

Problem Set no 3 - Empirical Application

We will now put the theoretical concepts of Regression Discontinuity Design (RDD) and Difference-in-Differences (DiD) into practical application. This will involve replicating the results using these methodologies in two recent publications.

Exercise 1 – RDD: Asher and Novosad (2017) Politics and Local Economic Growth: Evidence from India

In this exercise, our goal is to replicate the key findings from the research article “Politics and Local Economic Growth: Evidence from India” by Asher and Novosad ([AEJ: Applied Economics, 2017](#)). This paper investigates whether political favoritism influences the allocation of public resources and its potential impact on local economic growth. To identify causal effects, the authors employ a Regression Discontinuity Design (RDD) based on closed elections, identifying constituencies where the ruling party narrowly won and comparing with those where they barely lost. Thus, the authors use the margin of victory as the forcing variable.

1. One of the assumptions for the validity of the RDD design is the absence of manipulation around the threshold. The authors run a McCrary test to reject discontinuity of the density around the threshold. Illustrate this visually by examining the forcing variable (*margin*). Are there any discontinuities around the threshold (0)? (*You can evaluate it visually by building a histogram*).
2. Make a scatter plot with the outcome variable being the *logarithm of employment growth* (y-axis) and the running variable *margin* (x-axis). Distinguish data points by treatment groups (*alignment with the ruling party*). Additionally, include linear adjustments for each treatment section ($\text{margin} > 0$ and $\text{margin} \leq 0$) (*Make sure to use method = lm for both lines*). Repeat the same procedure for the second outcome variable: *change in log average night light emissions over the five years following an election*. What can you conclude from these graphs?
3. Calculate the magnitudes of the effects through various methods: *Note: You need to calculate equation 3 in the paper. Only focus on the variables “aligned” “margin” “m_a”, we will include control variables in the next exercise.*

- (a) Use a linear approximation.
 - (b) Employ a third-order polynomial approximation.
 - (c) Apply a local linear regression with a bandwidth of 5.1 percent.
4. Building on the specification of point 3 (c), include the necessary controls to replicate the outcomes presented in Table 2 of the original study. Note that the authors use a non-parametric regression, while we are using a parametric linear regression. Therefore, we will obtain slightly different estimates. These are described in Table 2(adj):
- (a) Provide interpretations for the coefficients.
 - (b) Compare the estimates in Columns 1 and 3. What can you conclude about the RDD coefficient of Column 1.

Table 2(adj): Effect of Ruling Party Status on log Employment Growth

	Jobs: Local linear		Jobs: Polynomial		Lights: Local linear	
	(1)	(2)	(3)	(4)	(5)	(6)
Ruling Party	0.017 (0.005)	0.017 (0.005)	0.009 (0.004)	0.009 (0.004)	0.033 (0.013)	0.033 (0.013)
Margin of victory	-0.362 (0.104)	-0.304 (0.088)			-0.713 (0.364)	-0.820 (0.408)
Margin * Ruling	0.343 (0.160)	0.214 (0.156)			0.697 (0.570)	0.900 (0.585)
Baseline log empl.		-0.020 (0.004)		-0.019 (0.002)		-0.121 (0.023)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Const. Controls	No	Yes	No	Yes	No	No
Observations	768	742	3712	3521	2240	2240
R^2	0.17	0.26	0.15	0.24	0.48	0.59

Notes: This table replicates the findings from Table 2 of Asher and Novosad’s 2017 study, using a local linear approximation method instead of non-parametric estimation. All other relevant notes from the table apply.

Exercise 2 – DiD: Plous (2020) The Buck Stops Where? Federalism, Uncertainty, and Investment in the Brazilian Water and Sanitation Sector

Now we will focus on a recent paper that uses difference-in-differences to study water provision in Brazil. The study titled “The Buck Stops Where? Federalism, Uncertainty, and Investment in the Brazilian Water and Sanitation Sector” by Plous ([AEJ: Economic Policy, 2020](#)) investigates how firm governance can affect investment decisions. The author uses a policy announced in 2005 and implemented in 2007. This policy aimed to increase the legal security for municipality-run water firms by mitigating the risk of state-level takeovers. We will focus on investment decisions before and after the policy was announced.

1. Visually inspect the trajectories of the variables of total investment (Table 3, Column 1) and self-financed investment (Table 3, Column 2) based on the type of management (municipality-run firms vs. state-run firms). What conclusions can be drawn in terms of parallel trends?
2. Replicate the primary findings outlined in Table 3 of the paper.
 - (a) Interpret the coefficients associated with *total investment* and *self-financed investments*. How substantial are the observed effects?
 - (b) Build a graph that shows the estimated effects of *total investment* for each individual year separately, with 2004 as the omitted year for comparison. Similarly, construct a corresponding graph for *self-financed investments*. What can you conclude from these graphs? Do they offer any valuable information regarding the assumptions underlying the Difference-in-Differences methodology?
Note: To create the graphs consider municipalities with observations from 2001-2012, ensuring a balanced panel. You can perform this task using the “feols” command, which is available within the “fixest” package.
3. Construct identical graphs to those created in section 2.(b), but this time designate the actual year of policy implementation, 2007, as the treatment year (omitting the year 2006 for comparison). What insights can be drawn regarding the potential presence of anticipation effects?