Written Preliminary PhD Examination

Department of Applied Economics

January 2012

Policy Analysis

Instructions

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

According to Heckman’s (1998) interpretation of the Becker Model

“The impact of market discrimination is not determined by the most discriminatory participants in the market, or even by the average level of discrimination among firms, but rather by the level of discrimination at the firms where ethnic minorities or women actually end up buying, working and borrowing. It is at the margin that economic values are set.”

a) What does this interpretation suggest for the ability of conventional econometric methods to correctly measure discrimination?

b) Write out a simple model of discrimination by general contractors against women and minority-owned subcontractors, providing appropriate assumptions needed to compute measures of one or more conventional notions of discrimination. Compare and contrast the resulting measures of discrimination when computed for i) “the most discriminatory participants in the market,” ii) the average among all general contractors; and iii) only those general contractors that actually subcontract with women or minority firms. How does the Heckman concept of discrimination at the margin affect the design of an effective intervention or remedy?

c) Persico and Todd (2001) develop a test to detect discrimination in motor vehicle searches: It compares the probabilities that various subgroups of the population are found guilty of carrying contraband when searched. Absent discrimination, both races should have the same probability of carrying drugs, but one race may be searched more often than another. Explain this result in light of the “marginal analysis” proposed by Heckman.
**Question 2**

Numerous innovative strategies have been offered for reducing racial gaps in test scores. Some of these innovations or interventions are informed by results such as those found in Fryer and Levitt, “Understanding the Black-White Test Score Gap in the First Two Years of School,” *The Review of Economics and Statistics*, May 2004, 86(2): 447–464. One innovation is earlier admission to kindergarten for talented students and/or for all students via alterations in existing cut-off dates for persons with summer/fall birthdates.

Table 2 (attached) from the Fryer-Levitt paper reports results of the estimation of an equation where the dependent variable is a normalized score on mathematics and reading examinations. The coefficients on the race variables denote the racial gaps in test scores relative to non-Hispanic whites. Various specifications are considered for both the estimation of the mathematics score and the estimation of the reading scores. Columns 4 and 9 control for such factors gender, age, birth weight, mother’s age at time of birth, and WIC participation in addition to socio-economic status and numbers of books in the home (which the authors state measures home environment). Columns 5 and 10 present still another specification. The key differences between columns 4 and 5 for mathematics and columns 9 and 10 for reading arise from the inclusion of more than 98 other covariates in the specifications reported in columns 5 and 10 as compared to columns 4 and 9. These additional covariates capture: city size, neighborhood characteristics, region of the country, parental education, parental income, parental occupational status, family size and structure, whether the mother worked, type of preschool program participation, whether English is spoken at home, and the extent of parental involvement in a child’s life and school.¹

a) Carefully review Table 2 and discuss what can and what cannot be inferred about the prospects of improving mathematics and reading test scores by early admission of students into kindergarten. In particular, does inclusion of neighborhood characteristics, preschool program participation, parental involvement, parent’s occupation or other variables not included in Columns 4 and 9 alter conclusions about early kindergarten admission? What, if anything, can be concluded about the impacts of early kindergarten admission on racial gaps in test scores?

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¹**The full text of the footnote to Table 2 reads:** NOTES: The dependent variable is the math or reading test score in the fall of kindergarten. Test scores are IRT scores, normalized to have a mean of 0 and a standard deviation of 1 in the full, unweighted sample. Non-Hispanic whites are the omitted race category, so all of the race coefficients are gaps relative to that group. The unit of observation is a student. Standard errors in parentheses. Estimation is done using weighted least squares, using sample weights provided in the data set. In addition to the variables included in the table, indicator variables for students with missing values on each covariate are also included in the regressions. In addition, columns 5 and 10 report only a subset of the coefficients from regressions with 98 covariates included in the specification. The full results for columns 5 and 10 are reported in appendix table A1. Note that the specifications in columns 5 and 10 include age and age squared; that is why the coefficient on age changes so dramatically relative to other columns in the table.
b) Discuss the potential weaknesses in using the results reported in Table 2 for addressing the question of whether early kindergarten admission can improve test scores and/or reduce racial gaps in tests scores.

c) Define propensity score matching. What is Heckman Difference-in-Differences matching? Detail the strengths and weaknesses of using nearest neighbor propensity score matching vs Heckman’s differences-in-differences matching to address the problem that the data are not drawn from a randomized experiment.

d) Discuss the nature of selection that might be involved in early admissions. Detail how one might control for selection effects when measuring the impacts of early admission on test scores and distinguish between Instrumental Variables (IV) and Heckman Selection Correction methods for controlling for such selection.
### Table 2—The Estimated Black-White Test Score Gap in Fall of Kindergarten

