Multi-Method 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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- Regression-Discontinuity Design

Classic Natural Experiment

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

Classic Natural Experiment

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- Process tracing and the cause of the cause.

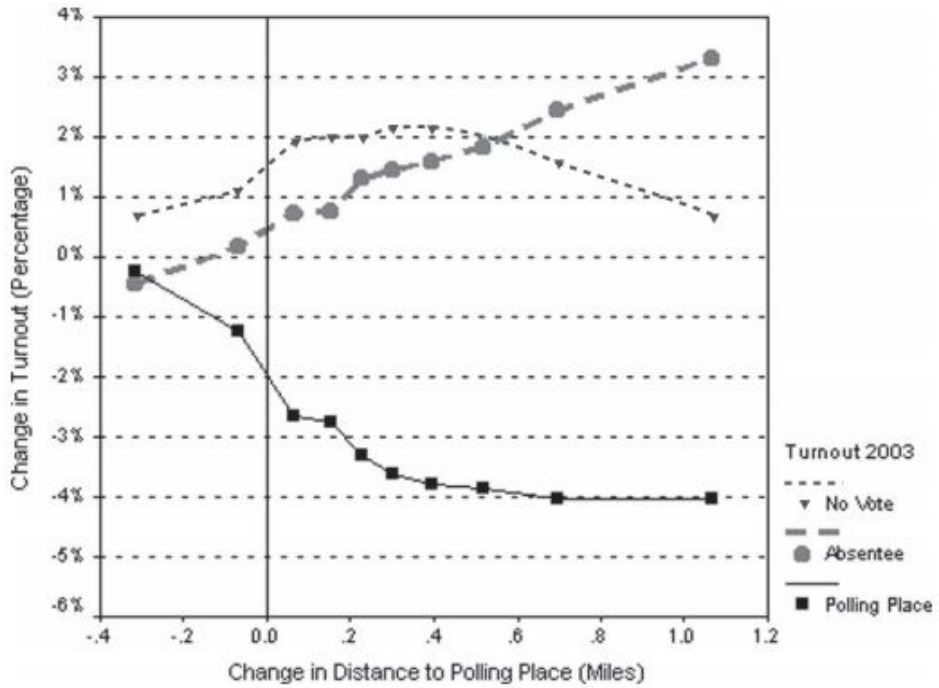
Classic Natural Experiment

- Process tracing and the cause of the cause.
- Process tracing to compare mechanisms inside and outside of the natural experiment.

Snow on Cholera

Brady and McNulty on Costs of Voting

FIGURE 3. Search and Transportation Effects



Vietnam War Draft Lottery

Statisticians Charge Draft Lotter'y Was Not Random

By DAVID E. ROSENBAUM JAN. 4, 1970

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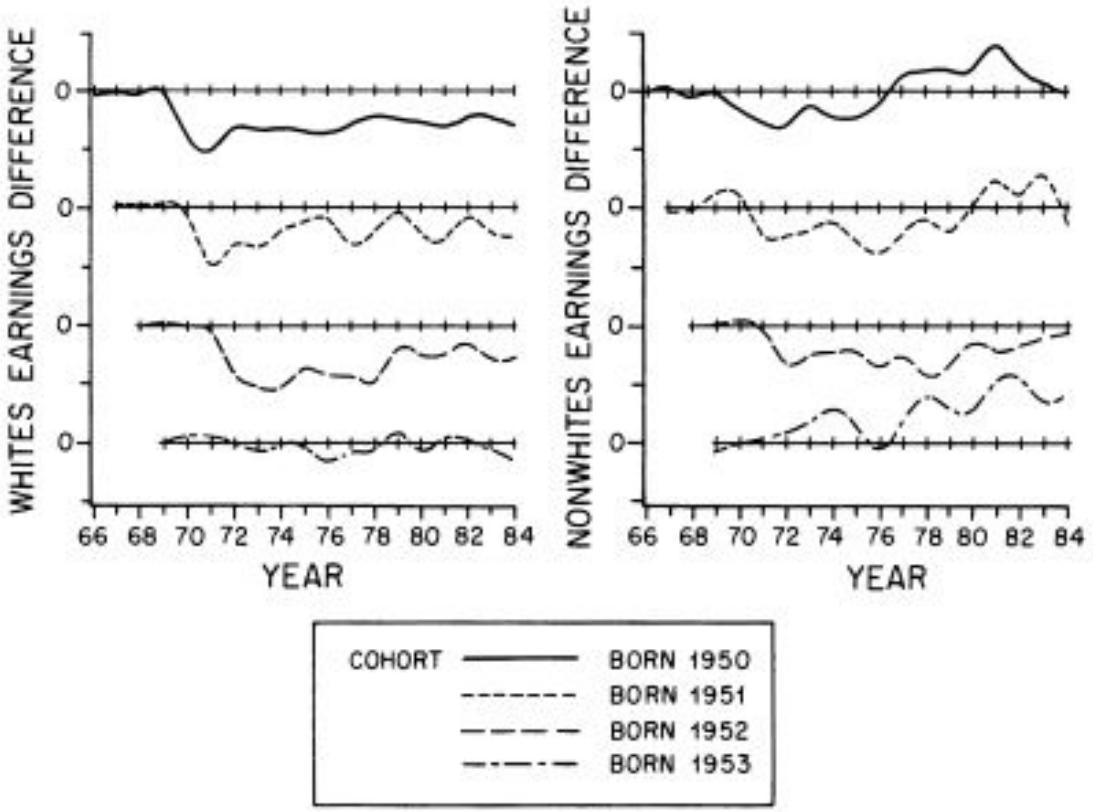
WASHINGTON, Jan. 3—The new draft lottery is being challenged by statisticians and politicians on the ground that the selection process did not produce a truly random result.



