FLS 6441 - Methods III: Explanation and Causation

Week 7 - Discontinuities

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Classification of Research Designs

		Independence of Treatment Assignment	Researcher Controls Treatment Assignment?
Controlled Experiments	Field Experiments	✓	✓
	Survey and Lab Experiments	✓	✓
Natural Experiments	Natural Experiments	✓	
	Instrumental Variables	✓	
	Discontinuities	✓	
Observational Studies	Difference-in-Differences		
	Controlling for Confounding		
	Matching		
	Comparative Cases and Process Tracing		

Section 1

Discontinuities

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- Natural Experiments

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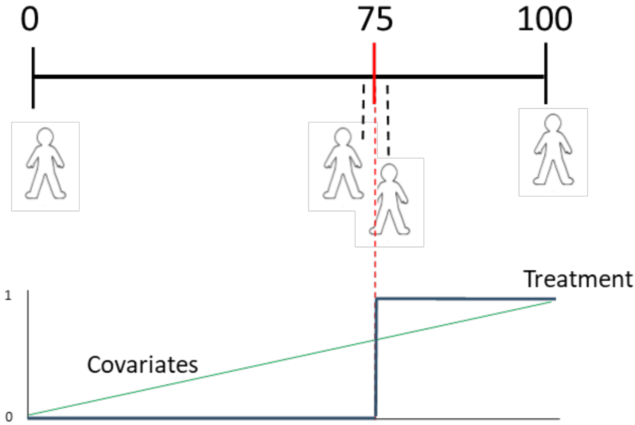
- Where the 'as-if' random treatment assignment comes from *discontinuities* in rules
    - Rules that **treat very similar people very differently**
    - Small differences on a **continuous** variable create big differences on a **binary treatment** variable

Discontinuities



Discontinuities

- Example thresholds:
  - Exam cutoffs
  - Age cutoffs
  - Policy eligibility rules
  - Close elections
  - Adminsitrative boundaries

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  - Weather
  - Chance
  - Mistakes

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    - They are plausible counterfactuals for each other

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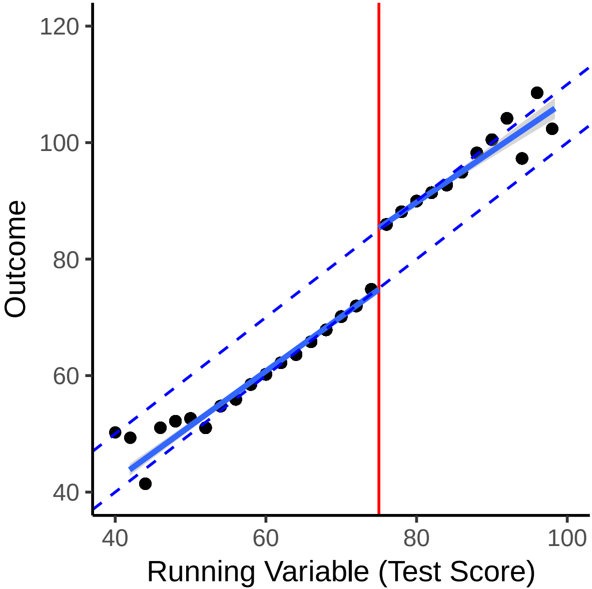
- So we need more assumptions (and more N)!

Discontinuities



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  - **Outcome Y_i:** Any subsequent outcome you have measured

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  3. No spillovers (SUTVA)

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- We need qualitative evidence to support these assumptions

Discontinuities

- We can check for sorting with a density test
- If units are bunched just above the threshold, this suggests manipulation

