

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
- Answer four of the following seven questions
- You have four hours to complete the examination
**Question # 1**

Consider the following two equations.

(I) \[ Y_{ij} = \alpha \text{Small}_j + X_{ij}\gamma + e_{ij} \]

(II) \[ \text{Small}_j = X_{ij}\beta + u_{ij} \]

These two equations were recently used in a study of the effect of small high schools on various measures of parent involvement in schooling. The parental involvement outcome \( Y_{ij} \) is observed for the \( i \)th parent in the \( j \)th school. The researchers used information on parent participation in field trips, parent-teacher organizations, and other school-related activities from a national survey of parents, students, and teachers. The vector \( X \) contains information on a large number of observed characteristics of parents and schools. The research question involves identifying the causal impact of smaller schools on parental involvement. A small school is denoted by a dummy variable.

a. If a researcher were to estimate the first equation only in an attempt to get an unbiased estimate of the effect of small schools, what assumption would need to be made about the correlation between \( e_{ij} \) and \( u_{ij} \) given \( X_{ij} \)? In other words, what is being assumed about \( \text{corr}(e,u/X) \)?

b. One way to detect the existence of unobservable characteristics correlated with both the parental involvement outcome and the decision to enroll a child in a small high school is to estimate equations (I) and (II) jointly, perhaps by bivariate probit estimation. Assume that this joint estimation of equations (I) and (II) reveals that the correlation (rho or p) between \( e \) and \( u \) is positive and significant. What does this imply about the nature of unobservable characteristics that are correlated with the decision to attend a small school and parent involvement? Provide some intuition to explain the nature of this unobservable parental characteristic.

c. Assuming that \( \text{corr}(e,u) \) is positive, what will that imply about the magnitude of the estimate of \( \alpha \) obtained from a simple single equation estimation of equation (I)?

d. Instead of using a large national data set to estimate the effect of small schools on parental involvement, say that you obtain funding to conduct a small randomized study in a single Minnesota county. How would findings from your randomized study satisfy concerns about internal validity and external validity?
Question #2

The Food Stamp Program offers low-income individuals assistance to buy food. The current Food Stamp Program (FSP) started in the United States in the mid-1960s and is administered by the federal government with benefits distributed by individual states. A number of researchers have attempted to estimate the benefits of food stamp participation on health and other outcomes. One way to measure health is by using data on body mass index (BMI) and obesity. The assumption is that overweight status is associated with poorer health.

Simple correlations suggest that food stamp recipients are more likely to be overweight when compared to nonrecipients.

a. Discuss the usefulness of this correlation in understanding the causal impact of Food Stamp Program participation on overweight status. Are data on these two measures alone - program participation and weight -- sufficient for making conclusions about the effect of FSP participation on overweight status?

b. What variables might a researcher include in a single equation regression to estimate the causal effect of FSP participation? Discuss the usefulness and limitations of using a single regression equation to estimate the effect of FSP on overweight status.

c. Explain how fixed effects estimation might help the researcher obtain better estimates of the effect of FSP participation. What kind of data set would be needed and what assumptions are required to conclude that the resulting estimated effect of FSP participation represents a causal effect?

d. Instead of using fixed effects estimation, the researcher decides to employ propensity score matching estimation. Discuss how this estimation is conducted.

e. How might regression discontinuity design (RDD) be used to estimate the effect of Food Stamp Program participation? In general, what kind of historical, administrative, or geographic information might be useful in employing the RDD design?

f. Now assume that instrumental variables estimation is conducted. Some researchers have shown that a valid instrument for use with a national data set in which the state of residence of each respondent is known is the amount of outreach expenditures (per capita) budgeted by each state to advertise and enroll eligible participants in the Food Stamp Program. In what way might this type of expenditure be considered an appropriate instrument for this estimation problem?

g. In comparing the estimation approaches discussed above (single equation regression, fixed effects estimation, propensity score estimation, RDD, and instrumental variables), which method(s) help control for unobservable characteristics of program participants that might be correlated with FSP enrollment? Explain.
**Question #3**

In 2004 New Jersey Department of Transportation fully implemented an “Emerging Small Business Enterprise” (ESBE) program as a means of addressing concerns that its “Disadvantaged Business Enterprise” program (DBE) discriminates against non-DBEs. DBEs are certified if they do not exceed certain size, tenure and net worth ceilings and if the majority owners are women, members of racial minority groups, or persons who can establish social disadvantage. The DBE program establishes a goal of a percentage amount of contract dollars that will be allocated to DBES.

An ESBE is understood to be a firm that meets the size, tenure and net worth standards for a DBE but which need not be a firm whose majority owners are women, minorities or persons who are socially disadvantaged. The ESBE program sets aside contracts on which only ESBEs are permitted to bid.

Analysts estimated the following model for prime contractors before and after the implementation of the ESBE program.

\[
\ln Y = \sum \beta_i x_i + \gamma \cdot DBE + \mu
\]

Where DBE is a dummy variable indicating whether the prime contractor was a DBE or non-DBE; Y is contract amounts awarded to prime contractors; x is a vector of characteristics of the contract and the contractor (location of firm in New Jersey, construction contract, year of the award, industry classification of the firm) The model was estimated for all firms and also for DBEs and non-DBEs separately, before and after the implementation of the ESBE program.

Table 1 reports the results of estimating the model.

