

Week 8 Quiz

CASA0006

Q1: Which of the following is true about correlation, causation and endogeneity? (acd)

- a) Correlation and causation are two related but distinct concepts in statistics and causal inference.
- b) A positive correlation between X and y means X causes y .
- c) Endogeneity occurs when the independent variable X is correlated with the error term e .
- d) Endogeneity can lead to biased estimates of the causal effect of the explanatory variable on the outcome variable.

Q2: What are the main sources of endogeneity? (abcd)

- a) Omitted variable
- b) Simultaneity
- c) Selection bias
- d) Measurement error

Endogeneity

1. Omitted Variables

- The relationship between X and Y is mediated by an unobserved variable Z.
- E.g. i run a regression between the percent of a district that is forest and the total number of crimes in a year. Massive negative effect. Do trees reduce crime?

2. Simultaneity

- X causes Y, but Y also causes X. In its most extreme form, we might worry about *reverse causality*.
- e.g., If I run a panel regression across countries where x=poverty and y=conflict incidence, I'll probably see a correlation. But does poverty cause war, or does war cause poverty, or both?

3. Selection Bias

- The sample is not representative of the wider population.
 - E.g. conducting phone interviews for political polling will probably overestimate conservative support because old people use landlines and tend to vote conservative.
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Measurement error [\[edit \]](#)

Suppose that a perfect measure of an independent variable is impossible. That is, instead of observing x_i^* , what is actually observed is $x_i = x_i^* + \nu_i$ where ν_i is the measurement error or "noise". In this case, a model given by

$$y_i = \alpha + \beta x_i^* + \varepsilon_i$$

can be written in terms of observables and error terms as

$$y_i = \alpha + \beta(x_i - \nu_i) + \varepsilon_i$$

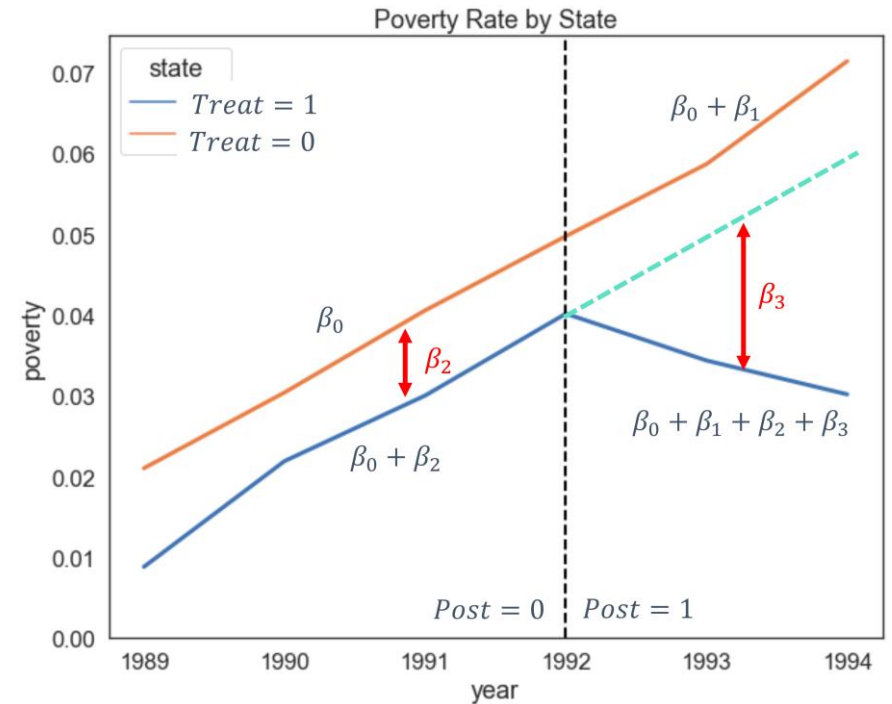
$$y_i = \alpha + \beta x_i + (\varepsilon_i - \beta \nu_i)$$

$$y_i = \alpha + \beta x_i + u_i \quad (\text{where } u_i = \varepsilon_i - \beta \nu_i)$$

Since both x_i and u_i depend on ν_i , they are correlated, so the OLS estimation of β will be biased downward.