Notes: The figure plots the difference in FICA taxable earnings by draft-eligibility status for the four cohorts born 1950–53. Each tick on the vertical axis represents $500 real (1978) dollars.

FIGURE 2. THE DIFFERENCE IN EARNINGS BY DRAFT-ELIGIBILITY STATUS

Lottery Winners and Political Attitudes

IV Natural Experiment

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1. "Nature" randomizes a cause of the treatment.
   - Call the treatment X.
   - Call the randomized cause of the treatment Z.

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2. Z only affects Y through its effects on X.
3. Treatment caused by the randomized cause has the same effect as treatment with any other cause would have.

IV Natural Experiment

- Process tracing backwards from the cause of the cause.

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IV Natural Experiment

- Process tracing backwards from the cause of the cause.
- Process tracing forward from the cause of the cause to the cause.
- Process tracing between the cause and the outcome in a matched pair of cases.

Colonialism and Development

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(potential) settler mortality $\Rightarrow$ settlements

$\Rightarrow$ early institutions $\Rightarrow$ current institutions

$\Rightarrow$ current performance.

Colonialism and Development

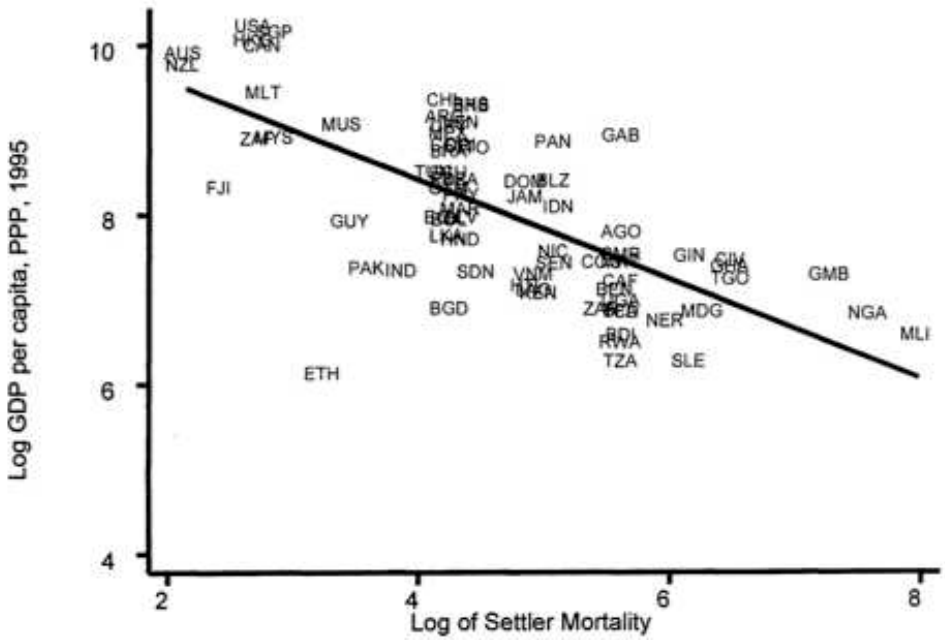

