FLS 6441 - Methods III: Explanation and Causation

Week 7 - Discontinuities

Jonathan Phillips

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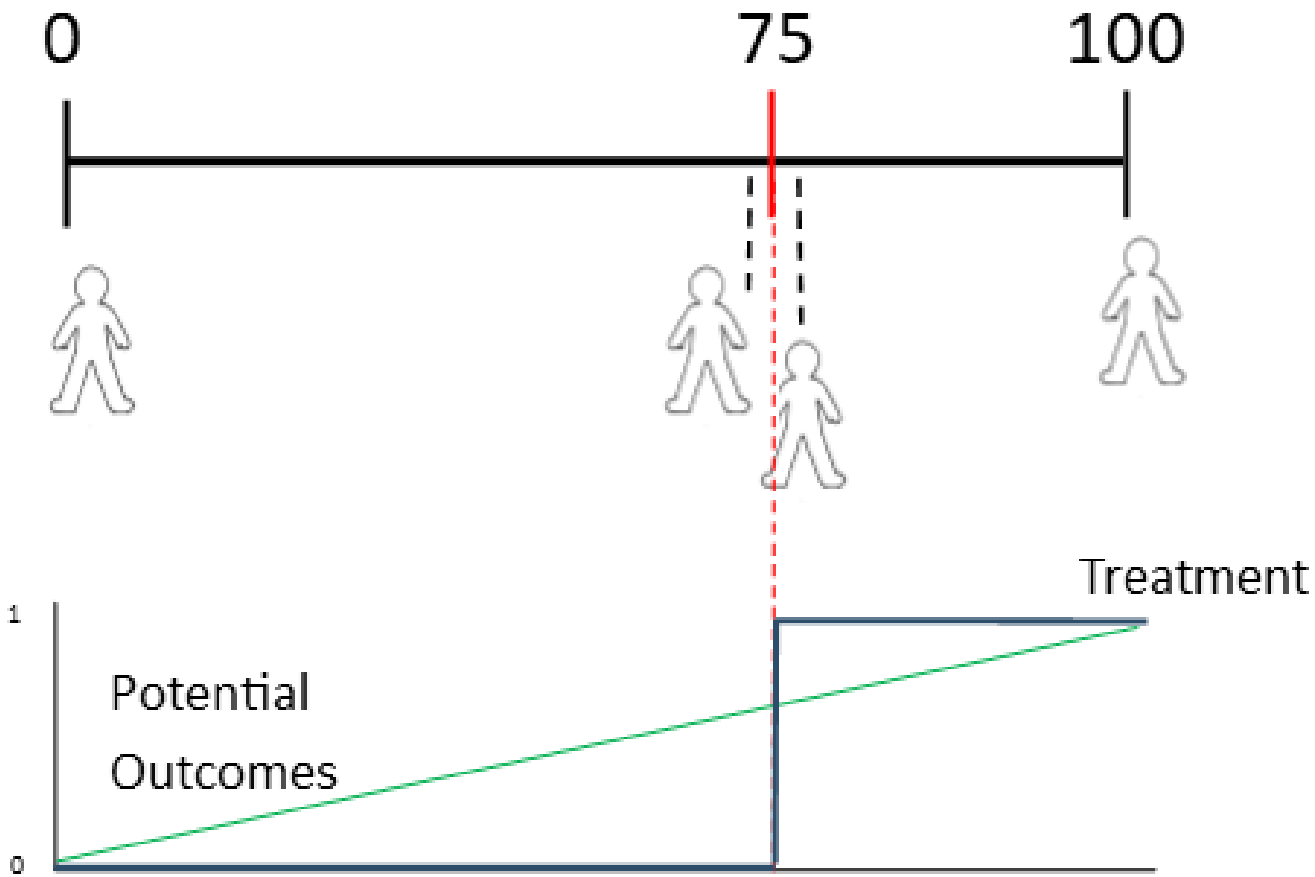
- Where the 'as-if' random treatment assignment comes from *discontinuities* in formal rules
  - Rules that **treat very similar people very differently**
  - Small differences on a **continuous** variable create big differences on a **binary treatment** variable

Discontinuities



Discontinuities

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

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  - Weather
  - Chance
  - Mistakes
  - Grading you can't control

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  - Difficulty of exam
  - Age
  - Feeling sick on the day of the exam
  - Weather making you late
  - The questions you prepared didn't appear
  - Who graded your exam

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    - They are plausible counterfactuals for each other

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

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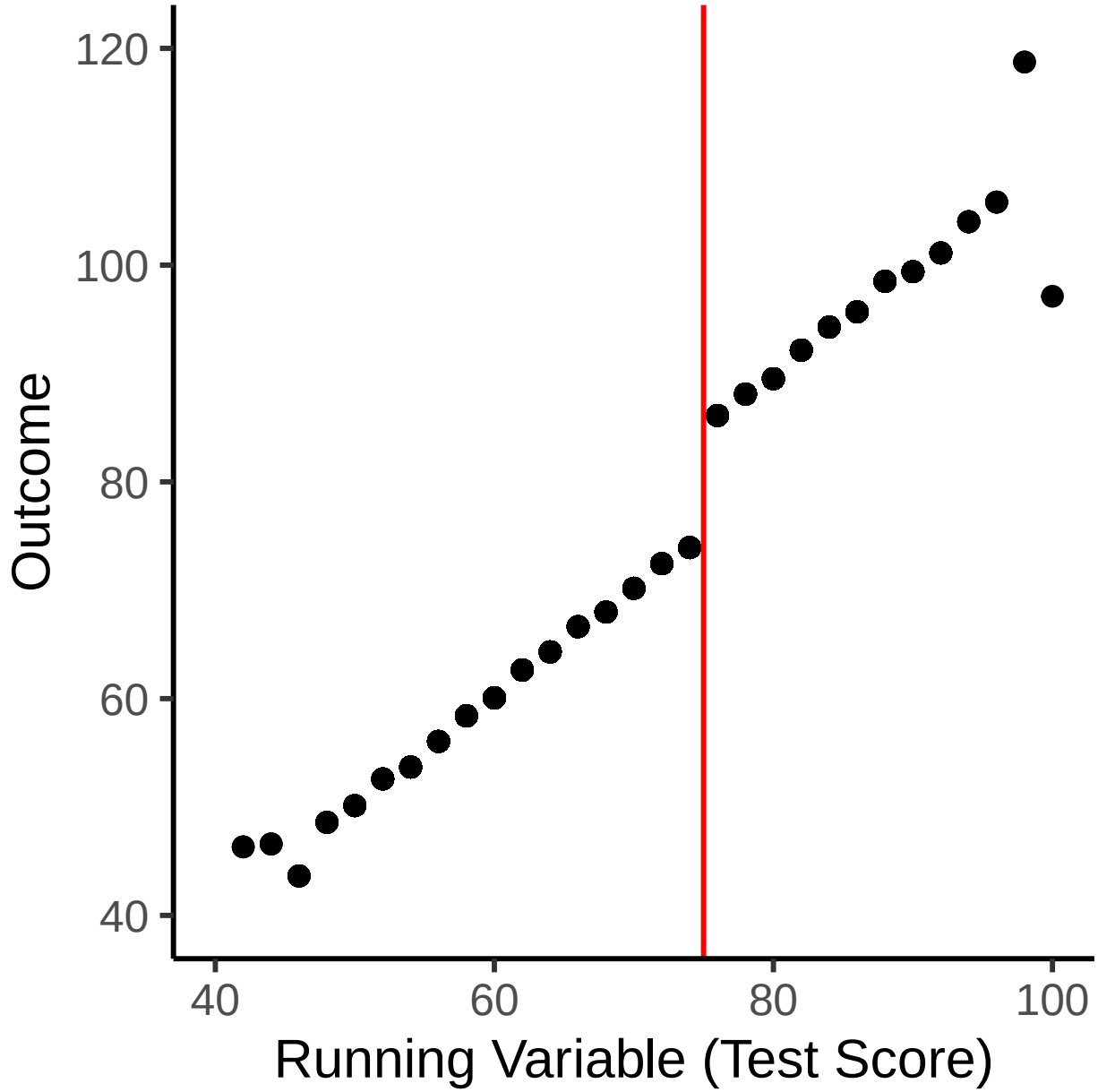

