Written Preliminary PhD. Examination

Department of Applied Economics

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Policy Analysis

Instructions

- Identify yourself by your code letter, not your name, on each question.
- Start each question’s answer on the top of a new page.
- Answer 4 out of the following 6 questions.
- You have four hours to complete the examination.
Question 1

Note: The share of total points for each part of this question is given in parentheses.

“According to the Becker Model, in the long-run discrimination will disappear.”

Indicate wherein you agree or disagree, proving details and underlying assumptions. (10%)

Consider an observed outcome, \( y \) (test score) and an unobserved measure \( q \), true skill level.
Aigner and Cain define a situation where the employer will pay workers based on expectations about the true skill levels given observed test scores. The expected value of \( q \) given \( y \), \( E[q|y] \), or the expectation of the true skill level is given by:

**Equation 1**

\[
E[q | y] = \hat{q} = (1 - \gamma)\alpha + \gamma \cdot y
\]

where \( \alpha \) is the group mean of \( q \) and \( \gamma = \text{Cov}(q,y) / \text{Var}(y) \).

Provide an interpretation of equation 1. (10%)

Now, consider two differentiated groups of workers, say whites and blacks, with possibly different group means, \( \alpha \), and possibility different \( \gamma \)'s. The employer is assumed to pay a worker an amount equal to the expected skill based on the specific information available for each group and individual:

**Equation 2**

\[
\hat{q}^w = (1 - \gamma^w)\alpha^w + \gamma^w \cdot y^w \\
\hat{q}^b = (1 - \gamma^b)\alpha^b + \gamma^b \cdot y^b
\]

Under what circumstances will the slopes in equation 2 differ between the white and black equations? (10%)

Under what circumstances will whites earn more than blacks with the same test scores? (10%)

Discuss wherein the resulting wage differential is or is not considered to be discrimination in the Becker Model and/or the Phelps Model. (10%)

Consider the following regression:

\[
\ln w = \sum \beta_i x_i + \delta \text{Race}
\]

where \( w \) is wage earnings, \( x \) denotes a vector of 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, \( y \), a test score.

\[
\ln w = \sum \beta x_i + \delta \text{Race} + \theta y
\]

According to the Darity-Mason critique of human capital models of discrimination, what can be
said about the relationship between \( \delta \) and \( \delta' \)? (10%)

Suppose that you have access to data on earnings in time \( t \) and test scores in time \( t-1 \) for a large
group of blacks born in the United States and blacks born in Africa along with comparable data
on whites. Discuss how one might model and test for discrimination. What biases might arise
by exclusion of test scores in the model? What biases might arise by inclusion of test scores in
the model? (10%)

Suppose instead of data on earnings and test scores, you have data on traffic stops and race.
Actual criminal propensities are unobserved. Police are assumed to observe skin color. Within
the framework of an Aigner-Cain or Phelps model, discuss how or why there might be
discrimination in traffic stops against darker skinned blacks. (10%)

Explain how or why a Blinder-Oaxaca decomposition might overstate the degree of
discrimination in the probability of stops when using a logistic model. (10%)

What would be an optimal policy intervention in the case of observed racial differences in traffic
stops? (10%)
Question 2

a. Draft a simple model of an individual who is subject to a progressive income tax and has the option of making charitable contributions. Use your model to show how the individual’s choice of how much to contribute to charity is affected by allowing a deduction from the income tax for charitable contributions. You may make simplifying assumptions, but be clear about your assumptions. You do not need to specify a functional form for the utility function.

b. Draw a graph showing how the charitable contributions deduction affects the amount of income an individual contributes to charity. Be sure to show the individual’s choice with and without the deduction on the same graph. In your illustration, what is the impact of the deduction on the individual’s contributions to charity? Explain.

c. The U.S. individual income tax includes an itemized deduction for charitable contributions. Assume a proposal is made to replace the U.S. charitable contribution itemized deduction with a tax credit. How does a deduction differ from a credit? What are the arguments in favor of converting the deduction into a credit? How would you expect the conversion to affect total charitable contributions?

d. What are the economic arguments for and against subsidizing charitable contributions through the income tax system? Cite any literature you think is relevant.
Question 3

The concept of the social rate of return (SROI) is popular now, as policymakers seek to identify effective public programs. Obviously, to calculate SROI, data would need to be available on both program benefits and program costs.

1. How would the calculation of the social rate of return on investment differ from the calculation of the private rate of return for the individuals who directly participate in the program? To answer this, think about a program that offers high-quality preschool services to children in low-income families. Provide some clear examples of the types of benefit calculations that are relevant to the case of early childhood education.

