ECON 1291: Development Economics

Problem Set 5 Suggested Solutions

Department of Economics
Northeastern University
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1. Estimate the naive cross-sectional estimate (i.e. the participant vs. non-participant estimate) of the impact of textbooks on academic test scores by (a) calculating the average test score for students with a textbook, (b) calculating the average test score for students without a textbook, and (c) calculating the difference in average test scores between those with a textbook and those without textbook.

   Answer:

   (a) *Average test score among students with a textbook:* 73.45

   (b) *Average test score among students without a textbook:* 52.68

   (c) *Difference:* $73.45 - 52.68 = 20.77$

2. Now calculate the naive cross-sectional estimate of the impact of textbooks on academic test scores by using the `LINEST` command to regress test score on the indicator for owning a textbook. **Paste** your Excel output into your answers and discuss your results. Make sure that the estimates reported in Questions 1 and 2 are equal.

Dep. Var. = Score	
Specification:	**OLS**
	(1)
Textbook	20.76***
	(1.55)
Constant	52.68***
	(1.30)

Standard errors in parenhteses.

3. Are children from wealthy households and poor households equally likely to own textbooks? Report the fraction of children in wealthy households who own textbooks, and compare this to the proportion of children in poor households who own textbooks.

Answer: children from wealthy households are 50 percentage points more likely to own a textbook than children from non-wealthy households; 100 percent of children from wealthy households own textbooks, versus only 50 percent of children from poor households.

Dep. Var. = Textbook

Specification:	**OLS**
	(1)
Wealth	0.50***
	(0.06)
Constant	0.50***
	(0.04)

Standard errors in parenhteses.

4. By now, you should be concerned about selection bias. Assess whether selection bias is likely to be driving your results in Questions 1 and 2 by estimating a multivariate regression of test scores on both textbook ownership and the indicator for being part of a wealthy household. **Paste** your Excel (`LINEST`) output into your answers. How does this estimate of the impact of textbooks compare to those reported in Questions 1 and 2?

Answer: the estimated impact of owning a textbook is still positive and significant after controlling for household wealth, but it is substantially smaller — these estimates suggest that owning a textbook increases scores by about 9 points (as opposed to 21 points). This suggests that selection bias was a problem in our early analysis: textbook ownership is confounded with wealth.

Dep. Var. = Score

Specification:	**OLS**
	(1)
Textbook	9.08***
	(0.98)
Wealth	20.45***
	(0.92)
Constant	52.68***
	(0.69)

Standard errors in parenhteses.

5. You learn that a textbook distribution program randomly assigned students to either a treatment group (`treatment` $= 1$) or a control group (`treatment` $= 0$). Estimate the impact of the program on textbook ownership by regressing the indicator for owning a textbook on the indicator for random assignment to the treatment group. **Paste** your Excel output into your answers. How much did the program impact the probability of owning a textbook?

   Answer: the program causes a 60 percentage point increase in textbook ownership; 40 percent of the control group owns textbooks, versus 100 percent of the treatment group.

   Dep. Var. = Textbook

Specification:	**OLS**
	(1)
Treatment	0.60***
	(0.05)
Constant	0.40***
	(0.03)

   Standard errors in parenhteses.

6. Now regress the test score outcome on the indicator for random assignment to the treatment group. **Paste** your Excel output into your answers. What is the estimated impact of the program on student test scores? Explain why your answer is different than your answer to question (4).

   Answer: the estimated impact of the program is that it increases test scores by an average of 5.48 points. This is consistent with the results reported in Question 4: there, we estimate that textbook ownership increases test scores by 9 points; the program increases the proportion of students with textbooks by 0.6 and 0.6*9 = 5.4.

   Dep. Var. = Score

Specification:	**OLS**
	(1)
Treatment	5.48***
	(1.92)
Constant	64.48***
	(1.36)

   Standard errors in parenhteses.