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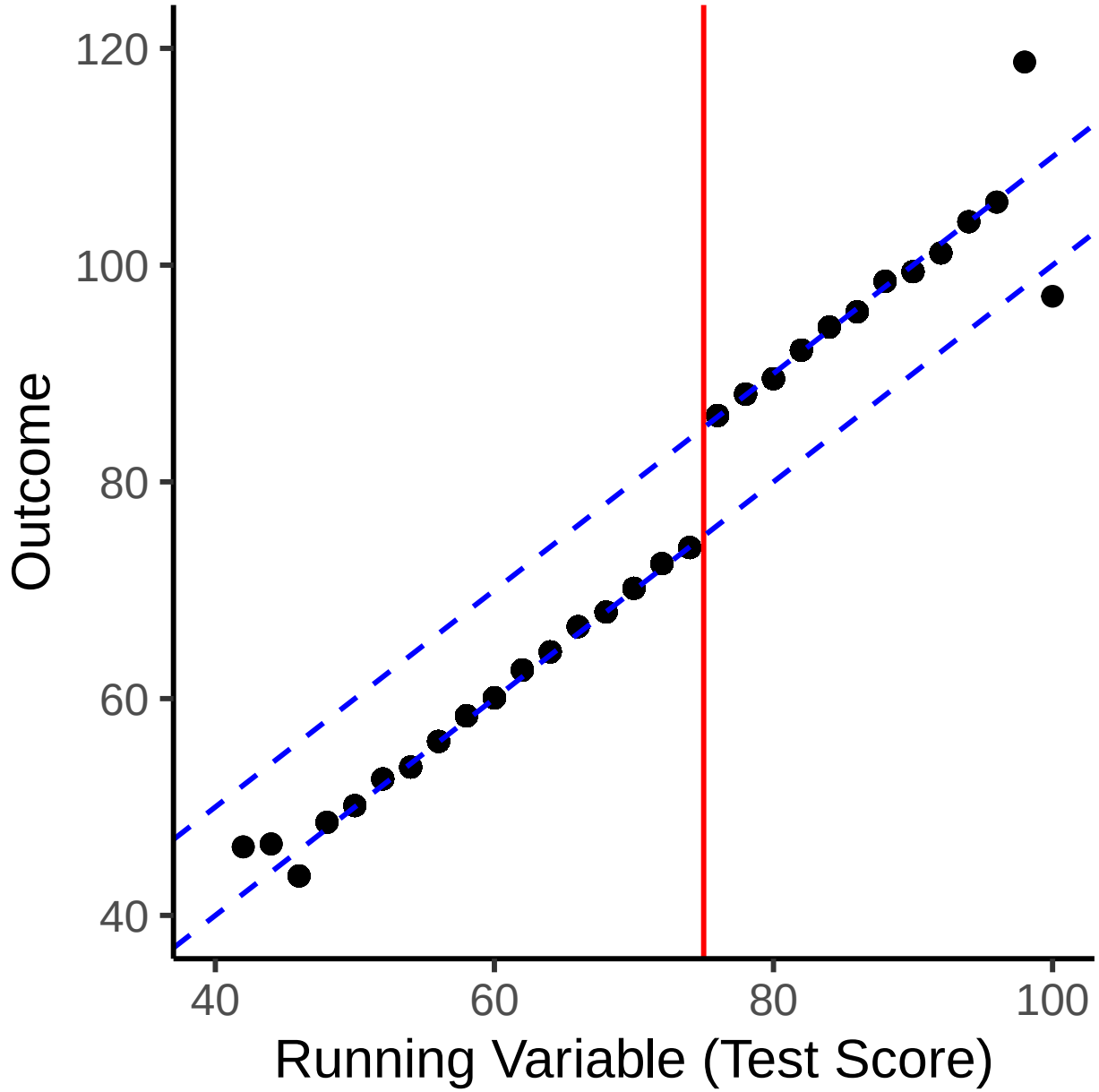

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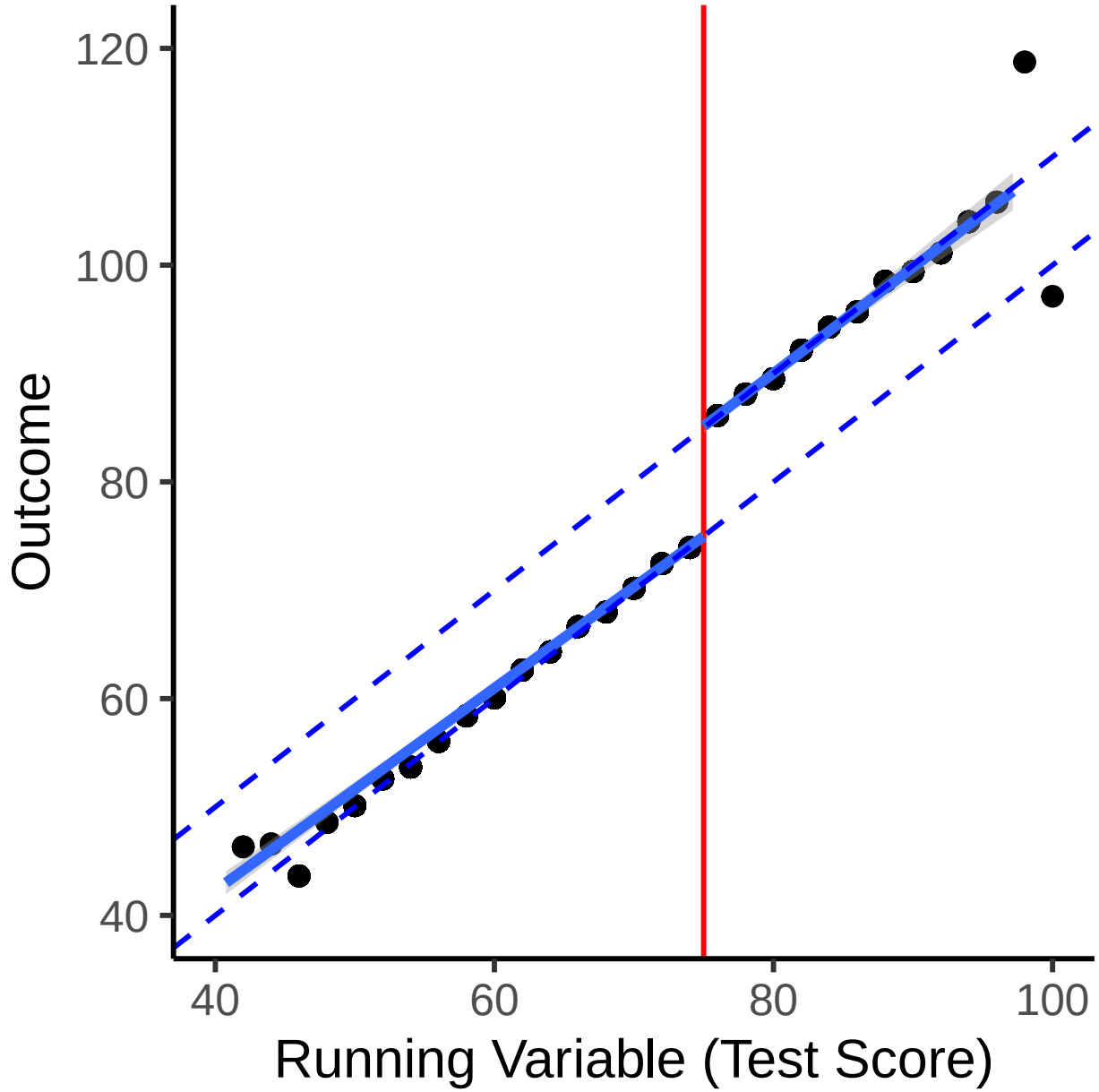

