

PA 397C Program Evaluation

Spring 2026

Denning

Name: _____

1 Multiple Choice- 3 points each

1. What is true if an experiment has a successful random assignment?
 - (a) In the absence of actual treatment (i.e. no treatment occurs), the expected outcomes of treatment and control groups will be the same
 - (b) Including control variables will reduce the bias of estimated treatment effects
 - (c) The experimental sample will have the same demographic characteristics as the national population
 - (d) all of the above
2. In the “Potential Outcomes Framework”, what does $E[Y_{i0}|D = 1] - E[Y_{i0}|D = 0]$ represent?
 - (a) The average population treatment effect (ATE)
 - (b) The treatment effect for individual i
 - (c) The difference in average outcomes between the treatment and control group
 - (d) Selection bias
3. Which of the following is likely to generate a violation of the Stable Unit Treatment Value Assumption (SUTVA) in an RCT?
 - (a) The treatment effects are not constant across all types of individuals
 - (b) Not all individuals are complying with their assigned treatment status
 - (c) There are many interactions between treated and untreated individuals
 - (d) All of the above

4. When can we be certain there *will be* omitted variable bias when we estimate the equation $Y_i = \beta_0 + \beta_1 D_i + \epsilon_i$?
- (a) treatment assignment is randomized
 - (b) a variable strongly correlated with the outcome is excluded from analysis
 - (c) a variable strongly correlated with the treatment is excluded from the analysis
 - (d) a variable strongly correlated with both the treatment and outcome is excluded from the analysis
 - (e) any of (b), (c), or (d)
5. In an instrumental variables design, you find that $Corr(D, Z) \neq 0$, where D is the treatment of interest and Z is the instrument. Which of the following is true if $Corr(D, Z) \neq 0$?
- (a) (a) This is bad. Using this instrument will introduce bias.
 - (b) (b) This could be bad. If $Corr(Y, Z) \neq 0$ as well, estimates using this instrument will be biased.
 - (c) (c) This is neither good nor bad. $Corr(D, Z)$ is not important for IV estimates.
 - (d) (d) This is good. $Corr(D, Z)$ is necessary for generating unbiased estimates using IV.

2 Short Answer- 3 points each

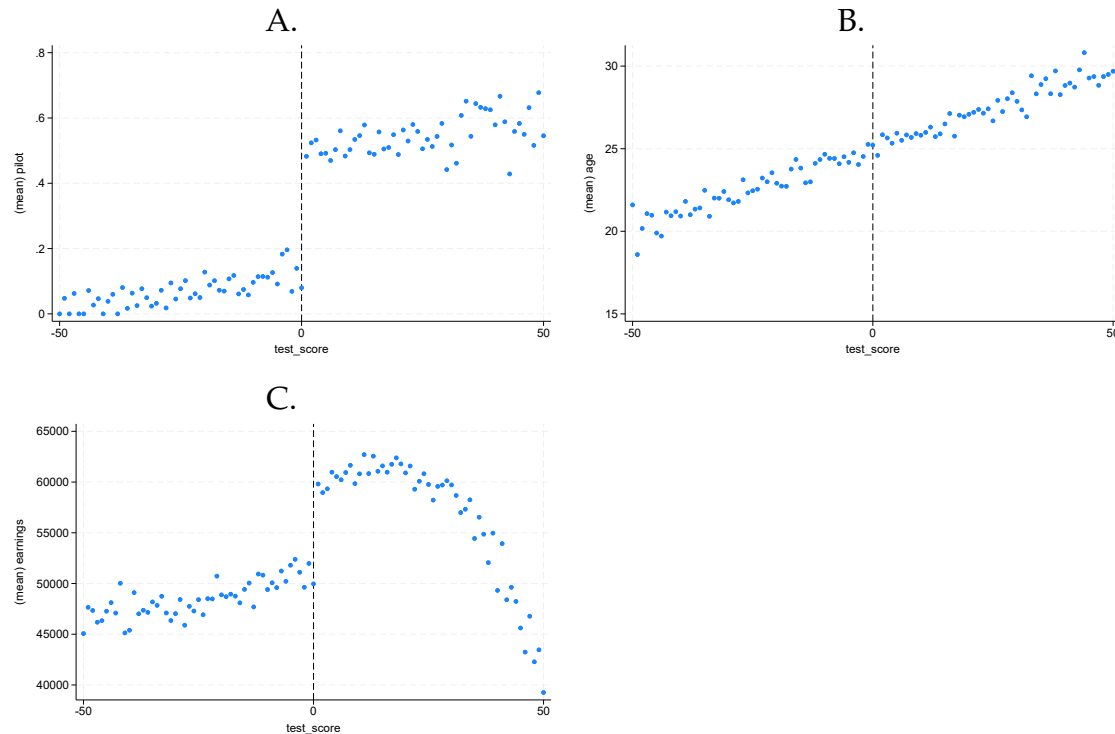
1. In Differences in Differences, can you have the parallel trends assumption satisfied if there are contemporaneous shocks to treated and/or control groups? Explain.