<table>
<thead>
<tr>
<th>Variables</th>
<th>Math</th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>-0.638</td>
<td>-0.368</td>
<td>-0.238</td>
<td>-0.094</td>
<td>-0.102</td>
<td>-0.401</td>
<td>-0.134</td>
<td>-0.006</td>
<td>0.117</td>
<td>0.093</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.722</td>
<td>-0.429</td>
<td>-0.302</td>
<td>-0.203</td>
<td>-0.171</td>
<td>-0.427</td>
<td>-0.223</td>
<td>-0.137</td>
<td>-0.064</td>
<td>-0.076</td>
</tr>
<tr>
<td>Asian</td>
<td>0.150</td>
<td>0.070</td>
<td>0.190</td>
<td>0.265</td>
<td>0.274</td>
<td>0.335</td>
<td>0.256</td>
<td>0.371</td>
<td>0.409</td>
<td>0.375</td>
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<tr>
<td>Other race</td>
<td>-0.503</td>
<td>-0.329</td>
<td>-0.253</td>
<td>-0.158</td>
<td>-0.113</td>
<td>-0.401</td>
<td>-0.230</td>
<td>-0.155</td>
<td>-0.072</td>
<td>-0.014</td>
</tr>
<tr>
<td>Socioeconomic status composite measure</td>
<td>0.041</td>
<td>0.037</td>
<td>0.036</td>
<td>0.035</td>
<td>0.035</td>
<td>0.044</td>
<td>0.040</td>
<td>0.040</td>
<td>0.038</td>
<td>0.039</td>
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<tr>
<td>Number of children’s books</td>
<td>—</td>
<td>0.014</td>
<td>0.014</td>
<td>0.014</td>
<td>0.024</td>
<td>—</td>
<td>0.014</td>
<td>0.015</td>
<td>0.015</td>
<td>0.023</td>
</tr>
<tr>
<td>(Number of children’s books)$^2$ ($\times 1000$)</td>
<td>—</td>
<td>—</td>
<td>0.001</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Female</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>(0.015)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>(0.017)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Age at kindergarten fall (in months)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Birth weight (ounces) ($\times 10$)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Teenage mother at time of first birth</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Mother at least 30 at time of first birth</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>WIC participant</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>—</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.108</td>
<td>0.223</td>
<td>0.239</td>
<td>0.317</td>
<td>0.354</td>
<td>0.045</td>
<td>0.16</td>
<td>0.175</td>
<td>0.233</td>
<td>0.279</td>
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</table>

**Number of observations**

<table>
<thead>
<tr>
<th></th>
<th>Math</th>
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<th></th>
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<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Notes:** The dependent variable is the math or reading test score in the fall of kindergarten. Test scores are IRT scores, normalized to have a mean of 0 and a standard deviation of 1 in the full, unweighted sample. Non-Hispanic whites are the omitted race category, so all of the race coefficients are gaps relative to that group. The unit of observation is a student. Standard errors in parentheses. Estimation is done using weighted least squares, using sample weights provided in the dataset. In addition to the variables included in the table, indicator variables for students with missing values on each covariate are also included in the regressions. In addition, columns 5 and 10 report only a subset of the coefficients from regressions with 98 covariates included in the specification. The full results for columns 5 and 10 are reported in appendix table A1. Note that the specifications in columns 5 and 10 include age and age squared; that is why the coefficient on age changes so dramatically relative to other columns in the table.
Question 3

Europe’s sovereign debt problems are a serious concern for the global economy. In simplest terms levels of public sector debt in several countries have reached levels such that without intervention by other Eurozone governments it appears likely that there will be a default on the bonds issued and backed by the full faith and credit of at least one nation.

Discuss the economic principles that policy makers in other Eurozone countries should follow in deciding whether to financially assist countries faced with defaulting on their government issued bonds. You are not expected to be familiar with the details of the financial situation in the countries undergoing financial stress or the mechanisms through which financial assistance might be provided. Just focus on the economic principles involved. Structure your answer as follows:

a) Begin by discussing the decision rule that a private bank would use to evaluate whether to purchase sovereign credits (government bonds). In normal times in a market economy with a private financial sector should national governments purchase sovereign credit issued by neighboring countries? Why or why not?

b) Given that private sector banks already hold some credits and that the probability of default on those credits has increased substantially, under what conditions will a private bank sell the credit? If the financially stressed country must issue additional debt to avoid default, under what conditions would a private sector bank purchase additional sovereign debt issued by the distressed country. Does it make a difference whether the private bank is in the country issuing the debt or in a neighboring country?

c) Are there conditions under which it is economically efficient for governments in neighboring countries to intervene and purchase additional sovereign debt from the distressed nation when private bankers would not do so? Describe those conditions. Is there a limit to the amount of new sovereign debt that a neighboring country would purchase? What determines that limit? Would you expect close neighbors to purchase more or fewer of the new bonds than a country located some distance from the Eurozone?

d) Explain the concept of moral hazard. How should decisions by government policy makers on the purchase of distressed sovereign credits be affected by this concern? How will private bank investment decisions be affected by any moral hazard created by intervention by neighboring countries in the sovereign credit market?
Question 4

a) Compare, contrast and evaluate the use of audits and field experiments vs. Blinder-Oaxaca type analysis of outcome data in measuring and detecting discrimination. Distinguish, in your answer, between attempts to measure market discrimination (e.g. rental housing, employment, or lending) vs nonmarket discrimination (child maltreatment reporting, traffic stops, or school suspensions).

b) Provide a formal representation of the pathways to racial/ethnic disparities in child protective services (CPS). Distinguish between disparities in outcomes and disproportionalities in outcomes and discuss how or whether the methods for measuring and detecting disparities and disproportionalities differ along the pathways. Detail some of the biases that arise when measuring disparities vs disproportionalities along these pathways. To what extent do these potential biases affect measures of discrimination?
Question 5

In his current campaign for the Republican nomination for the U.S. presidency, former Congressman Newt Gingrich has proposed a number of changes to the United States income tax system. The following description of the Gingrich proposal is excerpted from taxpolicycenter.org.