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  - **Outcome** Y_i**:** Any subsequent outcome you have measured

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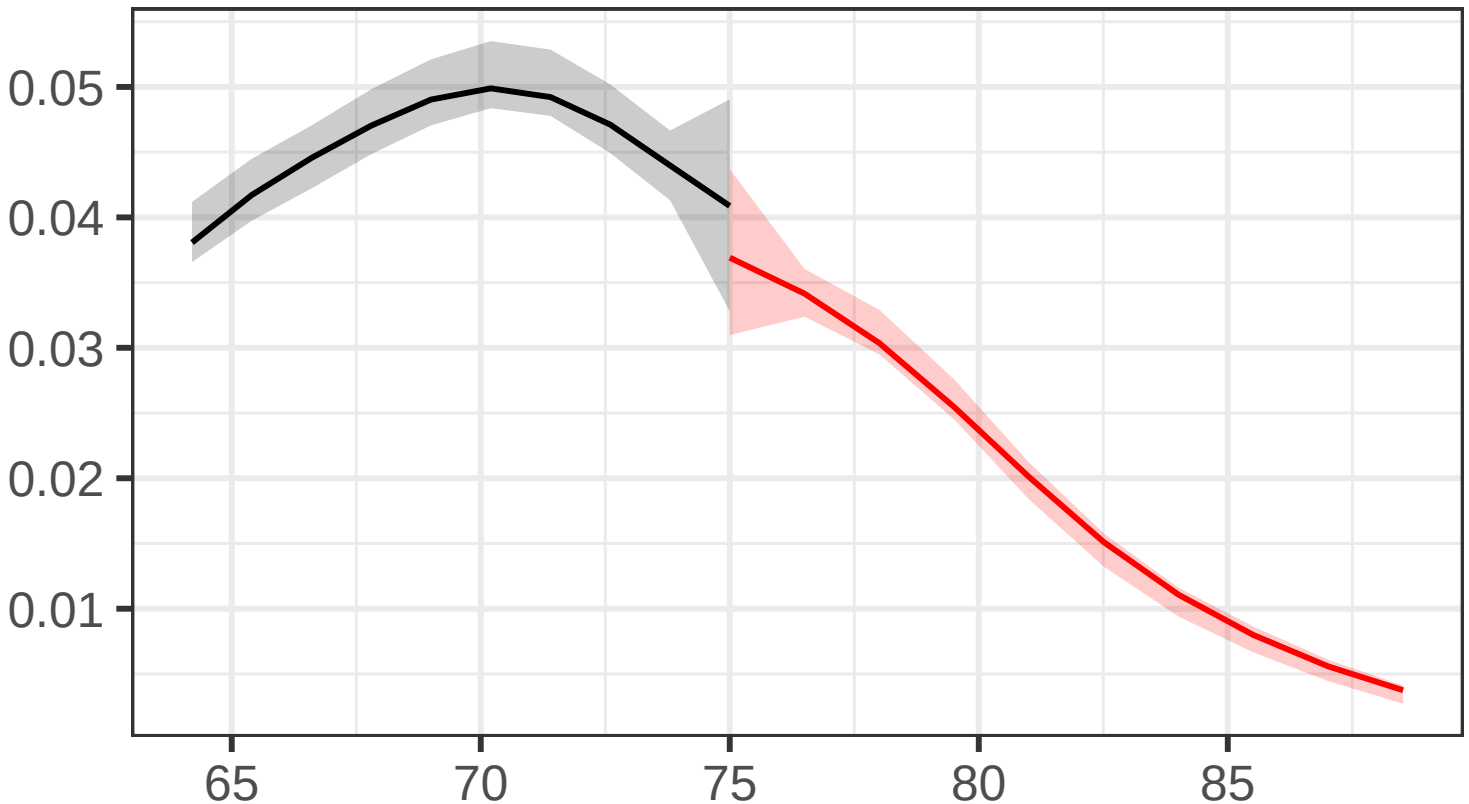
  - Simple t-test in a small window either side of the threshold
  - Or a 'placebo' regression discontinuity with the balance variable as the outcome

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

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$$Y_i = \alpha + \beta_1 Running\_Variable_i + \beta_2 Treatment_i + \epsilon_i$$

