A National Study Comparing Charter and Traditional Public Schools Using Propensity Score Analysis

Dissertation Proposal

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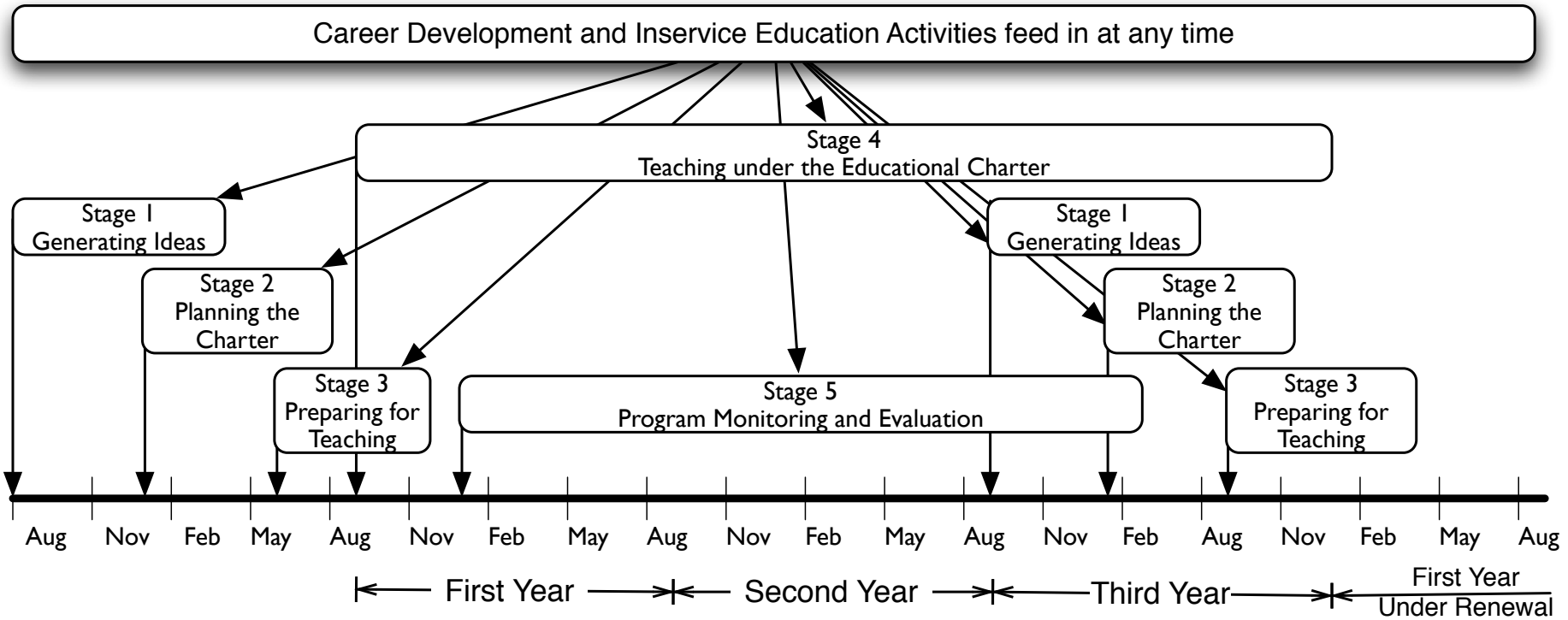
Agenda