1) Was there discrimination against non-DBEs prior to the implementation of the ESBE program?
2) Was there discrimination against non-DBEs after the implementation of the ESBE program?
3) Discuss the strengths and weaknesses of using the information included in Table 1 to test for discrimination.

Analysts also estimated the following models, measuring the impacts of an ESBE goal on DBE contract dollars awarded vs total contract dollars awarded during the period of 2004-2006.

\[
\ln Y^{DBE} = \sum \alpha_i^{DBE} z_i + \theta^{DBE} \cdot ESBE + \nu
\]
$\ln Y = \sum \alpha_i z_i + \theta \cdot ESBE + \nu$

Table 2 reports the results of the estimation of the models predicting the impacts of an ESBE goal placed on a contract. An ESBE goal of greater than zero (and less than or equal to one) means that a share of dollars (equal to the goal) has been set aside for which only ESBE-eligible firms may bid.

4) From the results provided in Table 2, determine whether the ESBE goals benefit DBEs relative to other firms.

5) Discuss how one might evaluate the effectiveness of the ESBE program
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Question #4

a. A U.S. corporation purchases a piece of equipment. Show how you would measure the present value of the tax savings the purchase generates for the corporation. Show the present value per dollar of the purchase price. Define the variables in your formula. Assume there is no investment tax credit.

b. The 2003 U.S. tax bill included a provision that allows businesses to expense (deduct immediately) 50% of the purchase cost of some capital assets. The remainder of the cost must be depreciated. Assuming the equipment purchased in (a) qualifies for this treatment, show the new present value of the tax savings the purchase generates for the corporation.

c. Define (in words) the user cost of capital from the Hall-Jorgenson model.

d. In the Hall-Jorgenson model, what is the formula for the user cost of capital for a U.S. corporation? Define the variables in your formula.

e. Explain, using the formula in (d), how the cost of capital is affected by the tax law change described in (b).

f. The National Association of Manufacturers (NAM), a trade group of U.S. manufacturing companies, wrote letters to key members of Congress strongly supporting the change described in (b). They argued that the change would stimulate economic growth by increasing investment. Use the Hall-Jorgenson user cost of capital model to support NAM’s argument.

g. Explain how, aside from the increased investment argument, the new expensing provision could benefit NAM’s members.

h. Recent research has shown that taxpayers chose to apply the expensing provision described in (b) to only about 60% of investment that qualified for the provision. Why might taxpayers choose not to apply the provision to all of their qualified investment?
Question #5

The central corridor project has drawn considerable interest in recent months. For this project federal, state, and local governments will combine to provide funding for a light rail line between Minneapolis and Saint Paul. What are the market failures government funding of this project seeks to remedy?

Since this project will not be held to a market test of profitability describe in detail how it can be evaluated to determine whether it is in society’s long run interest to fund the project? Since the project is expected to be in operation for many years describe how benefits occurring in the distant future should be treated. Explain how uncertainty about future outcomes can be incorporated into the project using the framework of Dixit and Pindyck.

How should the cost of the project be distributed among the federal, state, and local government to promote economic efficiency?
**Question #6**

In the U.S. federal and state governments have programs in place to make home ownership more affordable to households. While some of these programs target lower income households, others are available to all regardless of income. Discuss carefully the justification for public sector programs that intervene in the housing market that are available to all households (such as the deductibility of home mortgage interest and the insuring of qualifying home mortgages by the federal housing administration.) What, if any, are the market failures these programs seek to correct? In framing your answer to this portion of this question begin by assuming a completely homogeneous population, that is, that all households have the same income and that there are no minorities.

Now, assume that there is a progressive income tax and allow differences in household incomes. Describe how the subsidy provided by the tax deduction for home mortgage interest changes. Contrast the distribution of this subsidy with that from the FHA insurance program.

Expand the set of households to include minorities as well as income differences. Is there any difference in the impact of the mortgage interest tax deduction on behavior if the distribution of income in both the majority and minority groups is identical? What if one group has, on average, lower incomes than the other? What if there is discriminatory lending that a) reduces loan amounts or increases loan denial rates for minorities; or b) restricts loan availability for minorities in non-minority neighborhoods?
Question #7

1. How does Becker measure “tastes for discrimination?” What does Becker assume about the mobility of capital in his two sector model of discrimination? What assumptions are made in the Becker Model about uncertainty, bargaining and information about skills of workers? In long run equilibrium in the Becker model of discrimination, what can be said about racial gaps in wages?

2. What is statistical discrimination? What distinction is made in Aigner & Cain (1977) between group vs. individual discrimination? What does (or would) the Phelps Model say about the reliability of test scores in predicting true skill level, ability, or productivity of whites vs blacks?

3. Consider the following regression:

\[
\ln y = \sum \beta_i x_i + \delta \text{Race} \quad \text{(Eq. 1)}
\]

where \( y \) is earnings, \( x \) is human capital measures, absent measures of intelligence. Race is equal to one if the worker is African American and equal to zero if the worker is white. Consider the revised regression equation that incorporates unmeasured intelligence through a proxy, AFQT.

\[
\ln y = \sum \beta_i' x_i + \delta' \text{Race} + \theta \text{AFQT} \quad \text{(Eq. 2)}
\]

According to the Darity-Mason critique of human capital models of discrimination, what can be said about the relationship between \( \delta \) and \( \delta' \)?