Additional Assessment 2 Review Questions

Part 1: Political Movements

The following example is based on Madestam et al. (QJE, 2013).

The authors are interested in the effects of political protests on subsequent strength of political movements. They study whether attendance at Tea Party movement rallies on Tax Day in 2009 affected subsequent strength of the movement.

The authors have data on the following county-level measures:

- Rainfall on Tax Day
- Tea Party rally attendance
- Local movement strength following the rally, public support for Tea Party positions, Republican votes in midterm elections

$$\text{Strength}_i = \beta_0 + \beta_1 \text{Attendance}_i + u_i$$

1. Consider the regression above. If you estimated that regression via OLS would $\hat{\beta}_1$ give an unbiased estimate of the effect of attendance on subsequent movement strength? Why or why not?

Rally attendance is correlated with current movement strength which affects subsequent movement strength. Therefore attendance is correlated with the error term and OLS is biased.

2. The authors instrument for rainfall to estimate the effect of rally attendance on subsequent movement strength. What do the relevance, exogeneity, and monotonicity assumptions of IV mean in this context?

- ***Relevance:*** rainfall affects attendance
- ***Exogeneity:***
  - Rainfall on Tax Day did not impact Republican vote share directly.
  - Rainfall on Tax Day did not impact any other determinants of Republican vote share.
- ***Monotonicity:***
  - Rainfall only decreases rally attendance.

3. Suppose Tax Day 2009 was a beautiful rainless day in Cambridge, Massachusetts, and yet no one showed for the Tea Party rally. How would this affect the LATE? Assume the IV assumptions all hold.

It wouldn't! If monotonicity holds, attendance in Cambridge could only be lower or the same if it had instead rained. Therefore Cambridge isn't a complier (rainfall doesn't affect its rally attendence) and the LATE doesn't reflect the effect of rally attendance on movement strength in Cambridge.

4. What regressions could you run to estimate the effect of rally attendance on movement strength using rainfall as an instrumental variable?

There are two sets of regressions you could run. You could estimate the first stage regression of attendance on rainfall, and then estimate the second stage regression of movement strength on the predicted values from the first stage.

$$\text{Attendance}_i = \alpha_0 + \alpha_1 \text{Rainfall}_i + v_i \tag{1}$$

$$\text{Strength}_i = \beta_0 + \beta_1 \widehat{\text{Attendance}}_i + u_i \tag{2}$$

Alternatively, you could estimate the first stage regression and a reduced form regression of movement strength on rainfall.

$$\text{Attendance}_i = \alpha_0 + \alpha_1 \text{Rainfall}_i + v_i \tag{3}$$
$$\text{Strength}_i = \gamma_0 + \gamma_1 \text{Rainfall}_i + u_i \tag{4}$$

In this case, the ratio $\hat{\gamma}_1/\hat{\alpha}_1$ consistently estimates the effect of rainfall on attendance.

Part 2: Difference in Differences

You are studying the effect of local policy on the careers of young musicians in Massachusetts. Suppose Cambridge institutes a noise ordinance that bans music over a certain volume after 8pm in all but a few select venues. You obtain data from Cambridge and Somerville Public Schools on 12th graders before and after the ordinance went into effect. You estimate the following regression:

$$\text{Berklee}_{it} = \beta_0 + \beta_1 \text{Cambridge}_i + \beta_2 \text{Post}_t + \beta_3 \text{Cambridge}_i \times \text{Post}_t + u_{it}$$

- $Berklee_{it}$ equals 1 if student i who graduated from high school in year t attended Berklee College of Music and 0 otherwise.
- $Cambridge_i$ equals 1 if i lived in Cambridge and 0 otherwise.
- $Post_t$ equals 1 if graduation year t is after the ordinance and 0 otherwise.

1. Interpret each coefficient.

- β_0: Berklee attendance rate of students in Somerville before the Cambridge noise ordinance
- β_1: difference between Cambridge and Somerville in pre-ordinance attendance rates
- β_2: change in attendance rate in Somerville after the noise ordinance
- β_3: additional change in attendance rate in Cambridge after the noise ordinance

2. What assumption is necessary for a causal interpretation of β_3?

The parallel trends assumption must hold. In this context, that means that the change in the attendance rate in Cambridge would have been the same as the change in Somerville if the noise ordinance had not gone into effect.

3. Suppose that prior to the ordinance Somerville music students frequently use facilities in Cambridge that are affected by the ordinance. Does this affect the internal validity of difference-in-differences?

Yes! Parallel trends assumes that the trend in the untreated outcome for the treated group is the same as the trend for the control group. But Somerville students are somewhat affected by the treatment, so they are not an appropriate control group.

4. Suppose that the aliens from "A Quiet Place" touch down on Earth shortly after the noise ordinance goes into place. These murderous invaders have sharp hearing that they use to detect and hunt humans (like Jim from the Office). Does their arrival affect the internal validity of difference-in-differences?

Nope! As long as Cambridge would have followed the same trend as Somerville had the ordinance not gone into effect, internal validity is maintained. In this case, external validity is the main issue. While the noise ordinance may help to keep Cambridge residents safe, it's safe to say Berklee attendance will likely fall to zero.