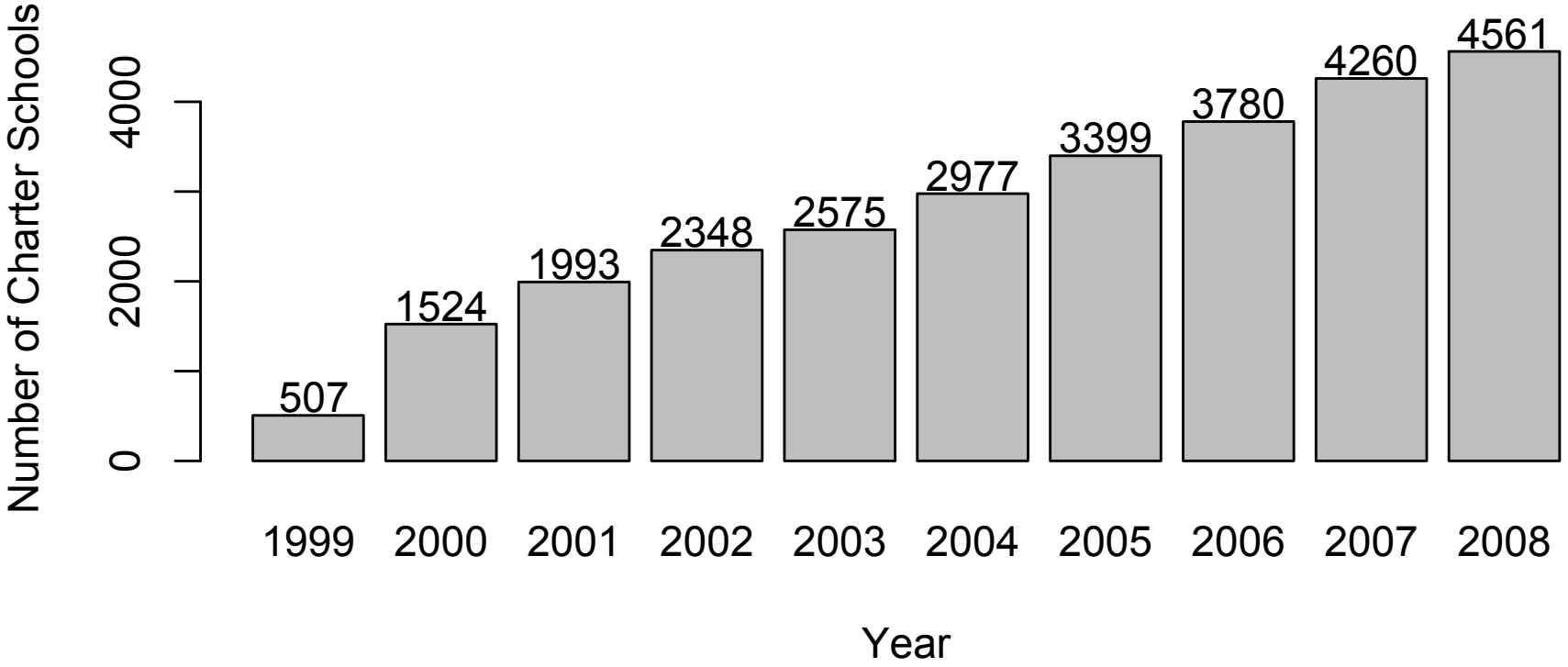
1. Overview
2. Method
3. Analysis
4. Preliminary Results
5. Discussion

What are Charter Schools?