FIGURE 1. REDUCED-FORM RELATIONSHIP BETWEEN INCOME AND SETTLER MORTALITY

Colonialism and Development

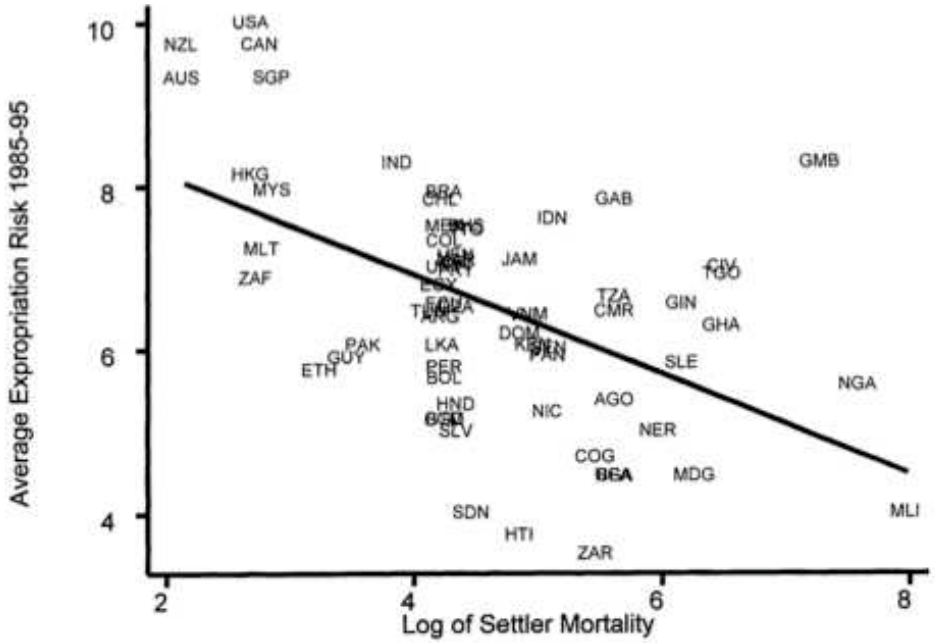

FIGURE 3. FIRST-STAGE RELATIONSHIP BETWEEN SETTLER MORTALITY AND EXPROPRIATION RISK

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	1.00	1.28	1.21	0.58	0.58	0.98	1.10	0.98
	(0.16)	(0.22)	(0.36)	(0.35)	(0.10)	(0.12)	(0.30)	(0.46)	(0.17)
Latitude		−0.65		0.94		0.04		−1.20	
		(1.34)		(1.46)		(0.84)		(1.8)	
Asia dummy							−0.92	−1.10	
							(0.40)	(0.52)	
Africa dummy							−0.46	−0.44	
							(0.36)	(0.42)	
"Other" continent dummy							−0.94	−0.99	
							(0.85)	(1.0)	
Panel B: First Stage for Average Protection Against Expropriation Risk in 1985–1995									
Log European settler mortality	−0.61	−0.51	−0.39	−0.39	−1.20	−1.10	−0.43	−0.34	−0.63
	(0.13)	(0.14)	(0.13)	(0.14)	(0.22)	(0.24)	(0.17)	(0.18)	(0.13)
Latitude		2.00		−0.11		0.99		2.00	
		(1.34)		(1.50)		(1.43)		(1.40)	
Asia dummy							0.33	0.47	
							(0.49)	(0.50)	
Africa dummy							−0.27	−0.26	
							(0.41)	(0.41)	
"Other" continent dummy							1.24	1.1	
							(0.84)	(0.84)	
R^2	0.27	0.30	0.13	0.13	0.47	0.47	0.30	0.33	0.28

Vietnam Draft Lottery and Returns to Education

NBER WORKING PAPERS SERIES

ESTIMATING THE PAYOFF TO SCHOOLING USING THE VIETNAM-ERA DRAFT LOTTERY

Joshua D. Angrist

Alan B. Krueger

Table 3

2SLS and OLS Wage Equation Estimates
Dependent Variable: Log Real Weekly Wage
Men Born 1944 - 1953