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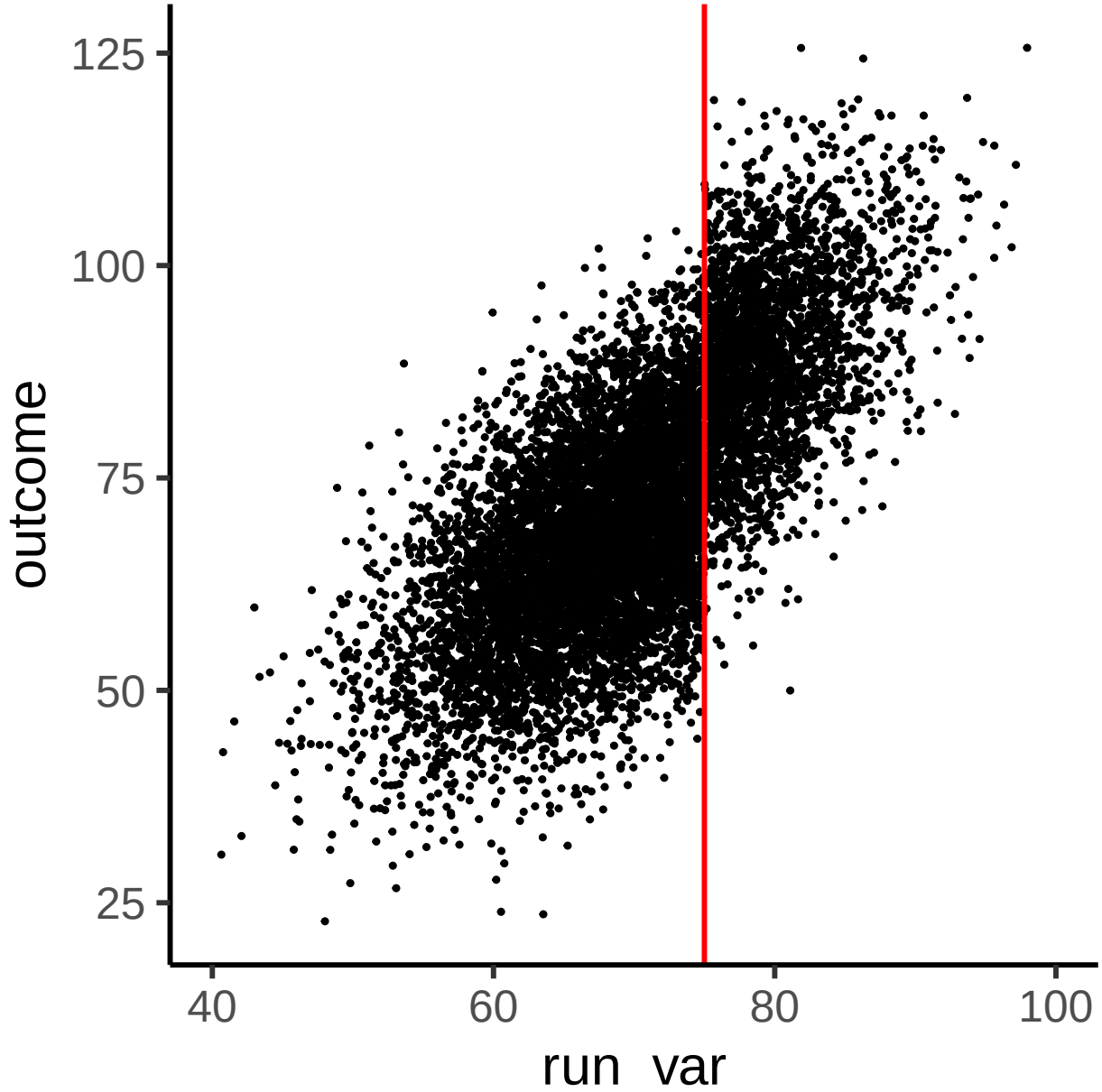
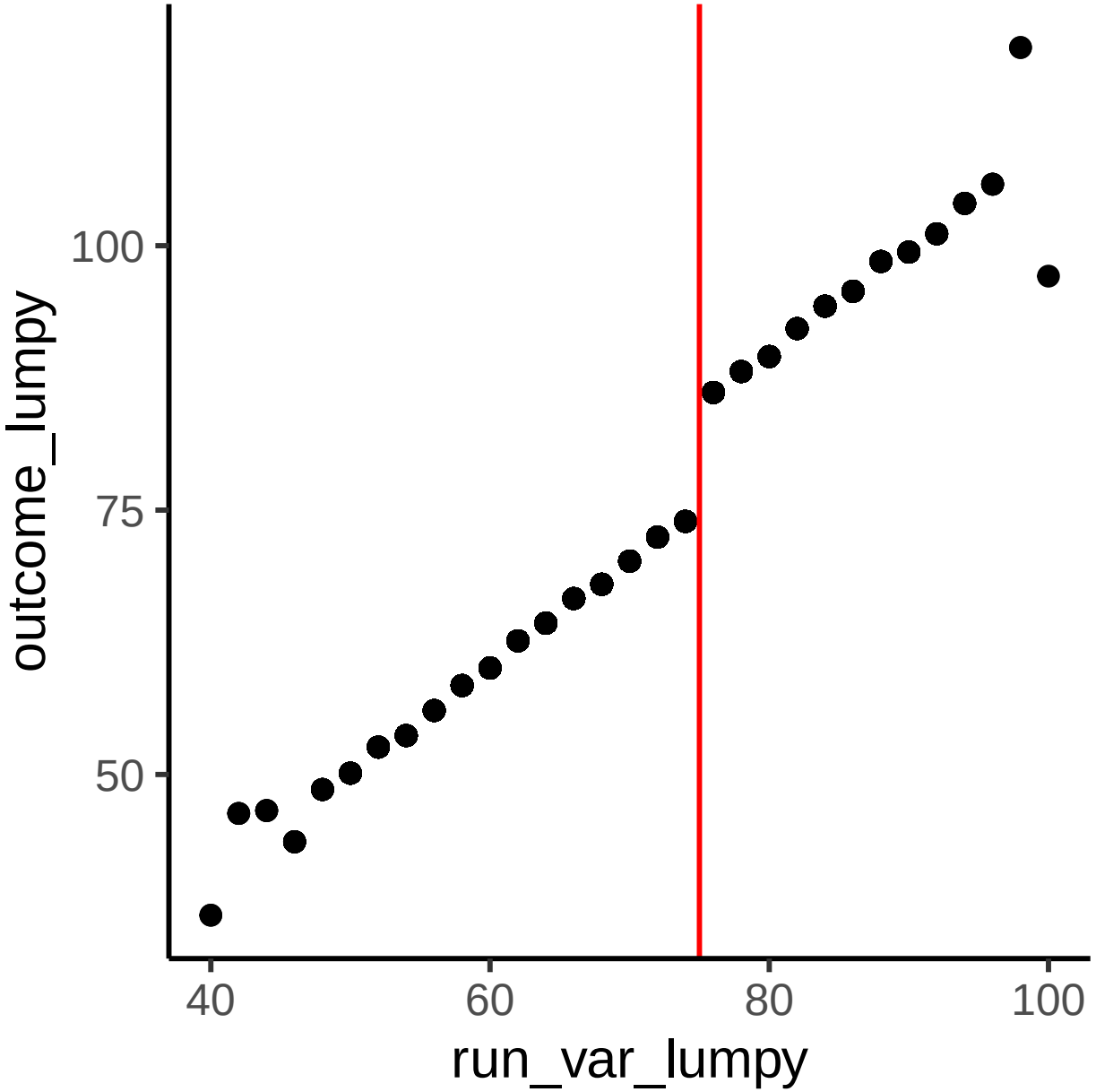
  3. **'Limited-bandwidth' regression discontinuity:** Same regression as above bu using only data close to the threshold
     - Balancing efficiency and bias/model-dependence

