

Quantitative Economics

TUTORIAL 5A: APPLIED MICRO: RANDOMISED CONTROLLED TRIALS

1. The LATE (local average treatment effect) is given by the following ratio:

$$\frac{E[Y|Z = 1] - E[Y|Z = 0]}{E[D|Z = 1] - E[D|Z = 0]}$$

under four assumptions.

- (a) Define LATE in words, and explain the meaning of both the numerator and the denominator of this ratio.
 - (b) Which are the required assumptions that make this ratio become the LATE? Explain the meaning of each assumption and describe its role.
 - (c) What happens with the above ratio under *perfect compliance*? By the way, what do we mean by perfect compliance? Provide an example where perfect compliance is easy to achieve.
 - (d) Suppose that a policy maker is seriously concerned with the usefulness of LATE. What happens with the LATE if there are no *always-takers*? By the way, what do we mean by always-takers? Provide an example where it is easy to rule out (or almost rule out) always-takers.
2. The following table displays the main results of a randomised controlled trial of a 6-month job training program: *The 6-month Job Training Program*. Individuals were randomly offered the opportunity to participate into the program, and earnings were measured among all individuals, regardless of their participation status, 24 months *after* the end of the job training program.

Table 5.1: Regressions of ...		
	Dependent variable:	
	Participation	Earnings (GBP)
Being offered a job training program	0.63 (0.21)	1,218 (399)
Number of observations	2,133	2,133

Note: Each regression includes a constant term, not reported in the table. Standard error in parentheses.

Being offered a job training program = 1 if offered participation into the program, = 0 otherwise.

Participation = 1 if the individual accepted to participate into the program, = 0 otherwise.

- (a) What is the *intent-to-treat* (ITT) effect of the job training program? Construct a 95% confidence interval for such a treatment effect and interpret it.
- (b) Estimate the LATE. In which sense the ITT is a lower bound of the LATE? Explain.
- (c) How would you estimate the impact of the job training program among program participants? What are the required assumptions to estimate such a treatment effect? Do you think those are likely to hold in this type of program? Explain.

3. According to a sample of 1,100 children from the *Survey of Attainment in Literacy* 2015, the average test score at the age of seven of children whose parents regularly read them at home between the ages of 2 years and 4 years was 85 (out of 100); whilst for children whose parents did *not* regularly read them at home between the ages of 2 years and 4, the mean test score was 71.6 (out of 100). The Survey also records whether or not at least one of the respondent's parents went to university and graduated. The average test score at the age of seven of children whose parents regularly read them at home and did not have a college degree was 86; whilst for children whose parents regularly read them at home and did have a college degree was 84. Amongst children whose parents did not regularly read them at home and had a college degree, their average test score was 74, and those whose parents did not graduate scored (on average) 70. The number of children in the group of parents who did not regularly read them and have a college degree is 200. In each of the remaining groups the number of children is 300.
 - (a) Show how the comparison of the observed mean difference in test scores between the two groups may be additively decomposed into a causal effect and a selection effect.
 - (b) Calculate the Local Average Treatment Effect (LATE) using whether or not at least one of their parents went to university and graduated as your Z_i variable.
 - (c) Do you think parents' educational attainment satisfies the four assumptions required to identify the LATE? Explain.
4. An economist is interested in the average causal effect of a job training program on earnings, and managed to design an experiment which achieves perfect compliance: from a *random sample* of 500 workers, 196 were randomly assigned to the job training program (and accepted to participate into the program), and 304 were randomly assigned to be part of the control group (and accepted not to take part in any job training). The economist has information on individual characteristics, collected *before* the job training program begins: age (years), education (years), black (indicator), Hispanic (indicator), and married (indicator). The dataset is available on weblearn in the **Data5a** folder.
 - (a) Why is it important that the sample of workers is random? Explain.
 - (b) If you were to run just *one linear regression* to test that randomisation worked as intended, which regression would you run? Which test would you conduct? Explain fully the null and alternative hypotheses, test statistic, decision rule and conclusion. Run the regression and perform the test. What can you conclude? Explain.
 - (c) Run a regression to estimate the average causal effect of this job training program on earnings. Is the average causal effect statistically different than zero? Explain.
 - (d) Suppose that our economist decides to standardize earnings as follows:

$$\frac{Y_i - \bar{Y}_c}{s_{Y_c}}$$

where Y_i is earnings of individual i , \bar{Y}_c is the sample average of earnings in the control group, and s_{Y_c} is the sample standard deviation of earnings in the control group. Why would the researcher do that? Run a regression to estimate the average causal effect of this job training program on standardised earnings and interpret your findings.

- (e) What regression would you run to test that the average causal effect of the job training program is *different* between “junior” (< 25 years old) and “non-junior” (25 or more) individuals? Which test would you conduct? Explain fully the null and alternative hypothesis, test statistic, decision rule and conclusion. Run the regression and perform the test. What can you conclude? Explain.

5. Critically assess the role of randomised controlled trials (RCTs) in economic research. To what extent RCTs constitute a gold standard?