Independent Variables	Mean [SD]	2SLS (1)	2SLS (2)	2SLS (3)	OLS (4)
Intercept	—	4.551 (0.199)	4.639 (0.033)	4.543 (0.201)	4.647 (0.025)
Education	13.39 [2.92]	0.066 (0.015)	0.059 (0.001)	0.066 (0.015)	0.059 (0.001)
Veteran Status	0.34 [0.43]	0.022 (0.007)	0.041 (0.055)	0.042 (0.055)	0.022 (0.007)
Black	0.07 [0.26]	-0.161 (0.017)	-0.167 (0.013)	-0.162 (0.017)	-0.167 (0.013)
Hispanic and Other Races	0.03 [0.18]	-0.121 (0.021)	-0.113 (0.020)	-0.118 (0.023)	-0.116 (0.019)
Central City	0.23 [0.42]	0.016 (0.010)	0.019 (0.009)	0.017 (0.011)	0.018 (0.009)
Balance of SMSA	0.32 [0.47]	0.131 (0.013)	0.136 (0.008)	0.131 (0.013)	0.136 (0.008)

RDD

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2. Cases are assigned to treatment if and only if Z is greater than a predetermined threshold value, T.
3. There are enough cases that lots have scores of Z that are just above and just below T.

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- Assumptions 1 and 3 can be checked with the quantitative data.

RDD

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- For assumption 2, process trace the cause of the cause and the cause of the cause of the cause.

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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- Maimonides' Rule is used to determine class sizes in Israel.

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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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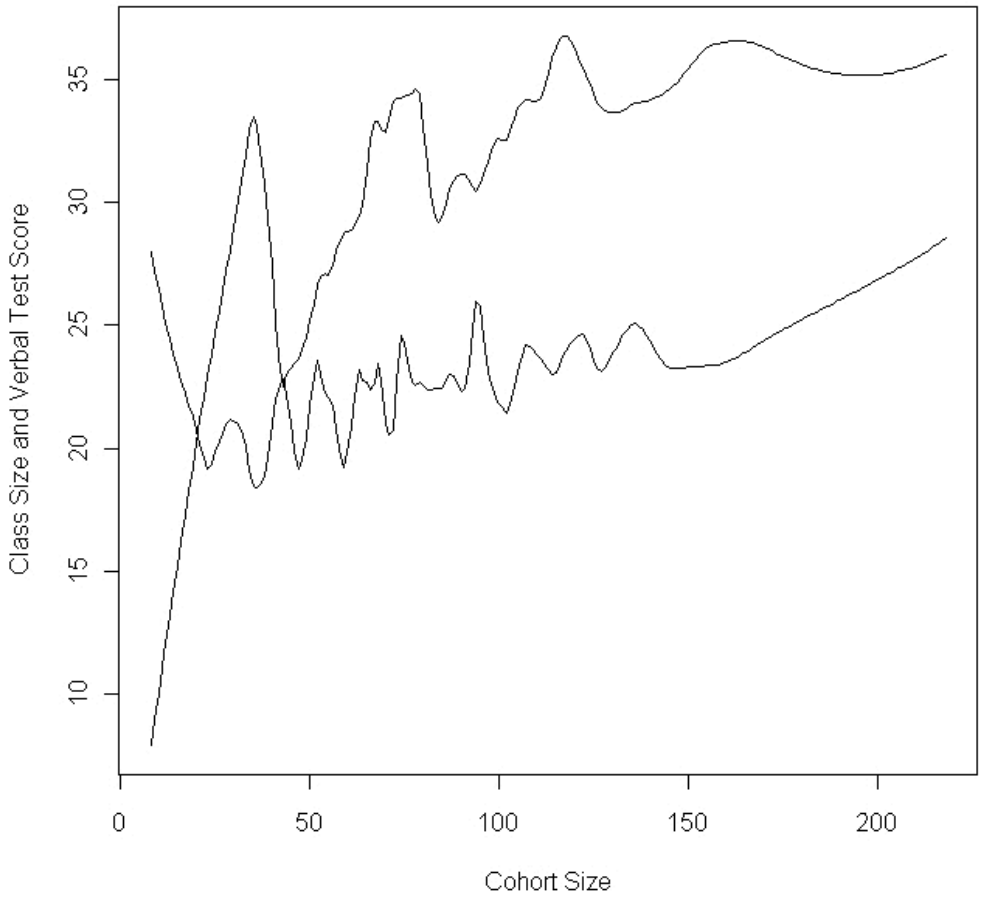