Raw Data



'Binned' Data



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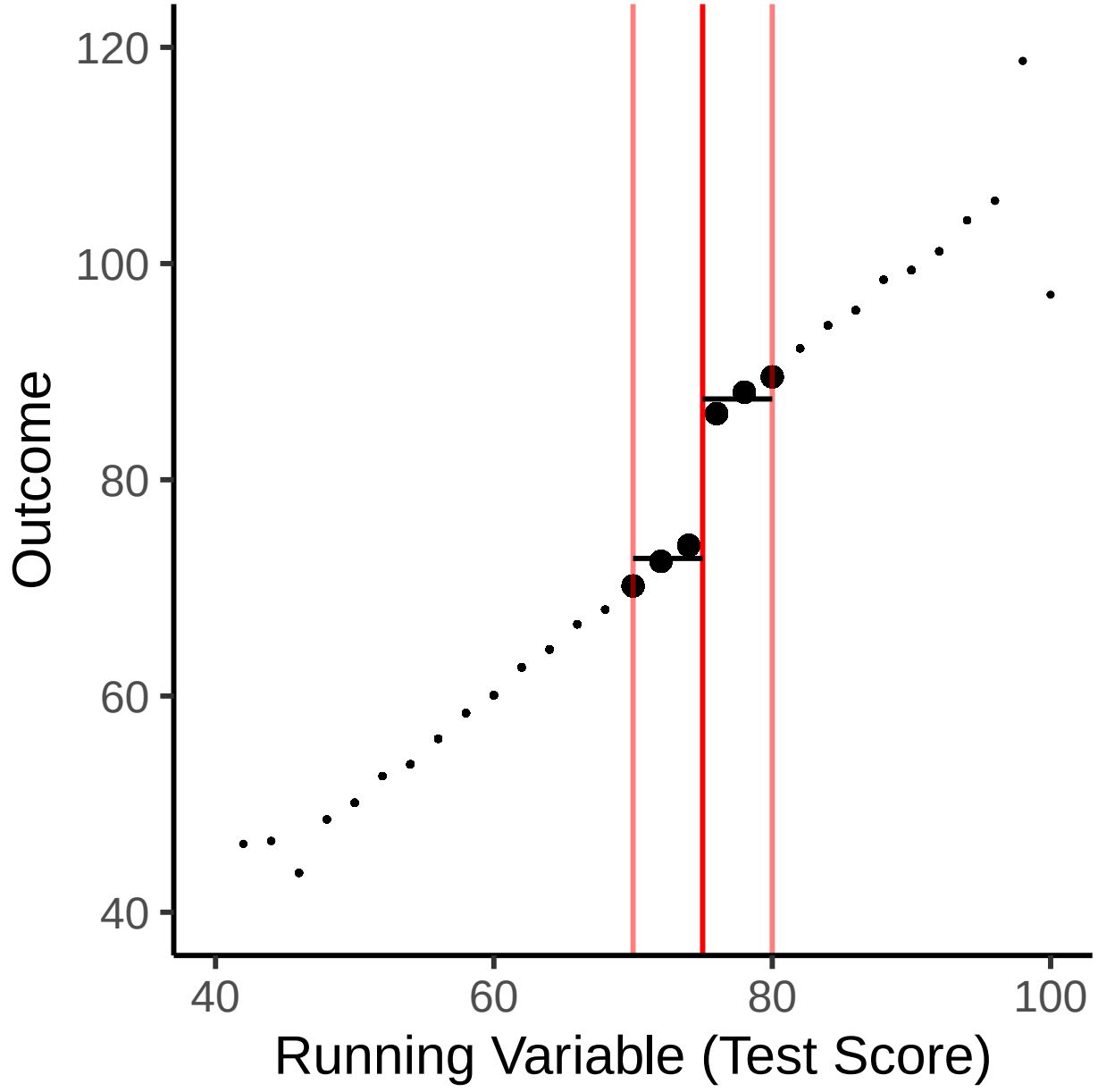
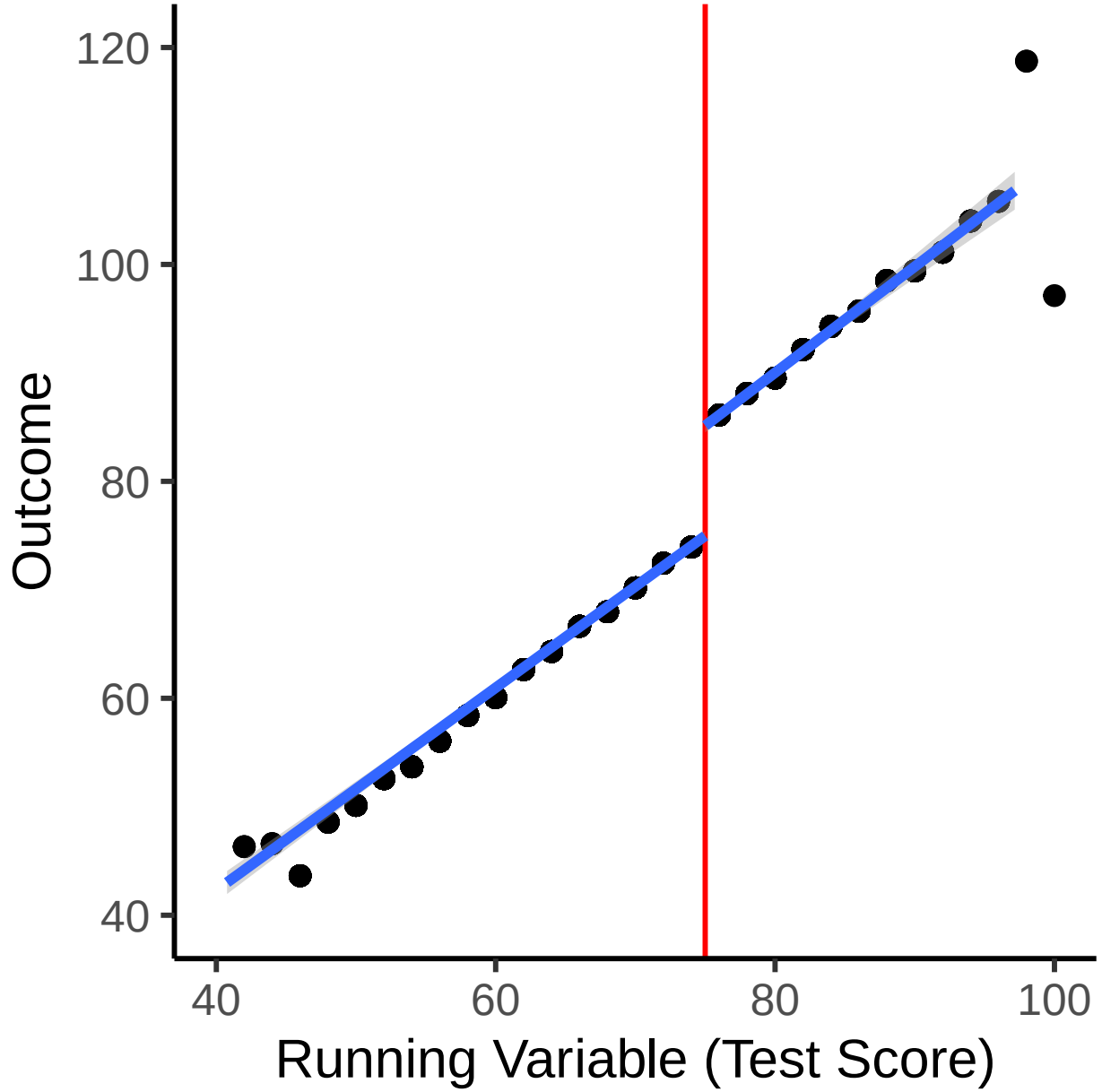
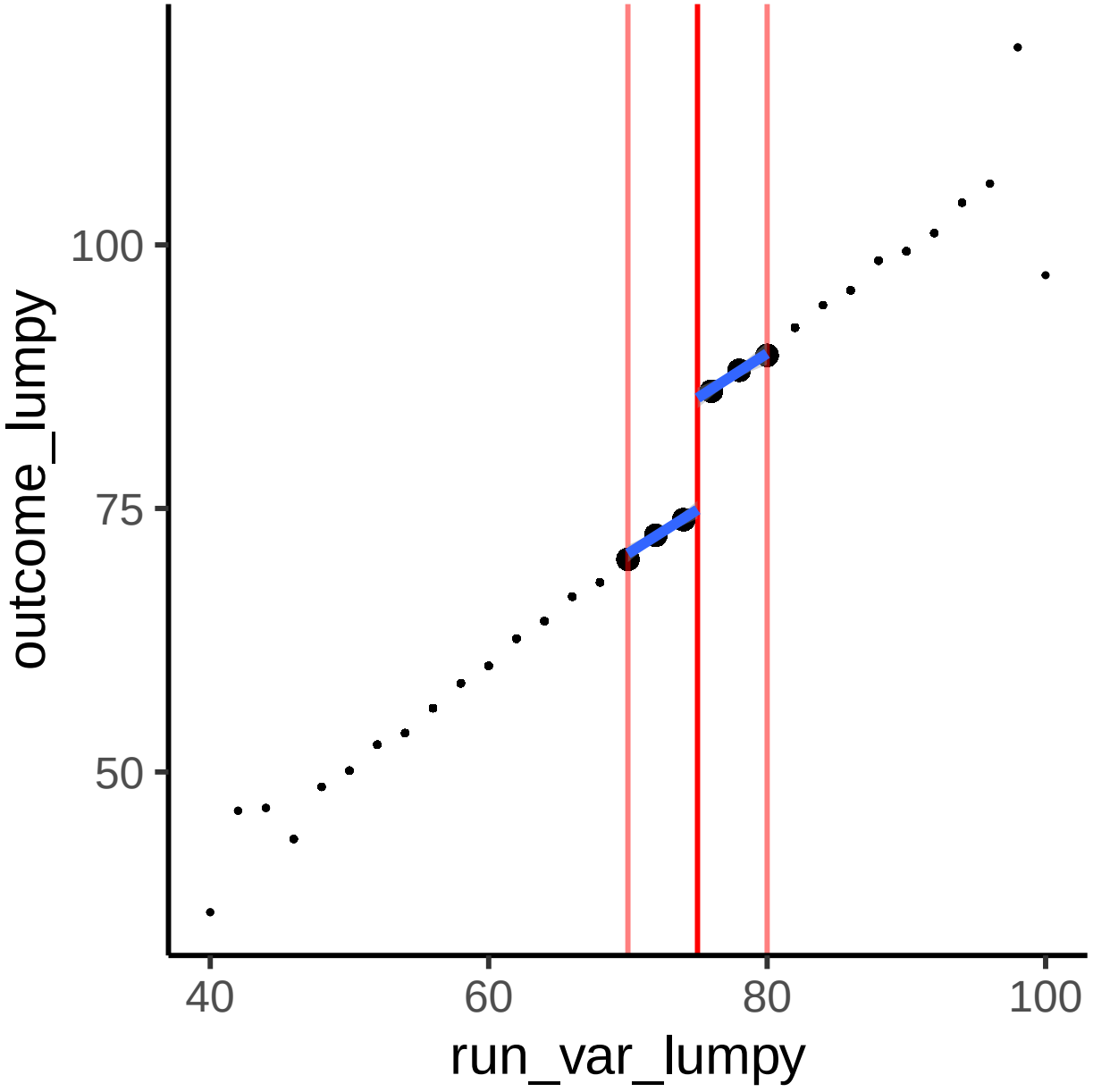