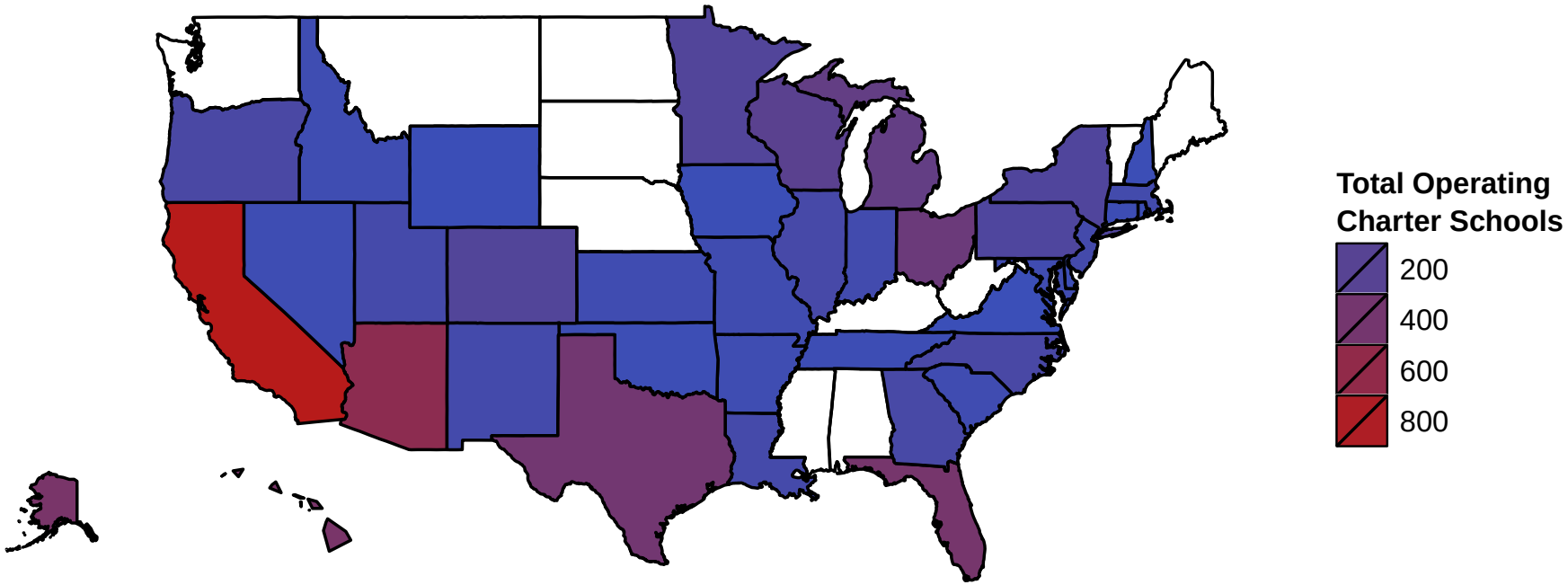
The first charter school opened in Minnesota in 1991 In principle, charter schools have opted out of bureaucratic rules and union contracts in order to gain academic autonomy. The standard argument has become that this autonomy will lead to higher student test scores and better academic environments (Wells, 2002). The idea is that, under the charter framework, teachers, administrators, students and the community that comprise the charter school would be free to innovate



