

Natural Experiments

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Typology of Natural Experiments

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- Classic Natural Experiment

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- Instrumental Variables-Type Natural Experiment

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- Instrumental Variables-Type Natural Experiment
- Regression-Discontinuity Design

Bolstering

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Explore role of qualitative evidence.

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- 4 Randomized treatment has the same effect as non-randomized treatment would have.

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- Consider using qualitative evidence about causal processes to compare what can be observed of the process in the natural experiment to what can be observed in otherwise similar cases where treatment is not randomized.

Snow on Cholera

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- 4 Treatment caused by the randomized cause

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- Point 2 is a causal claim that cannot be tested quantitatively using the natural experiment.
- Point 4 is another causal claim that cannot be quantitatively tested using the natural experiment.

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IV Natural Experiment

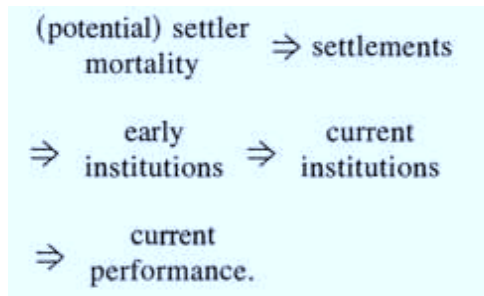
- Use qualitative evidence about the cause-of-treatment-assignment process to test points 1 and 3.
- For some number of cases, trace the causal process from cause-of-treatment assignment, to treatment score, through to the outcome. Look for interference from other potentially systematic causes, and check for evidence of direct effect of cause-of-treatment on outcome.

IV Natural Experiment

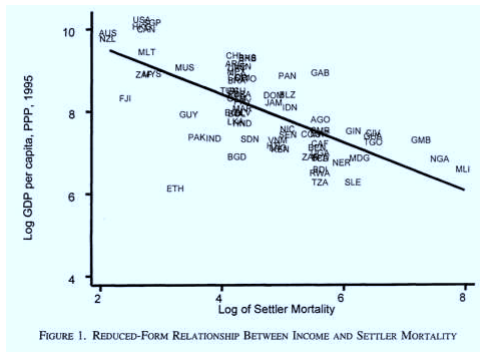
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Colonialism and Development

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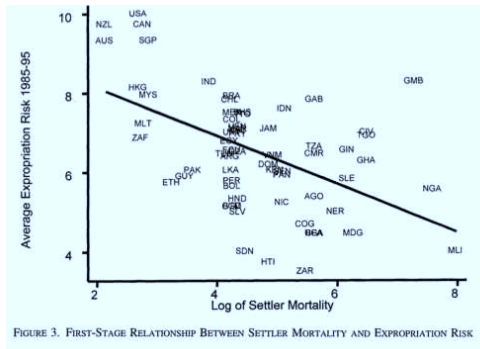


FIGURE 3. FIRST-STAGE RELATIONSHIP BETWEEN SETTLER MORTALITY AND EXPROPRIATION RISK

Colonialism and Development

TABLE 4—IV REGRESSIONS OF LOG GDP PER CAPITA

	Base sample (1)	Base sample (2)	Base sample without Neo-Europes (3)	Base sample without Neo-Europes (4)	Base sample without Africa (5)	Base sample without Africa (6)	Base sample with continent dummies (7)	Base sample with continent dummies (8)	Base sample, dependent variable is log output per worker (9)
Panel A: Two-Stage Least Squares									
Average protection against expropriation risk 1985–1995	0.94 (0.16)	1.00 (0.22)	1.28 (0.36)	1.21 (0.35)	0.58 (0.10)	0.58 (0.12)	0.98 (0.30)	1.10 (0.46)	0.98 (0.17)
Latitude		-0.65 (1.34)		0.94 (1.46)		0.04 (0.84)		-1.20 (1.8)	
Asia dummy							-0.92 (0.40)	-1.10 (0.52)	
Africa dummy							-0.46 (0.36)	-0.44 (0.42)	
"Other" continent dummy							-0.94 (0.85)	-0.99 (1.0)	
Panel B: First Stage for Average Protection Against Expropriation Risk in 1985–1995									
Log European settler mortality	-0.61 (0.13)	-0.51 (0.14)	-0.39 (0.13)	-0.39 (0.14)	-1.20 (0.22)	-1.10 (0.24)	-0.43 (0.17)	-0.34 (0.18)	-0.63 (0.13)
Latitude		2.00 (1.34)		-0.11 (1.50)		0.99 (1.43)		2.00 (1.40)	
Asia dummy							0.33 (0.49)	0.47 (0.50)	
Africa dummy							-0.27 (0.41)	-0.26 (0.41)	
"Other" continent dummy							1.24 (0.84)	1.1 (0.84)	
R ²	0.27	0.30	0.13	0.13	0.47	0.47	0.30	0.33	0.28

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- 4 There are enough cases that lots have scores of Z that are just above and just below T .

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- Condition 3 is a generally singular causal claim about the dynamics of the treatment-assigning system.