Figure: Age Cohorts and Verbal Test Scores

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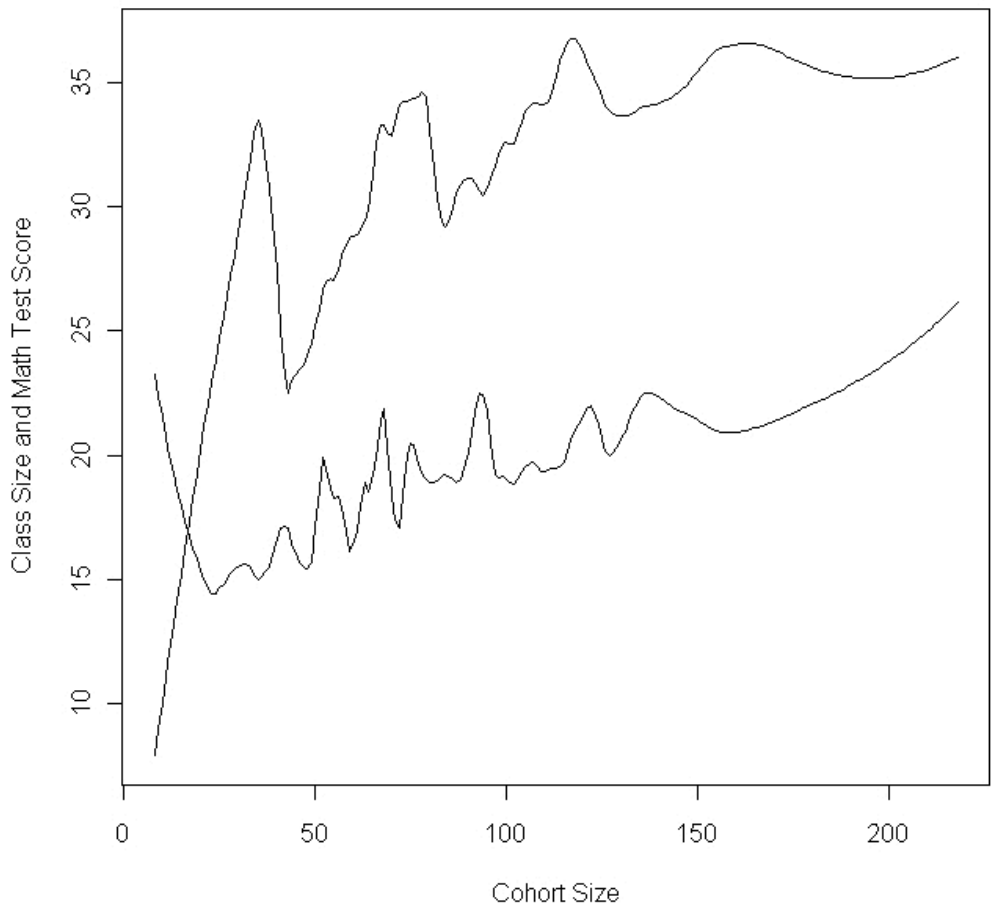

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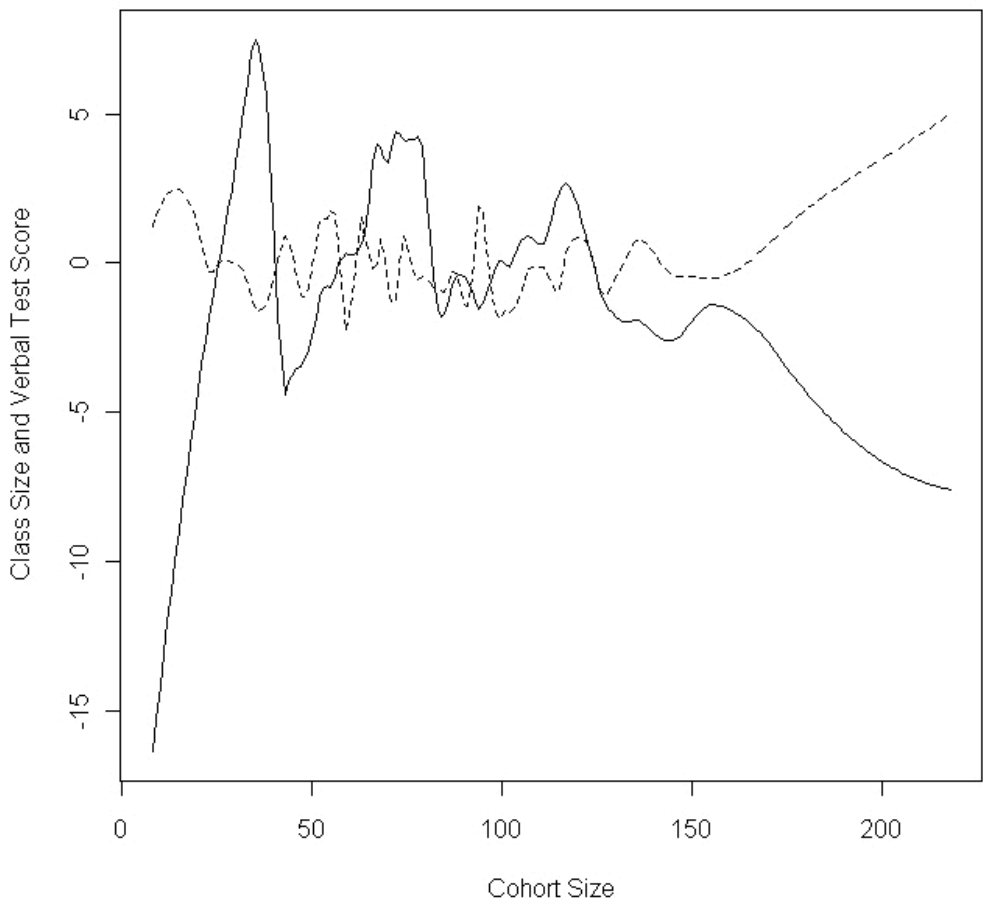