Section 2

Estimating Regression Discontinuities

Estimating Discontinuities

- 3 Regression Discontinuity Methodologies:
  1. **Difference-in-means:** Define a small window either side of the threshold and compare average outcomes in this window
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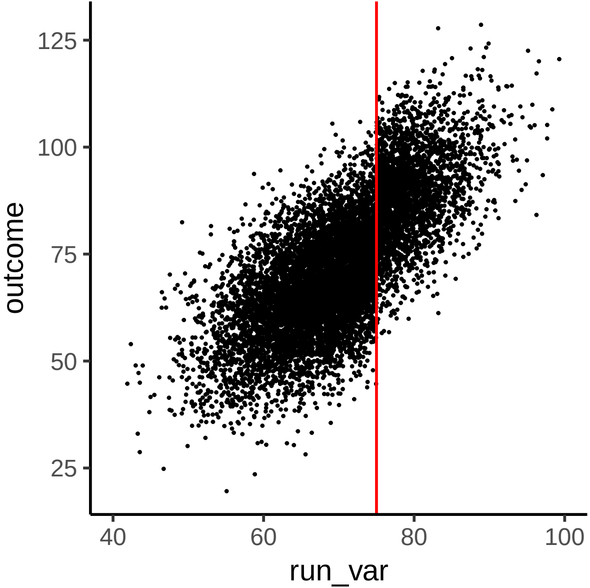
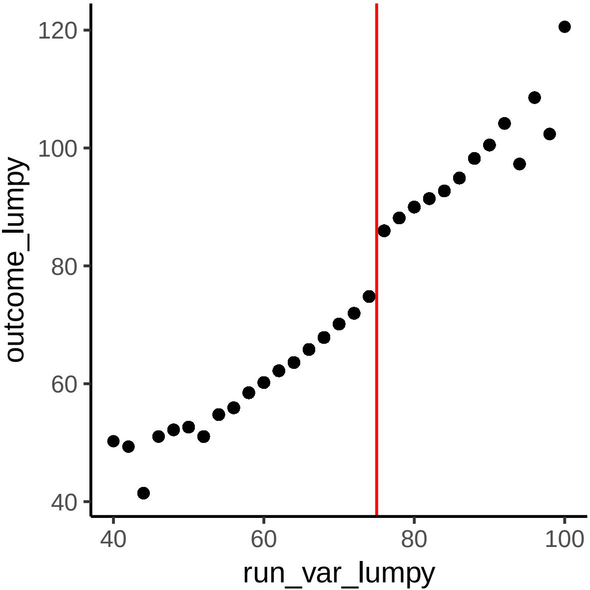
  3. **'Limited-bandwidth' regression discontinuity:** A regression only using only data close to the threshold
     - What *bandwidth* around the threshold do we use?