2. Full Data Regression - Linear



3. Limited-bandwidth Regression - Local Linear



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- In practice, apply all three as robustness checks

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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
  - Opportunistic regression discontinuities may not identify a useful causal effect or for a relevant group

Section 3

Close Elections

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  - A couple of votes either way due to the weather, illness
- 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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- What is the challenge to causal inference here?

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- **Treatment Assignment:** 'As-if' random in close elections

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- **Treatment Assignment:** 'As-if' random in close elections
- **Outcome:** Approved radio licence application rate

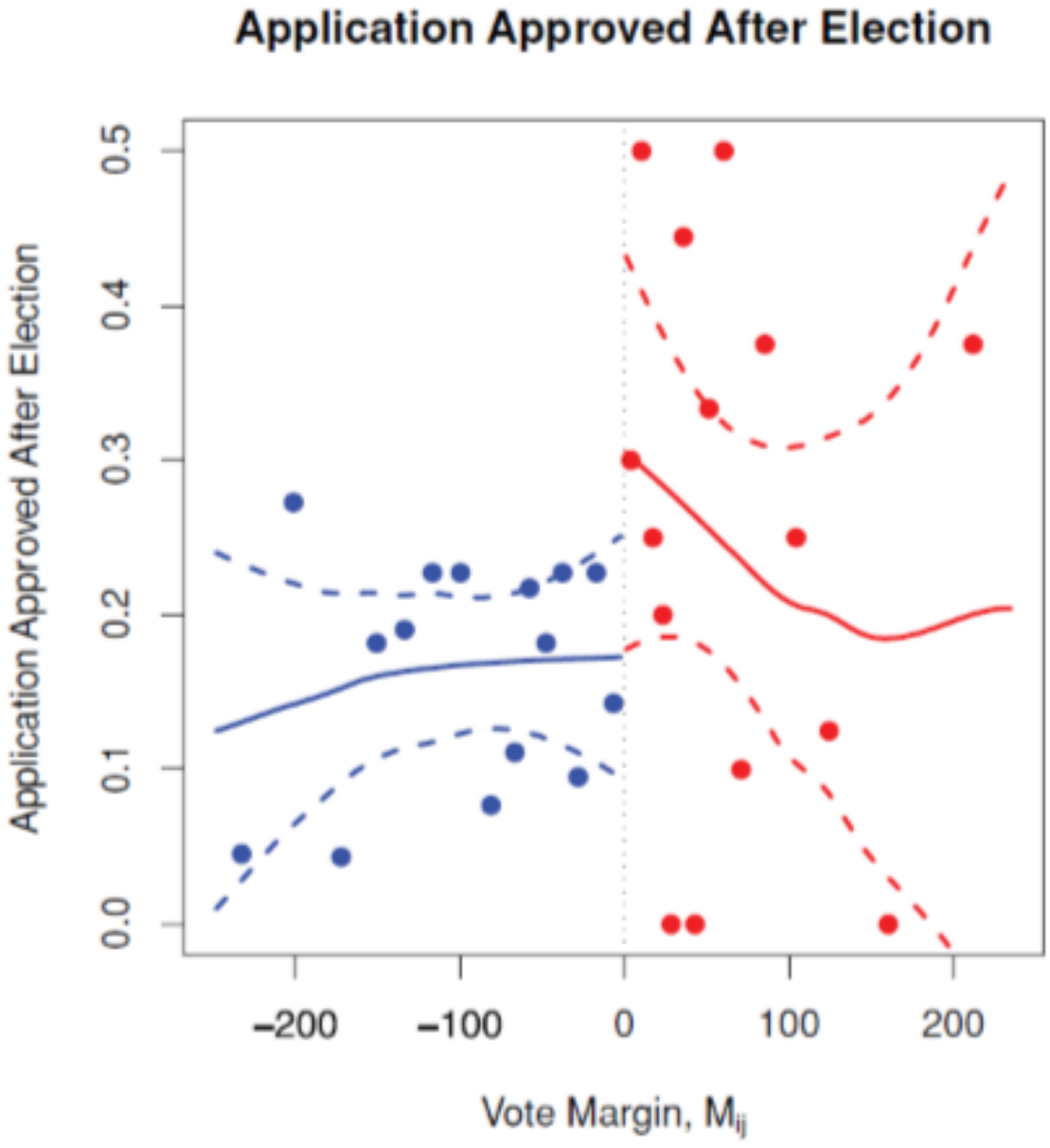
Close Elections

- 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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- **Before 2005:** 'Jungle raj': Clientelism, violence, corruption, caste bias
- **After 2005:** Bihar is a reform success case

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  - Socioeconomic, geographic and national governance conditions are very similar at the border

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  - Jharkhand did not experience the same governance improvements as Bihar

Methodology

- The 'running variable' is distance to the border, but in 2-dimensions:
- Captured by a flexible polynomial in latitude and longitude (x and y)

$$y_i = \alpha + \beta Bihar_i + x_i + y_i + x^2 + y^2 + x^3 + y^3 + x^4 + y^4 + x * y + x^2 * y^2 + x^3 * y^3 + x * y^2 + x * y^3 + x^2 * y + x^3 * y + \epsilon_i \quad (1)$$