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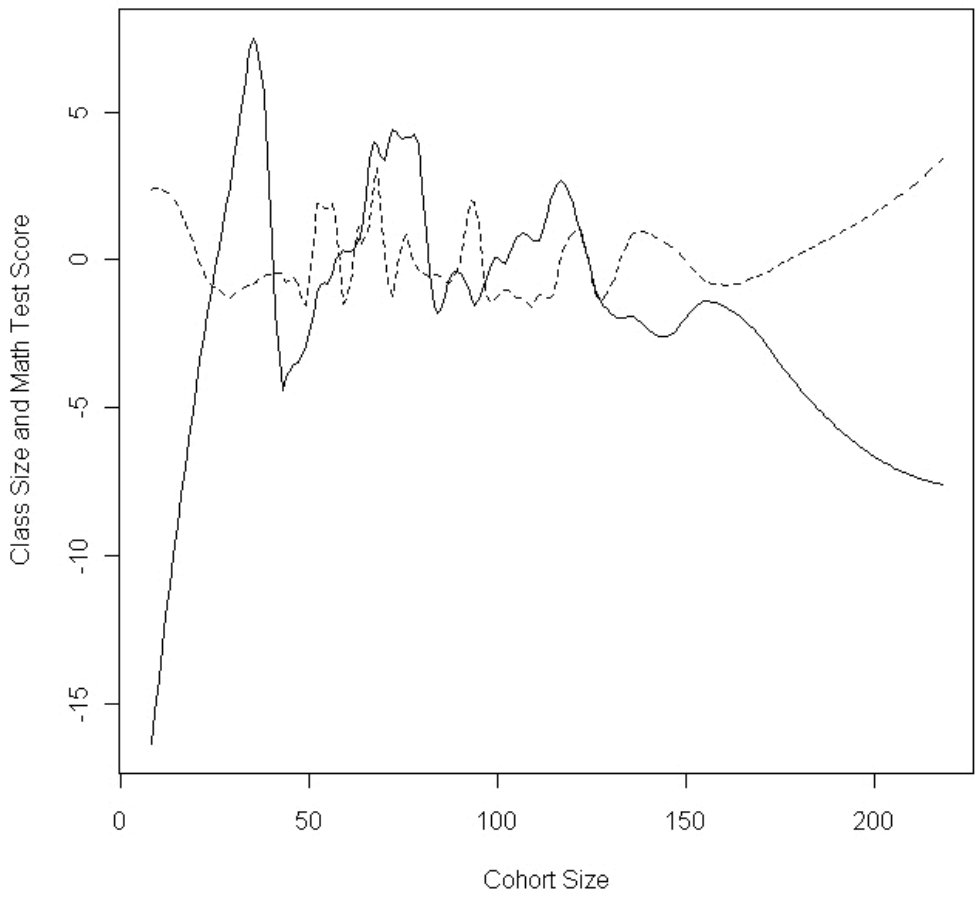

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RDD

RDD isn't a good idea if:

- Actors are aware of the discontinuity and adjust their behavior accordingly.

RDD

RDD isn't a good idea if:

- Actors are aware of the discontinuity and adjust their behavior accordingly.
- 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.

Case Selection and Natural Experiments

- Classic natural experiments: extreme values of the cause
- IV natural experiments: extreme values of the cause of the cause; surprising values of the cause
- RDD natural experiments: cases with power or privilege