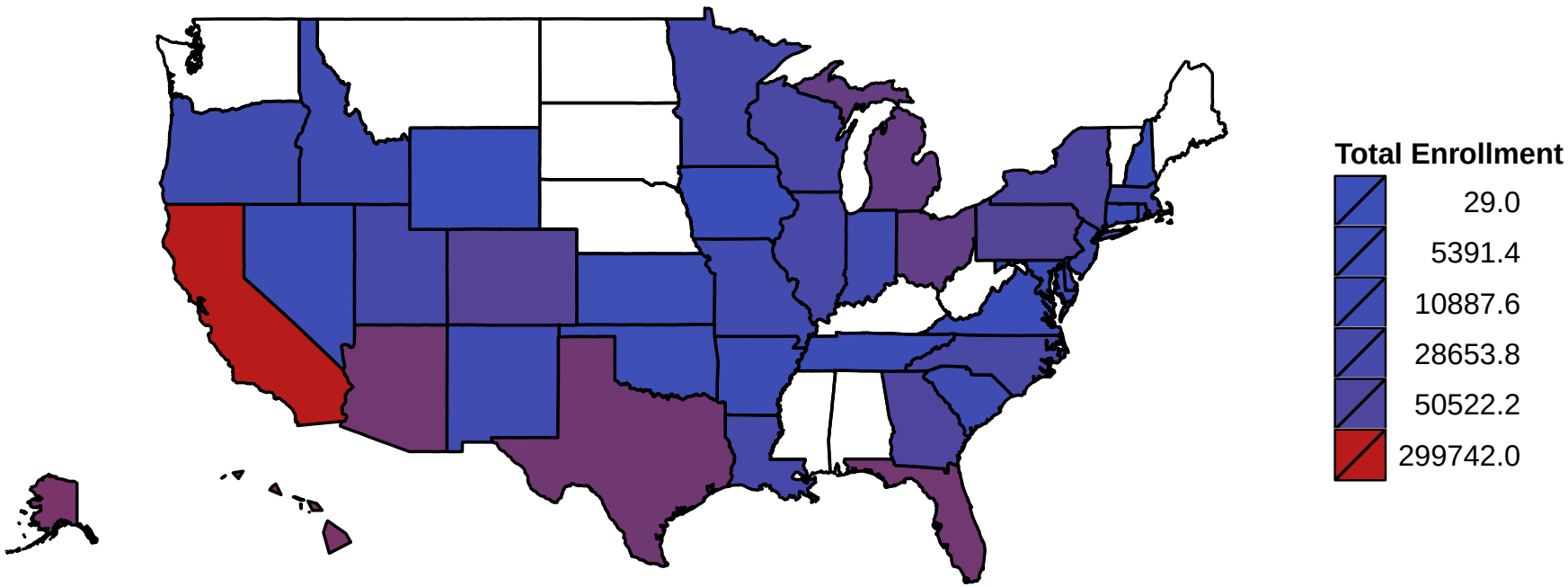
Growth in Number of Charter Schools



Charter Schools are National (Operating)



Charter Schools are National (Enrollment)



National Studies Examining Charter and Traditional Public Schools

1. Braun, Jenkins, and Grigg (2006) examined charter and traditional public schools using hierarchal linear modeling (HLM) with NAEP 2005. They found that there was often no difference, and in some instances charter school students performed worse.
2. *The CREDO Study* - Center for Research on Education Outcomes (2009) conducted a study of more than 1.7 million records from 2400 charter within 16 states. The methodology involves creating a Virtual Control Record (VCR) for each charter school student which is used to find matching student from an eligible traditional public school. Overall results show that charter school students performed, on average, 0.01 and 0.03 standard deviations below public school students for reading and math, respectively.

If, however, charter schools are not improving the achievement of disadvantaged children, it may be that the cause of low student performance is not bureaucratic rules but something else. When a treatment is based on a diagnosis, and the treatment doesn't work, it is prudent to examine not only whether the treatment should be improved, but also whether the diagnosis might be flawed. (Carnoy, Jacobsen, Mishel, & Rothstein, 2005)

Issues with Charter Schools Research

1. The issue of selection bias
2. The variation in types or kinds of charter schools.
3. The nature of student achievement. Research has shown there are numerous factors that contribute to student success including, but not limited to, social economic status, parental education, motivation, etc. The ability to decipher how school choice contributes to student learning in the context of all the other factors cannot help but be difficult.

Guiding Research Questions

1. Given appropriate adjustments based on available student data, is there a discernible difference between charter and public schools with regard to math and reading scores at grades 4 and 8?
2. If so, what is the nature and magnitude of this difference for the two outcomes reading and mathematics (for two grade levels)?
3. And finally, do identified differences differ between states with differing charter school laws?

Propensity Score Analysis

1. *Propensity score analysis using stratification.*
   1. Full logistic regression. This method will estimate propensity scores using logistic regression with all available covariates.
   2. Logistic regression with step AIC. The `stepAIC` in the `MASS` package (Venables & Ripley, 2002) will select the best logistic model based upon the Akaike Information Criterion (Akaike, 1974).
   3. Conditional inference trees.
2. *Propensity score matching.*
   1. One-to-one
   2. One-to-five
   3. One-to-ten.

   A dependent sample analysis will be performed on the resulting matched pairs (Austin, 2011).
3. *Multilevel propensity score analysis.*
   1. Full logistic regression.
   2. Logistic regression with step AIC.
   3. Conditional inference trees.