2. Some policymakers use SROI interchangeably with cost benefit analysis (CBA) to refer to the calculation of the total benefits and costs of a program, while others use SROI to refer to an actual rate of return on investment, like the internal rate of return (IRR). In general, how does one calculate the IRR, and how does it differ from CBA?

3. Consider the following example of costs and benefits that occur in different time periods. Imagine that the costs of preschool education for one year at age 4 are $10,000. Some early benefits are realized at age 5 and 6 as some children who participated in preschool are less likely to require special education services. Assume that those benefits (which are the reduction in the probability of needing special education times the costs of special education services) are $2,000 at age 5 and $2,000 at age 6. Assume that there appear to be no other benefits during the grade school years.

   a. Calculate the present value of the benefits and costs and compute the benefit-cost ratio for preschool education using a discount rate of 3.5%. Show your work.

   b. Calculate the internal rate of return for this example. In empirical applications, the practical method of solving for the IRR involves starting with some educated guesses in an attempt to identify the relevant interest rate within a narrow range. Given time limitations, your answer does not need to be exact.

   c. Using only this information on the short-term benefits of early education, does this look like an efficient use of public resources? Discuss.
d. Many of the benefits of early childhood education do not appear until the teenage years. Assume that an important benefit is the increased lifetime earnings associated with increased probability of graduating from high school as a result of a good preschool education. Show (but do not calculate) how the present value of the stream of lifetime earnings could be incorporated into your initial calculation of the benefits and costs.

e. Some of the new behavioral economics research challenges the assumption of a constant discount rate for benefits or costs that occur over long periods of time. Discuss how the assumption of the constant 3.5% discount rate might be different for researchers who are familiar with any of this new research.
Federal transit rules require that state and local agencies that receive funding for certain transportation projects maintain goals to include disadvantaged business enterprises (DBEs) in their overall expenditure plans. The DBE goals are intended to rectify past or continuing disparities that have occurred in public procurement and contracting between white male-owned firms and women or minority-owned business enterprises. Some critics of DBE programs argue that DBE goals amount to discrimination against non-DBEs (NBEs). Many jurisdictions around the nation have sought to address this criticism and have implemented “Emerging Small Business Enterprise” (ESBE) programs as race-neutral alternatives to typical DBE programs.

DBEs are certified if they do not exceed certain size, tenure, and net worth ceiling, and if the majority owners are women, members of racial minority groups, or persons who can establish social disadvantage. The DBE program establishes an overall goal of a percentage of contract dollars that will be allocated to DBEs out of all contract and procurement dollars expended by the state or local agency or authority that is receiving the federal transit funds.

An ESBE is understood to be a firm that meets the same size, tenure, and net worth standards established for the certification of DBEs, but it 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.

For a given jurisdiction (and recipient of federal funding), analysts estimated the following model for prime contractors for a period before and after the implementation of the ESBE program.

**Equation 1**

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

where DBE is a dummy variable that indicates 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. Coefficients to be estimated are \(\beta\) and \(\gamma\); error term is \(\mu\). The model was estimated for all firms and also for DBEs and non-DBEs (NBEs) separately:

**Equation 2**

\[
\ln Y^{DBE} = \sum \beta_i^{DBE} x_i^{DBE} + \mu
\]
Equation 3
\[ \ln Y^{NBE} = \sum \beta_i^{NBE} x_i^{NBE} + \mu \]

The model was also estimated separately before and after the implementation of the ESBE program, where \( t \) denotes before and \( t+1 \) denotes after implementation of the ESBE program:

Equation 4
\[ \ln Y_t = \sum \beta_i x_i + \gamma_t \cdot DBE_i + \mu_t \]

Equation 5
\[ \ln Y_{t+1} = \sum \beta_i x_{i,t+1} + \gamma_{t+1} \cdot DBE_{t+1} + \mu_{t+1} \]

Equation 6
\[ \ln Y_t^{DBE} = \sum \beta_i^{DBE} x_i^{DBE} + \mu_t \]

Equation 7
\[ \ln Y_t^{NBE} = \sum \beta_i^{NBE} x_i^{NBE} + \mu_t \]

Equation 8
\[ \ln Y_{t+1}^{DBE} = \sum \beta_i^{DBE} x_{i,t+1}^{DBE} + \mu_{t+1} \]

Equation 9
\[ \ln Y_{t+1}^{NBE} = \sum \beta_i^{NBE} x_{i,t+1}^{NBE} + \mu_{t+1} \]

Estimating equations 1-9, analysts found strong support for the following hypotheses:
\[ \hat{\gamma}_t = \hat{\gamma}_t \leq 0; \]
\[ \hat{\beta}_{i,t}^{NBE} = \hat{\beta}_i^{DBE}, \quad \forall i; \]
\[ \hat{\beta}_{i,t+1}^{NBE} = \hat{\beta}_{i,t+1}^{DBE}, \quad \forall i; \]