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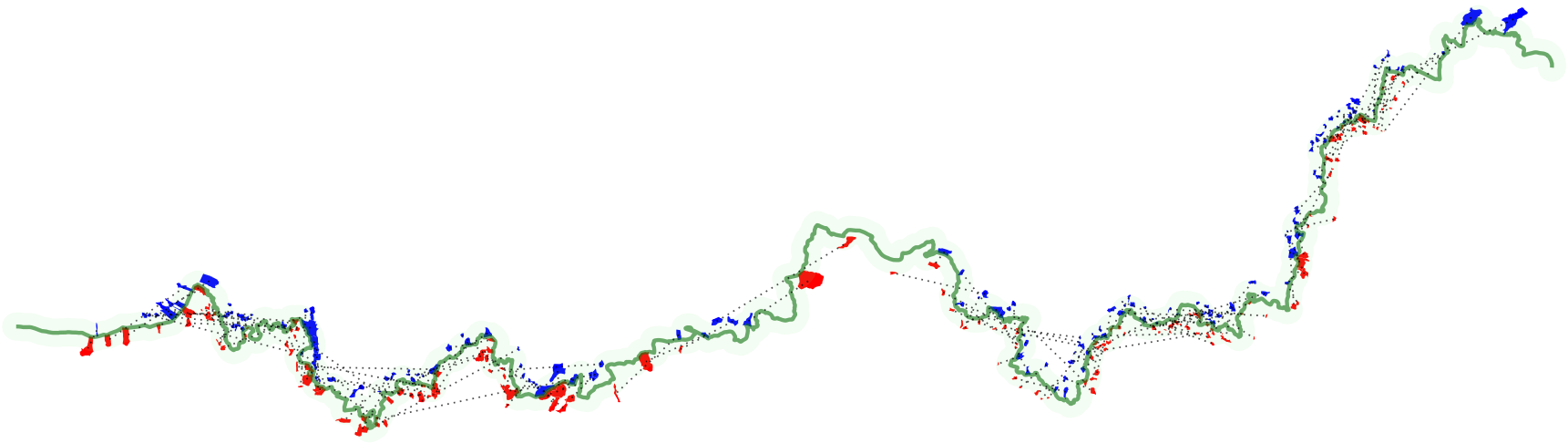
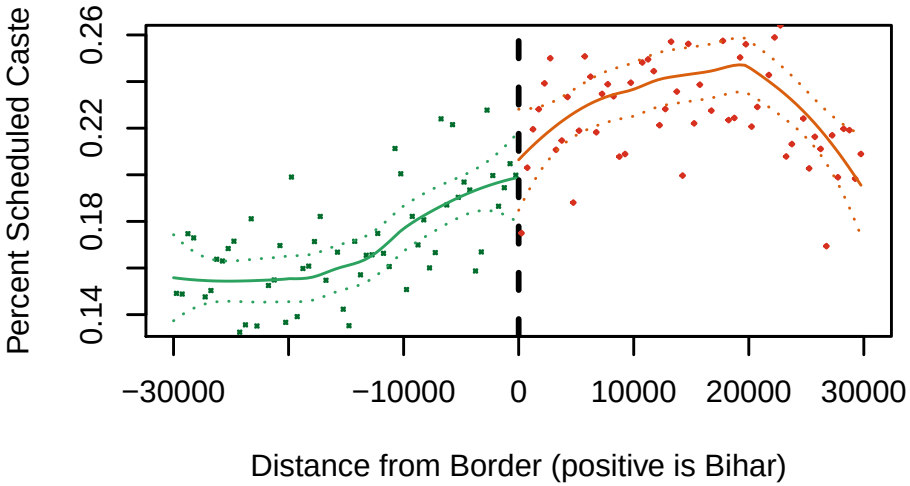
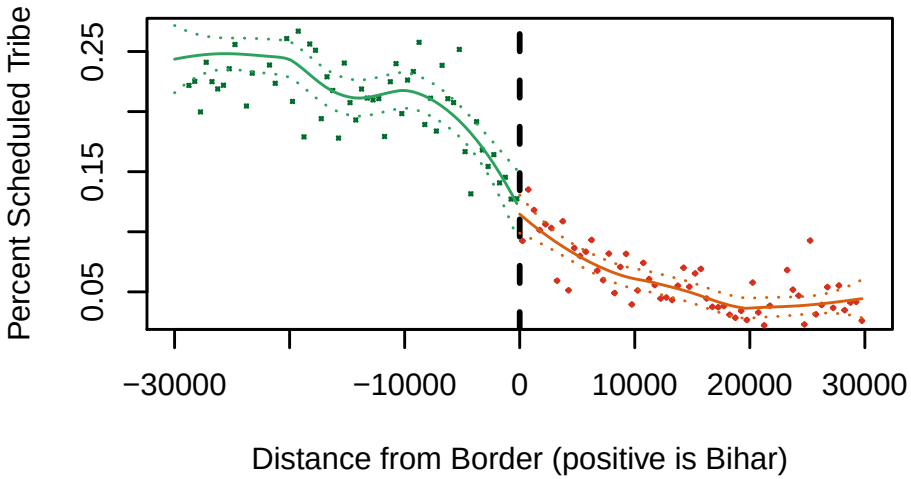
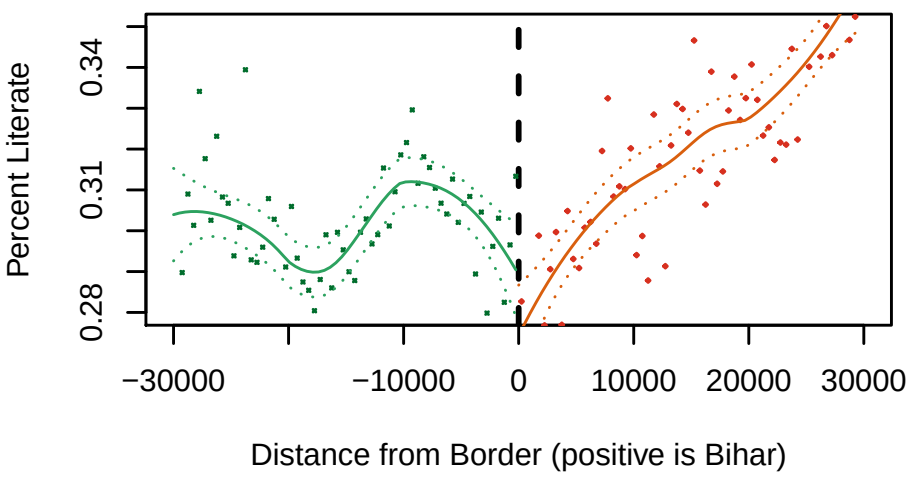
  - **Outcome:** Political attitudes and behaviour