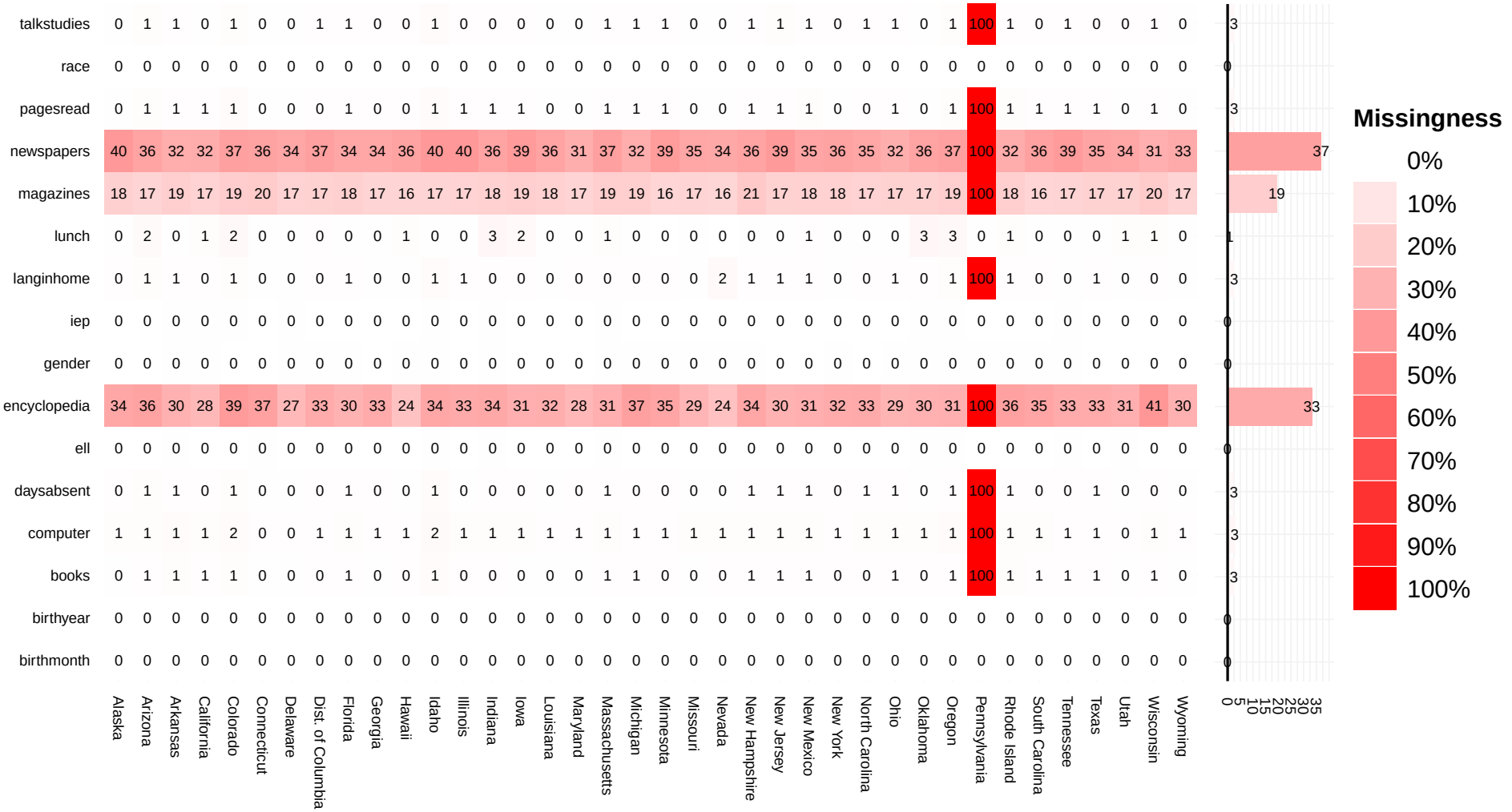
National Assessment of Educational Progress (NAEP)

1. Congressionally mandeted.
2. Started in 1971
3. Provides national measures of student achievement in many subjects including mathematics, reading, science, writing, history, civics, and the arts.
4. The 2007 assessment included over 6,000 public schools and over 200 charter schools comprising of over 145,000 and 3,000 students, respectively.