1. Across all of the years measured, is there evidence that non-DBEs experienced discrimination? (10%)
2. Was there discrimination against non-DBEs prior to the implementation of the ESBE program? If so, did the program eliminate (or reduce) this discrimination? (10%)

3. Was there discrimination against DBEs prior to the implementation of the ESBE program? If so, did the program eliminate (or reduce) this discrimination? (10%)

Analysts also estimated the following models that measure the impacts of an ESBE goal on DBE contract dollars awarded and measure the impacts of an ESBE goal on total contract dollars awarded during the period after the implementation of the ESBE program.

**Equation 10**

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

**Equation 11**

\[
\ln Y = \sum \alpha_i z_i + \theta \cdot ESBE + \nu
\]

Z denotes a vector of the firm’s and the contract’s characteristics; ESBE is the percentage goal on a given contract and ranges from 0 to 100%. \( Y \) is contract dollars awarded and \( \alpha \) and \( \theta \) are coefficients to be estimated; error term is \( \nu \).

An ESBE goal of greater than zero means that a share of dollars (equal to the goal) has been set aside for which only ESBE-eligible firms may bid.

Analysts estimated equations 10 and 11 and obtained the following statistically significant results:

\[ \hat{\phi} > \hat{\phi}_{DBE} > 0 \]

4. From the information provided, can you tell whether ESBE goals benefit DBEs relative to other firms? If not, what additional information would be needed? (20%)

5. Discuss how one might evaluate the effectiveness of the ESBE program. (20%)

6. Discuss how one might measure the benefits and costs associated with the implementation of the ESBE program. (30%)
Question 5

Note: The share of total points for each part of this question is given in parentheses.

What is quasi-experimental design? How does it differ from classical randomized experiments? What are the advantages and disadvantages of quasi-experimental designs over classical randomized experiments? (20%)

What is regression discontinuity design and how does it differ from propensity score matching methods? Discuss some of the methods for implementing propensity score matching and regression discontinuity designs. (20%)

How does nearest neighbor matching differ from Heckman’s differences-in-differences matching? Discuss the Howard Bloom critique of propensity scores. (20%)

Consider the following interrupted time series problem:

The outcome variable, \( Y \), is observed over many quarters (or months or days). A single policy intervention date, \( T \), (implementation) is observed.

\[
Y_i = \alpha_0 + \alpha_1 X_i + \alpha_3 (T = 1) + \epsilon_i
\]

Discuss how one might test for the change in the outcome variable on or after the date of implementation. (20%)

Provide an illustration from the literature on the passage of the Civil Rights Act of 1964 on why the above specification may be flawed. (20%)
Question 6

Some suggest that state and local governments in the United States could reduce their costs of delivering services by re-organizing. They specifically note that substantial cost savings might be obtained by consolidating smaller local governments, particularly those serving areas which are relatively sparsely populated, and realizing savings from size economies. Evaluate that argument from an economist’s perspective. Your answer should include a discussion of the following points.

1) What is the output to be measured? Discuss the problems with obtaining a measure of the output of local government. Can we assume that expenditures on a particular service reflect the quality of the service or the value society places on that service?

2) How can the inefficiency caused by market failures be minimized through the choice of the size of the geographic service area over which local services are supplied? Since local governments typically provide more than one service, what does this mean about the size of the service area over which goods are provided?

3) Discuss the alternative measures of cost to be considered in the analysis. How would economic costs differ from the amount indicated on a budget document? What difference would using a more inclusive cost measure have on the appropriate geographic size of the unit providing the service?

4) In a market economy private sector firms allocate inputs and choose their scale of operation to maximize profits. What would economists consider to be the appropriate objective function for use in determining local government service levels? How does this differ from the objective function of the elected public sector policy maker? Whose utility would the elected policy maker maximize by his/her choice of service level and taxes? Is the objective function of the elected policy maker necessarily the same as the bureaucrat who is managing the service delivery system?

4) Size economies typically are an issue when one is concerned about intra-jurisdictional efficiency, or setting the boundaries for delivery of a predetermined level of services at minimum cost. Economists are also concerned about inter-jurisdictional efficiency, or the optimal distribution of services across jurisdictions when tastes are allowed to differ and...
when migration among communities is possible. Briefly discuss how the Tiebout model arrives at a more efficient *inter-jurisdictional* distribution of local public goods. Compare the size of governments indicated by the Tiebout model with those resulting from studies which focus on *intra-jurisdictional* efficiencies.