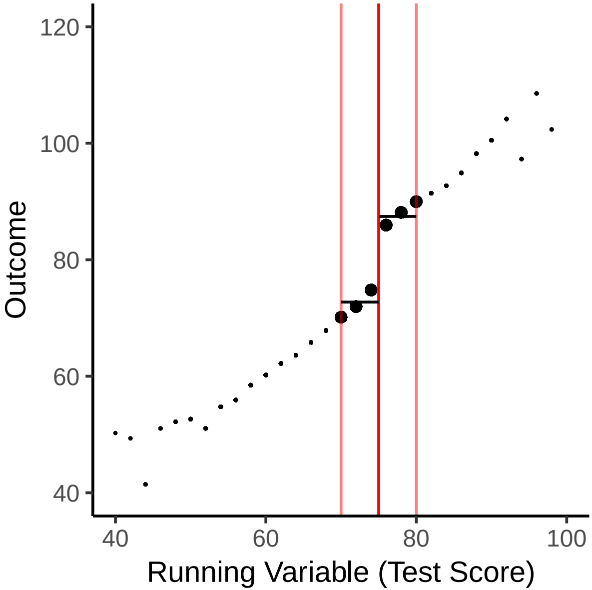
Raw Data



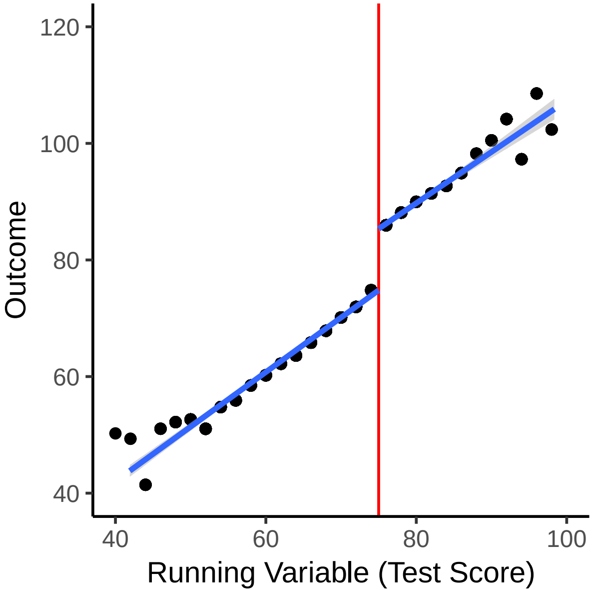
'Binned' Data



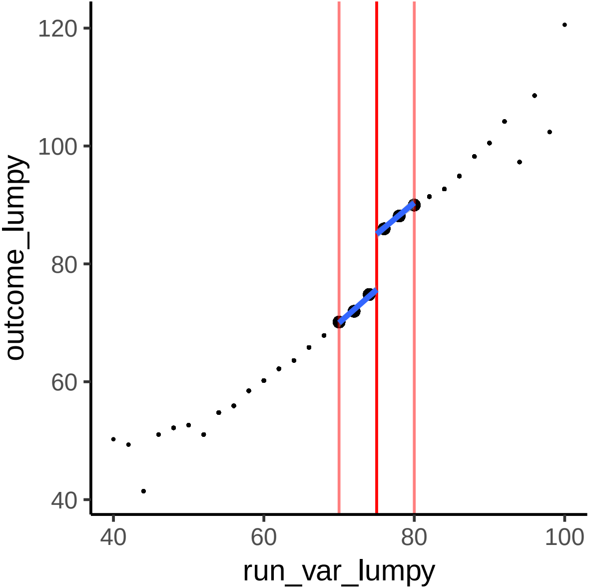
1. Difference-in-Means



2. Full Data Regression - Linear



3. Limited-bandwidth Regression - Local Linear



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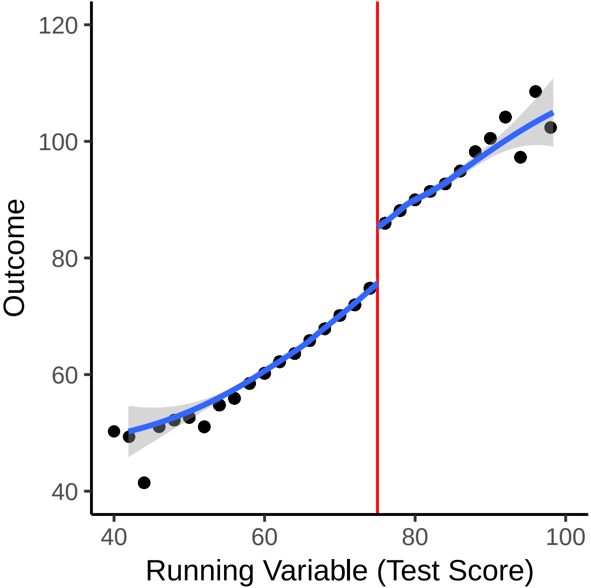
- In practice, apply all three as robustness checks

2b. Full Data Regression - Non-linear



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  - Units far from the threshold are very different for a reason, and causal effects are likely to be different

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  - Risk of sorting/manipulation

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- Useful for understanding the effects of political power
  - **Running Variable:** Margin of victory
  - **Treatment:** Winning a close election
  - **Control:** Losing a close election
  - **Outcome:** Anything that happens later...

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  - So potential outcomes are not balanced
  - But no other case (9 countries) has this problem

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  - Radio licencing process depends on ability to lobby the Ministry and Congress
  - Local radio systematically used to favour specific politicians
  - Incumbents better placed to initiate exchange between Mayors and legislators
- What is the challenge to causal inference here?