Example: Maimonides' Rule

“The number of pupils assigned to each teacher is twenty-five. If there are fifty, we appoint two teachers. If there are forty, we appoint an assistant, at the expense of the town.” (Baba Bathra, Chapter II, page 21a; translated by Epstein 1976: 214)

Example: Maimonides' Rule

“Twenty-five children may be put in charge of one teacher. If the number in the class exceeds twenty-five but is not more than forty, he should have an assistant to help with the instruction. If there are more than forty, two teachers must be appointed.”
(Maimonides, given in Hyamson 1937: 58b)

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- Angrist and Lavy (1999) use this to carry out an RDD analysis of the effects of class size on educational outcomes.

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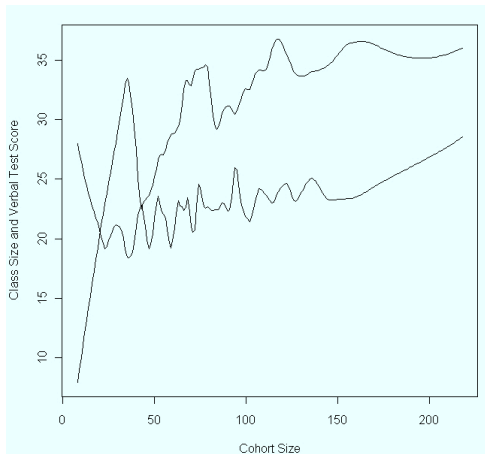


Figure: Age Cohorts and Verbal Test Scores

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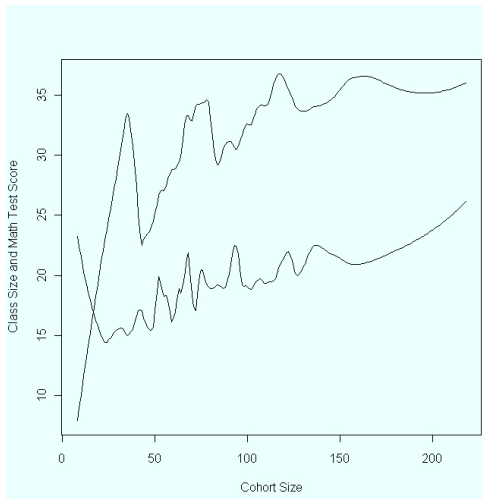


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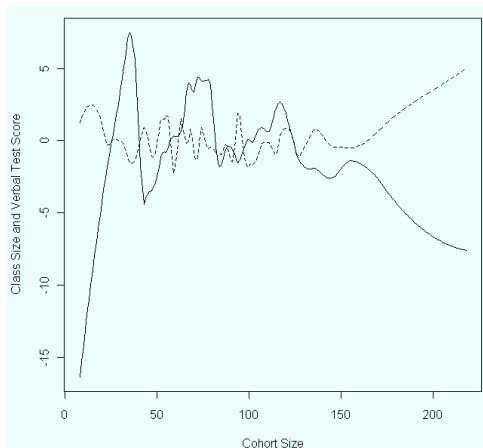


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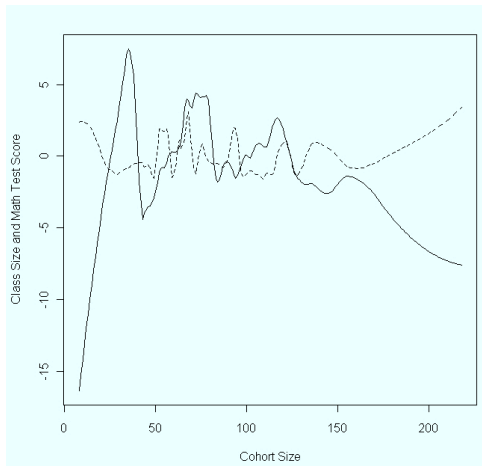


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RDD isn't a good idea if:

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- The variable which assigns the discontinuity is so coarsely measured or distributed that the cases nearest to the divide are not close to each other.

Issues of analysis:

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- How to estimate the treatment effect?

RDD

Irrespective of the manner in which the bandwidth is chosen, one should always investigate the sensitivity of the inferences to this choice, for example, by including results for bandwidths twice (or four times) and half (or a quarter of) the size of the originally chosen bandwidth. Obviously, such bandwidth choices affect both estimates and standard errors, but if the results are critically dependent on a particular bandwidth choice, they are clearly less credible than if they are robust to such variation in bandwidths. (Imbens and Lemieux 2008)

- Green, Leong, Kern, Gerber, and Larimer find that an estimate of the optimal bandwidth proposed by Imbens and Kalyanaraman, in conjunction with local linear regression, helps RDD come very close to replicating experimental results.

Case Selection and Natural Experiments

IV in R

RDD in R

Design Case Study After IV or RDD

Choose an article of your preference, or one from my website

Consider elements to test:

- 1 Measurement
- 2 Mechanism Hypotheses
- 3 Outliers
- 4 IV/RDD Assumptions