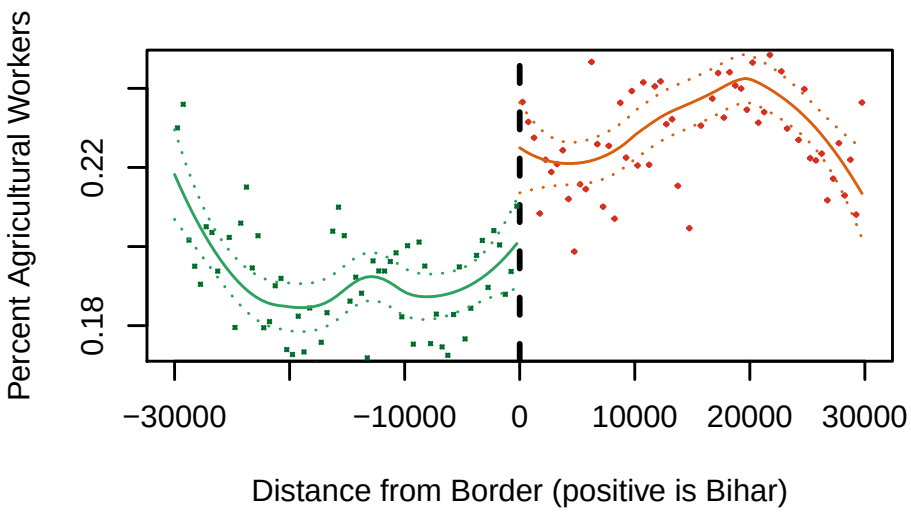
Pair Matched Villages

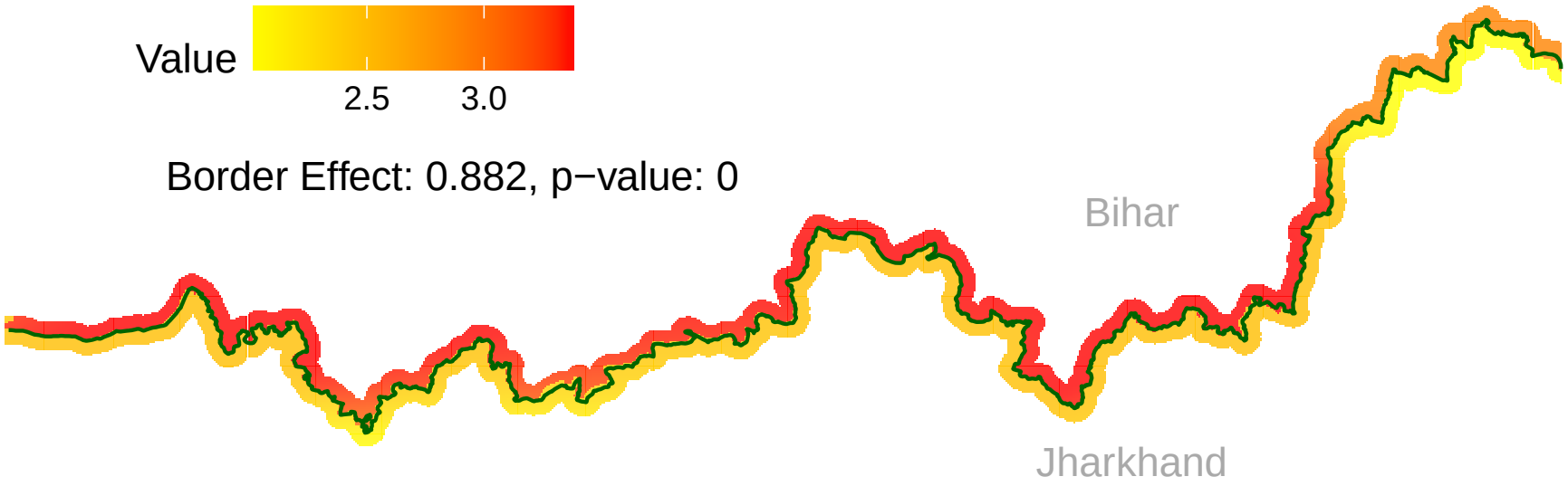



Percent Scheduled Caste
0.14
0.18
0.22
0.26
−30000
−10000
0
10000
20000
30000
Distance from Border (positive is Bihar)

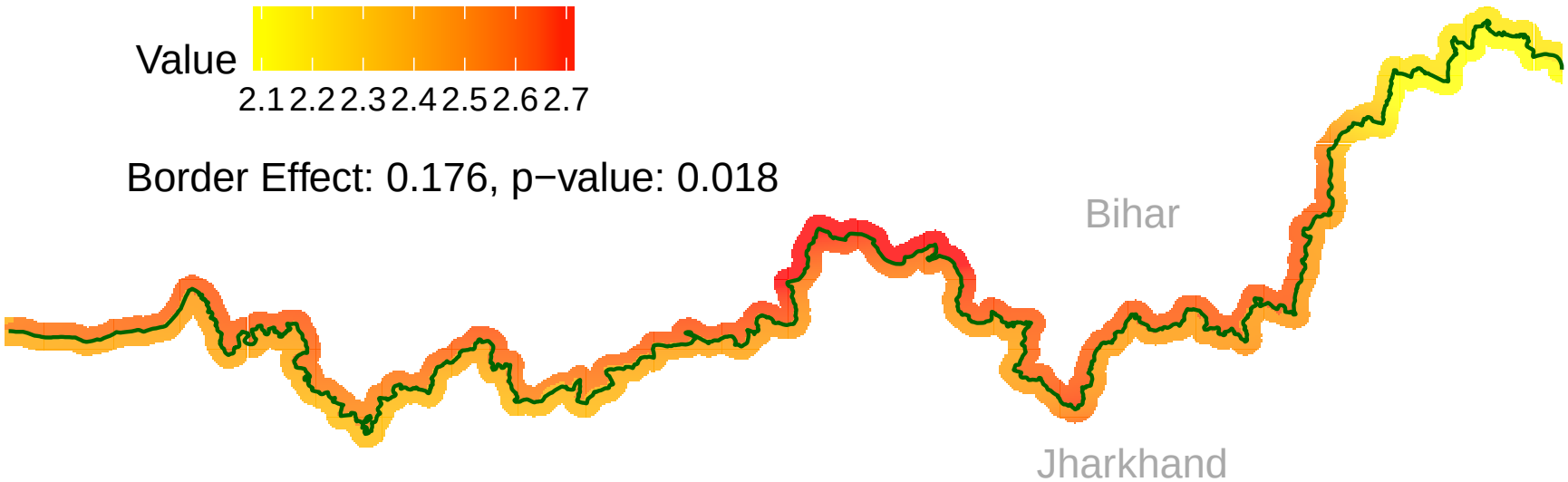

Percent Scheduled Tribe
0.05
0.15
0.25
−30000
−10000
0
10000
20000
30000
Distance from Border (positive is Bihar)


Percent Literate
0.28
0.31
0.34
−30000
−10000
0
10000
20000
30000
Distance from Border (positive is Bihar)

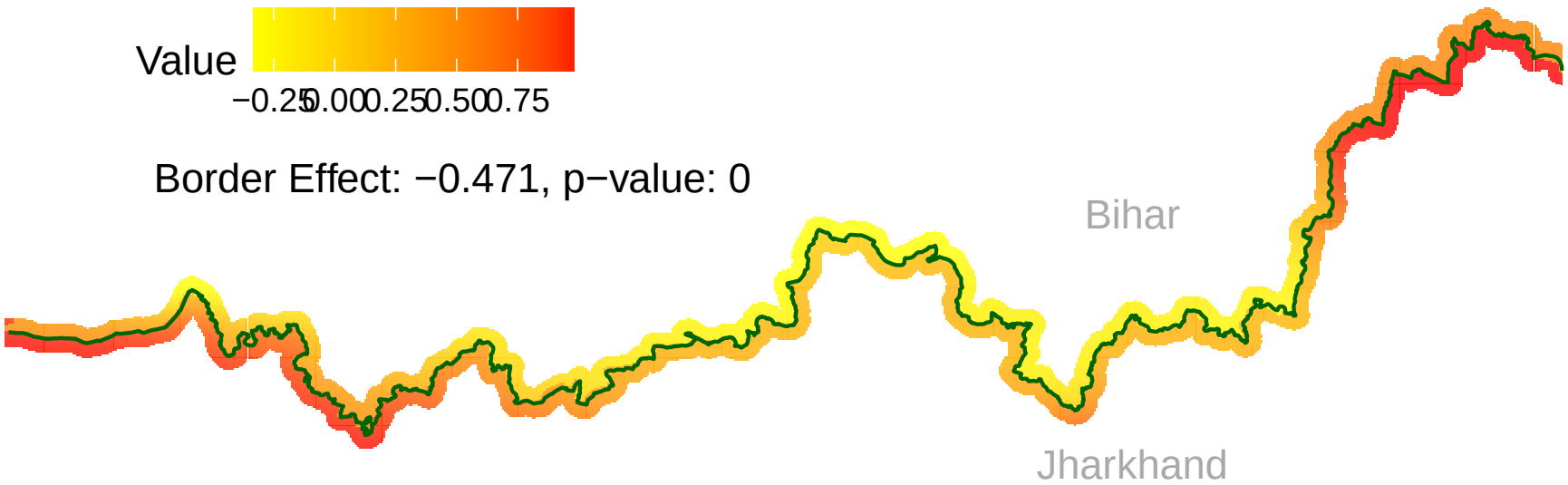

Percent Agricultural Workers
0.18
0.22
−30000
−10000
0
10000
20000
30000
Distance from Border (positive is Bihar)



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

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- But some imbalance at the border...
- ...And compound treatment makes interpretation difficult