2. In a typical Differences in Differences do you need to worry about SUTVA? Explain.

3. What is statistical power? If you're running an RCT and are doing power calculations what are two ways that you can increase power?
4. If you regressed health on health insurance but did not control for income, would you likely recover the causal effect of health insurance on health. If yes, explain why. If no, explain the likely sign of the bias and why that is the likely sign.
5. You're interested in the effect of binary treatment D on Y . You have an instrument for D . If the fraction of your sample that is compliers is .25 and the reduced form effect is 2. What is the Wald estimate for the LATE?
6. Let's say you randomize people to receive a tutoring service but cannot force them to use the service and you're interested in test scores as your outcome. If you compare the students who decide to use the service to the control group, will you recover a causal effect? Explain.
7. Suppose you wanted to study the effect of college education on earnings, and you had data on twins. If you included twin fixed effects, what is that equivalent to matching on? What would the necessary assumption be? Outline a potential violation of this assumption.

3 Longer Question

Being a helicopter pilot is one of the most desired jobs in the Army. Eligibility for this position is determined by scores on the General Technical (GT) portion of the Armed Services Vocational Aptitude Battery (ASVAB) test scores. The ASVAB is taken as part of the application process for the Army. You want to use an RD design to estimate the effect of becoming a military pilot on earnings 10 years after applying to join the Army. You start your analysis by creating the following plots (you rescale the GT scores so that 0 is the cutoff score):



1. (8 Points) This question is about Plot A. This plot shows what fraction of applicants become pilots at each GT test score.

(a) What name do we give to Plot A

(b) Which of the assumptions for a valid fuzzy RD does this plot provide evidence for/against?

(c) You estimate the following equation using data from plot A:

$$D_i = \theta \cdot 1(R_i > Cutoff) + f(R_i) + \epsilon_i$$

What is the interpretation of θ and (approximately) what numeric value will θ be?

(d) Does your estimate of θ increase or decrease your confidence in the validity of this regression discontinuity design? Explain.

2. (8 Points) This question is about Plot B. This plot shows the average age at application at each GT test score.

(a) What name do we give for Plot B?

(b) Which of the testable implications for valid RD does this plot provide evidence for/against?

(c) You estimate the following equation using data from plot B:

$$X_i = \beta \cdot 1(R_i > Cutoff) + f(R_i) + \eta_i.$$

What does β represent and (approximately) what numeric value will β be?

(d) Does your estimate of β increase or decrease your confidence in the validity of this regression discontinuity design? Explain.

3. (8 Points) This question is about Plot C. This plot shows the average earnings of applicants 10 years after application at each GT test score.

(a) What name do we give for Plot C?

(b) In addition to Plot C, what other plot do you need to use to calculate the effect of becoming a pilot on earnings? Approximately what are the estimated effects of being a pilot?

(c) Assume that all RD identification assumptions are met. If you choose to make $f(R_i)$ linear ($f(R_i) = \delta R_i + \omega R_i \cdot AboveCut_i$), would a global bandwidth of (-50,50) give you an unbiased estimate? Explain why.

(d) In RD we estimate a local average treatment effect. In what two dimensions is this treatment effect “local”?

4 Hypothetical Questions- 3 points each:

1. Discuss the necessary assumptions for IV and a LATE interpretation for the following. An observation is a country, outcome is a measure of conflict. The endogenous variable is GDP, and the instrument is rainfall. The idea for this instrument is that rain increases GDP through increased agricultural productivity.
2. Let's say a school district starts requiring students to wear school uniforms starting on Feb 23 one school year. Assume you have data from several school districts on end of year test scores and absences by day. The data also include some districts where they did not implement school uniforms. What's a reasonable strategy to assess the impact on student, end of school test scores?
3. Every undergrad admitted to the university Texas is assigned a random number from 0 to 1 (e.g. .2734). People with a number below .6 are given the Jeff Denning scholarship. What are two ways to identify the effect of the Jeff Denning scholarship?