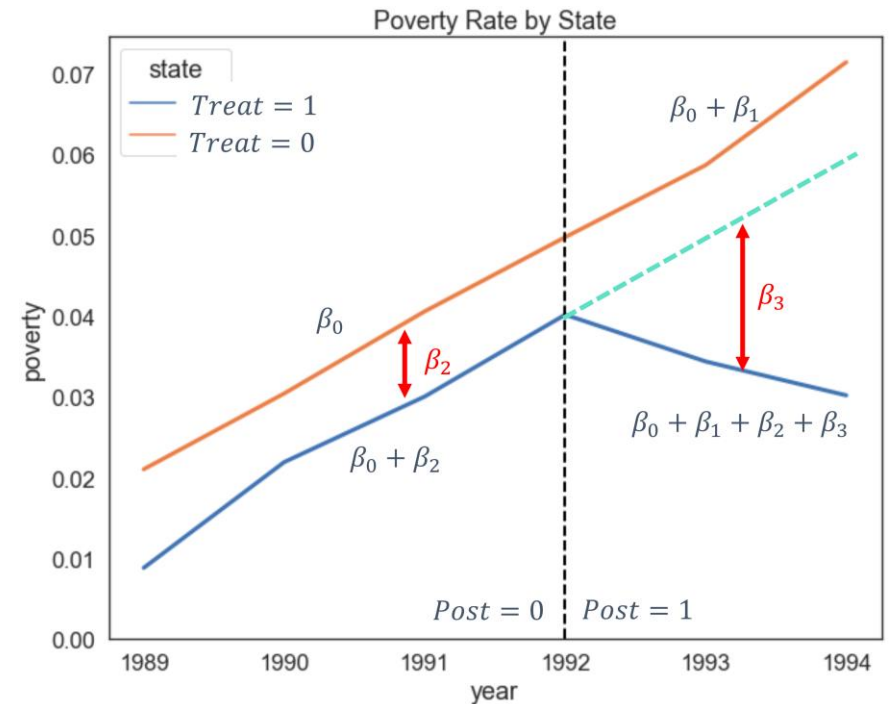
Q3: What is the main assumption behind difference in differences? (c)

- a) The treatment group and control group have identical characteristics
- b) The treatment group and control group have different characteristics
- c) The treatment group and control group have identical trends in the outcome variable in the absence of the policy or treatment
- d) The treatment group and control group have different trends in the outcome variable in the absence of the policy or treatment



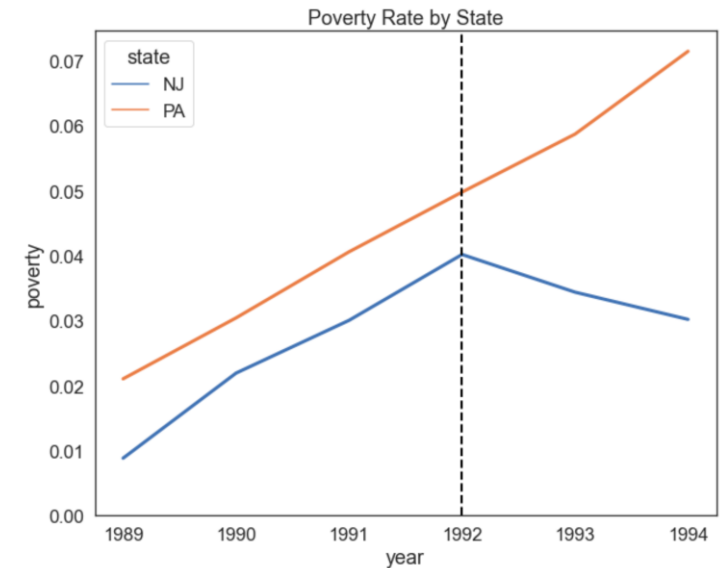
Q4: What does difference in differences require? (abcd)

- a) A treatment located at a point in time
- b) Two distinct groups for which we have measurement pre- and post-treatment
- c) Parallel pre-treatment trends in the outcome variable y
- d) No simultaneous treatment occurring around our treatment of interest



Q5: How can we assess parallel trends? (abcd)

- a) Visual assessment
- b) Perform a placebo test using a fake treatment group. The fake treatment group should be a group that was not affected by the program. A placebo test that reveals zero impact supports the equal-trend assumption.
- c) Perform a placebo test using a fake outcome. A placebo test that reveals zero impact supports the equal-trend assumption.
- d) Perform the difference-in-differences estimation using different comparison groups. Similar estimates of the impact of program confirms the equal-trend assumption.



Case – The effect of additional tutoring for grade 7 students on their probability of attending school

Settings:

- You have the school attendance of students from grade 6, 7, and 8.
- Only grade 7 students have received additional tutoring at a certain time.
- You performed DiD using grade 7 as treatment group and grade 8 as comparison group.

Question:

How do you test the Validity of the “Equal Trends” Assumption?

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| a) Visual assessment. | Inspect the trends before treatment |
| b) Placebo test – fake treatment group | Perform diff in diffs using grade 6 as fake treatment group and grade 8 as comparison group. |
| c) Placebo test – fake outcome | Use another outcome that you know is not affected by tutoring. |
| d) Using different comparison groups | First do the estimation using grade 8 students as the comparison group, and then do a second estimation using grade 6 students as the comparison group |