Close Elections

- **Population:** Brazilian councillors
- **Sample:** Brazilian councillors in close elections that made radio licence applications in 2000/2004
- **Running Variable:** Vote margin
- **Treatment:** Just winning close election
- **Control:** Just losing close election
- **Treatment Assignment:** 'As-if' random in close elections
- **Outcome:** Approved radio licence application rate

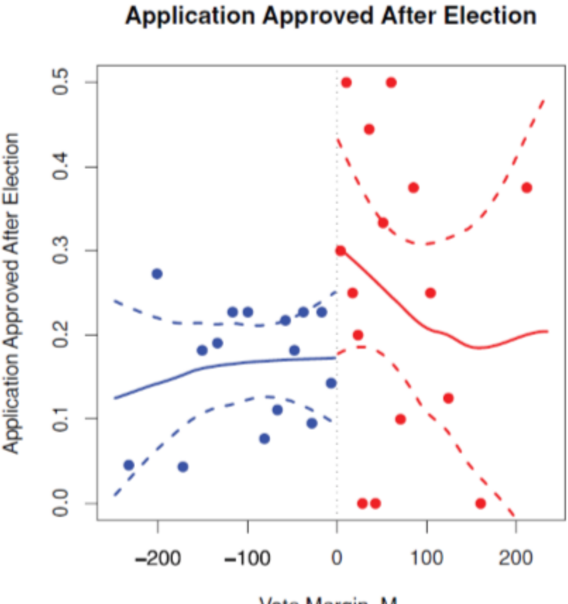
Close Elections

- Boas and Hidalgo (2011) Methodology:
  1. Local Linear regression within bandwidth of 165 votes
  2. Difference-in-Means within 10-40 vote bandwidth

Close Elections

- Results
  - Incumbent Vereadores are twice as likely (14-27 % points) to have their radio licence applications approved

Close Elections



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  - The two states were only created in 2001; before that they experienced the same relationship with government
  - The border was set according to old district borders, and not politically
  - Jharkhand did not experience the same governance improvements as Bihar

Methodology

- The 'running variable' is distance to the border, but in 2-dimensions:

$$y_i = \alpha + \beta Bihar_i + x_i + y_i + x^2 + y^2 + x^3 + y^3 + x^4 + y^4 + x * y$$
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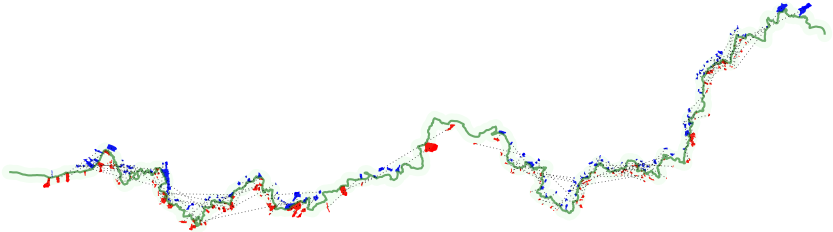
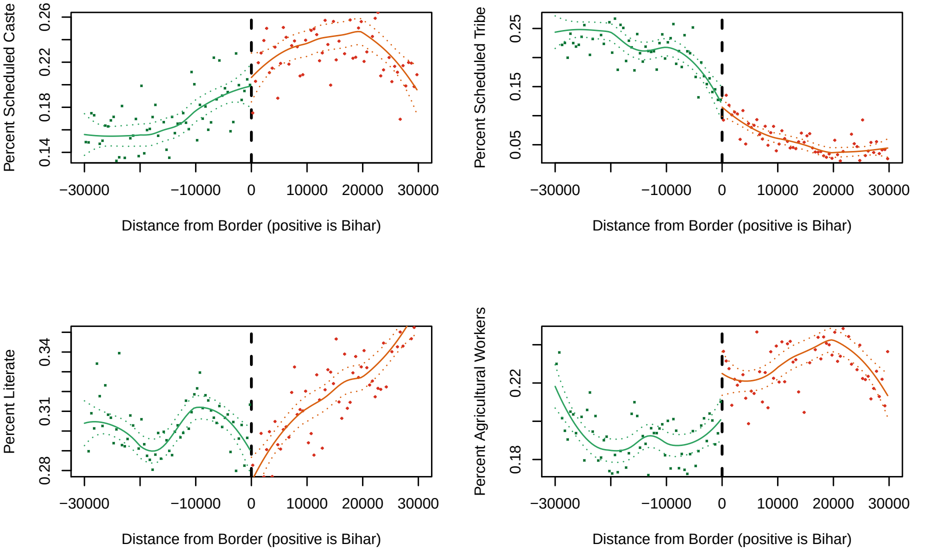
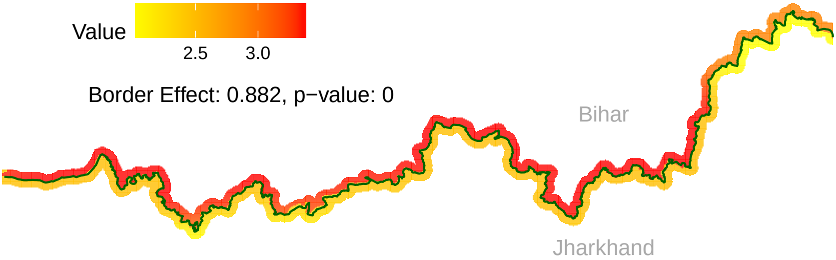
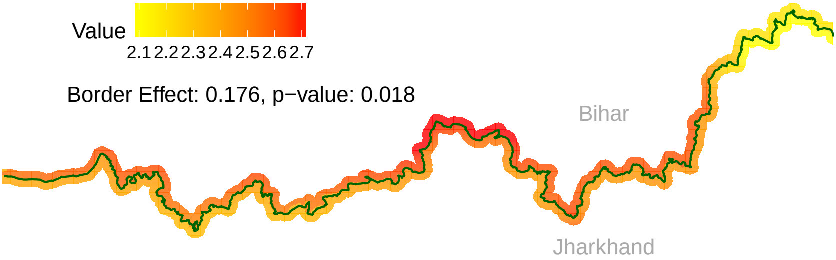
Pair Matched Villages



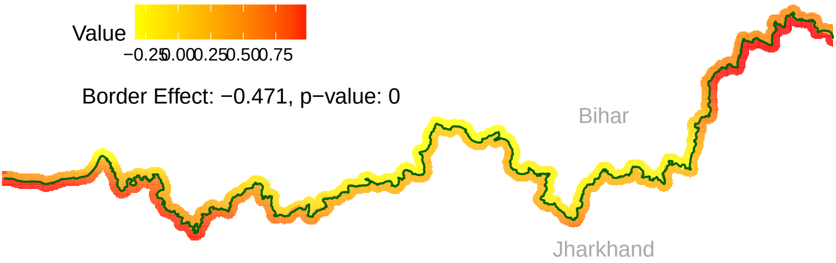

Percent Scheduled Caste
0.14
0.18
0.22
0.26
Percent Scheduled Tribe
0.05
0.15
0.25
Percent Literate
0.28
0.31
0.34
Percent Agricultural Workers
0.18
0.22
−30000
−10000
0
10000
20000
30000
Distance from Border (positive is Bihar)



Predicted Value Plot of Likelihood of Incumbent Providing Public Goods if Reelected



Predicted Value Plot of Likelihood of Corrupt Elite being Caught



Predicted Value Plot of Gram Sabha Attendance

Geographic Discontinuities

- Interpretation:
  - Programmatic policy has changed voters' attitudes and expectations
- But some imbalance at the border...

Geographic Discontinuities

- Interpretation:
  - Programmatic policy has changed voters' attitudes and expectations
- But some imbalance at the border...
- ...And compound treatment makes interpretation difficult