

AREC 345: Global Poverty and Economic Development

Problem Set 8

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Problem Set 8 is due at the start of section on December 2. Problem sets turned in more than 5 minutes after the start of section will be marked as late. All problem sets must be turned in as hard copies; points will be deducted if multiple pages are not stapled together.

You are helping the Ministry of Education evaluate the effectiveness of a program to distribute textbooks to students in Grade 4. A pilot program has distributed free textbooks to Grade 4 students in a school in a rural area, and you have test score data for students in that school and a neighboring school. For each child that is now in the 4th grade in either school, you have data on their test performance at the end of both their 3rd and 4th grade years. Data on students' test scores from the pilot (i.e. treatment) school and the nearby (i.e. comparison) school is contained in the spreadsheet `arec345ps8data.xlsx`. The data set contains the following variables:

- `id`: a unique ID number for each student (constant across grades)
- `pilotschool`: a dummy variable for equal to one for students enrolled in the pilot school
- `grade`: student grade level (either 3 or 4 for the observations in this data set)
- `score`: the test score (i.e. the outcome of interest)

Use the data set to answer the following questions.

1. Calculate the naive cross-sectional (or treatment vs. comparison) estimate of the program's impact by regressing the test score variable on the `pilotschool` variable using data from the year in which the program took place (4th grade). Paste your Excel results into your write-up of the answers. How large is the estimated impact of the program? Is the estimated impact statistically significant?
2. The treatment vs. comparison estimator is, of course, only valid if the treatment school and the comparison school looked similar prior to the intervention; evidence that students in the treatment school were performing better (or worse) prior to the program (i.e. in 3rd grade) suggests that selection bias is a problem. Estimate the magnitude of selection bias by regressing the test score variable on the `pilotschool` variable using data from the year prior to the program (3rd grade). Paste your Excel results into your write-up of the answers. How large is the pre-treatment difference in test scores between the prior to the program? Is the estimated difference statistically significant? What do your results suggest about the estimate reported in Question 1?

3. Calculate the before vs. after (or pre vs. post) estimate of the program's impact on test scores in the pilot school by regressing the test score variable on an indicator for being in 4th grade (you will need to generate this variable) using data from the pilot school. Paste your Excel results into your write-up of the answers. How large is the estimated impact of the program? Is the estimated impact statistically significant?
4. The pre vs. post estimator assumes that there is no time trend in the absence of the program. This may not make sense in this setting if children are learning in school — students might do better on a standardized test administered in 4th grade (relative to 3rd grade) in the absence of the program. Test whether this is the case by regressing the test score on an indicator for being in 4th grade using data from the neighboring school. Paste your Excel results into your write-up of the answers. How large is the estimated time trend? Is the estimated time trend statistically significant? What does this suggest about your answer to Question 3?
5. Calculate the difference-in-difference estimator of the program's impact by regressing the test score on three variables (in a multivariate regression framework): the `pilotschool` variable, the indicator for being in 4th grade, and an interaction between the two (you will need to generate this variable). Paste your Excel results into your write-up of the answers. How large is the estimated impact of the program? Is the estimated impact statistically significant? How does the difference-in-difference estimate of the impact compare to the two false counterfactual estimates?