Mr. Gingrich’s individual “flat tax” proposal would create an optional alternative tax system with a single 15 percent tax rate, which would apply to an income base similar to that in current law, with three major modifications: 1) capital gains, dividends, and interest income would not be taxable; 2) taxpayers could claim a standard exemption of $12,000 for each individual and dependent; and 3) the plan would eliminate the standard deduction and most itemized deductions and credits but would retain deductions for mortgage interest and charitable contributions as well as the child and earned income tax credits. The plan would also repeal the alternative minimum tax (AMT). The plan is unclear about whether taxpayers could switch back and forth between the current tax system and the alternative “flat tax” system.

At the corporate level, the Gingrich plan would make two major changes: 1) reduce the corporate income tax rate from 35 to 12.5 percent; and 2) allow full expensing of capital expenditures. The plan would not broaden the corporate tax base by eliminating existing tax expenditures or reducing the tax deductibility of interest payments.

a) If the Gingrich plan were implemented, what would you expect to be the effect on tax revenues? Why? How would specific elements of the plan contribute to the revenue effect that you predict?

b) If the Gingrich plan were implemented, what would you expect to be the effect on the distribution of the tax burden? Why? How would specific elements of the plan contribute to the distributional effect that you predict?

c) What are the key differences between a comprehensive income tax and a consumption tax?

d) If implemented, would the Gingrich plan make the U.S. tax system more like a consumption tax, more like a comprehensive income tax, or no more similar to either system? Explain. How do specific elements of the plan contribute to your answer?

e) Write the Hall-Jorgenson formula for the user cost of capital for a U.S. corporation. Define the variables in your formula, assume there is no investment tax credit, use either discrete or continuous time, and assume the corporation pays all profits as dividends to individual shareholders.

f) How would the changes to the individual and corporation income taxes in the Gingrich plan affect the cost of capital you defined in e? Which variables in the formula change, how do they change, and how is the magnitude of the cost of capital affected?

g) Consider the change in the cost of capital you describe in f. According to the Hall-Jorgenson model, how will this change affect investment by corporations?
Question 6

The following series of questions involve cost-benefit analysis. As an expert, you are asked to assist Easton City in evaluating the benefits associated with building a larger runway at its airport. Currently most of the flights are short flights in smaller airplanes to and from nearby cities. The analysis is to be conducted from the standpoint of Easton City residents. In other words, only Easton City residents and the local government have standing in this cost-benefit analysis.

The larger runway would allow more long distance flights to land and depart. Figure A shows the existing (D0) and expected demand curves (D1) for departures by long-distance travelers from Easton City. The vertical axis depicts the departure fee that currently is zero but will be increased to $10 to finance the runway expansion. The expanded runway is expected to cause a parallel shift of 10,000 in the demand for departures due to the enhanced convenience of long-distance travel from this airport. Assume that there are currently 50,000 departures a year. Also assume that the construction will cost $20 million in year 0 (with no other costs) and the expanded runway will be available in year 1.

![Figure A](image)

a) Using the information in the graph, derive the original demand curve where quantity is a function of the departure fee p.

b) Derive the new demand curve and the expected number of departures.

c) Calculate the change in consumer surplus. How should this be taken into account in a cost-benefit analysis? Assuming the benefits or costs are to be estimated for an infinite number of years, what is the present value of this amount if the discount rate is 5%? (Hint, the PV of a $1 to be received in perpetuity discounted at rate r is approximated by 1/r.)
d) With a larger runway, residents of Easton City who want to fly longer distances will now spend less time driving to the larger airport several hours away. Should this time savings be added to the benefits calculated in part C above? Explain.

e) The runway upgrade will increase the number of foreign tourists who can fly directly into Easton City. Assume an analyst has estimated the consumer surplus enjoyed by the foreign tourists and finds it to be $5 million per year. How should this consumer surplus be treated in your cost-benefit analysis?

f) Approximately 300 homes near the airport will experience an increase in noise exposure as a consequence of the runway expansion. The average price of these homes is currently $500,000. Estimates suggest that the increased noise will reduce the value of these homes by 10%. How should this house price effect be treated in the CBA? What is the present value of this amount evaluated in year 0 if the price falls in year 1 and the discount rate is 5%?

g) In general, why do cost-benefit experts recommend reporting the present value of the net benefit rather than the benefit-cost ratio?