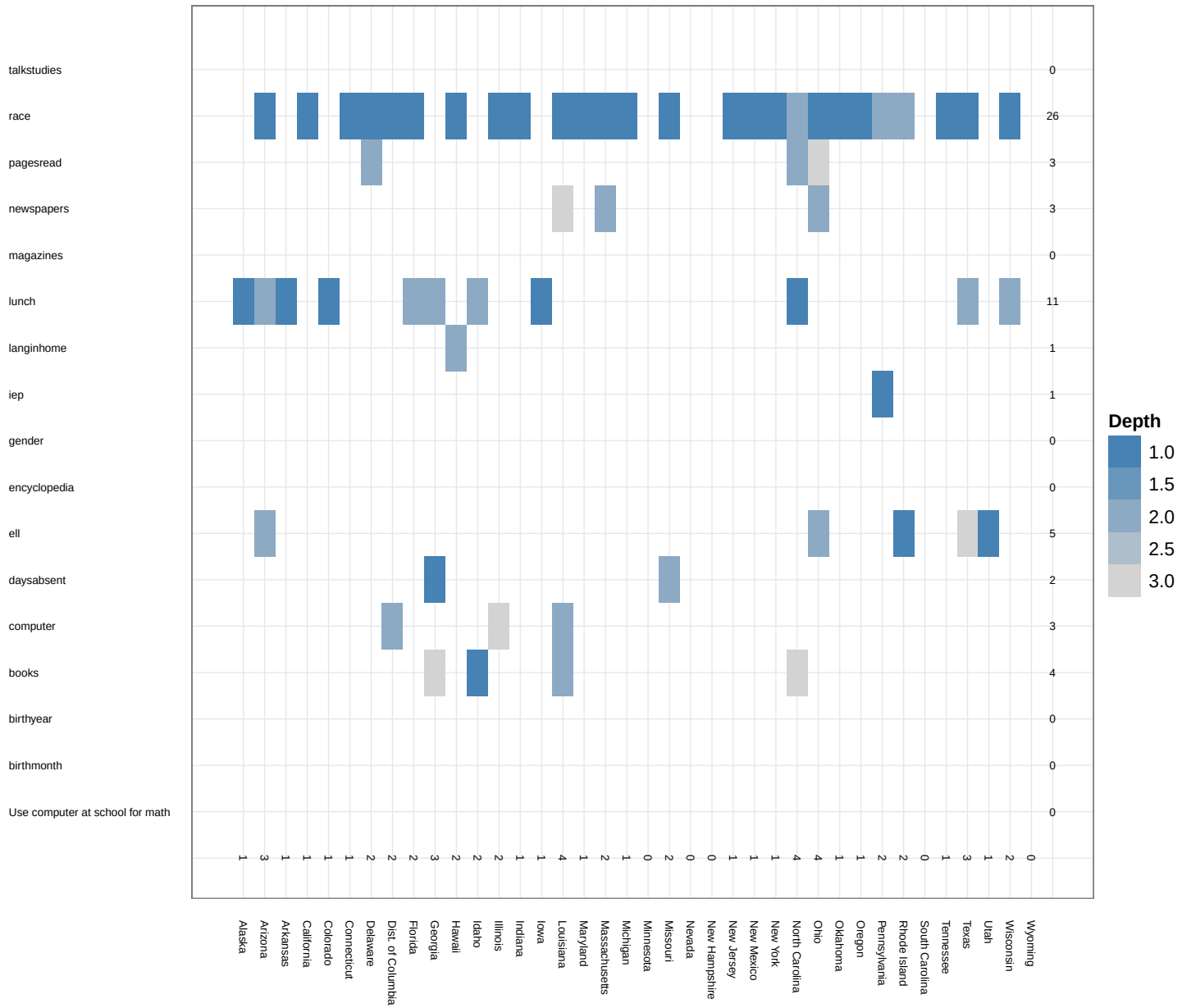
Covariates Available from NAEP

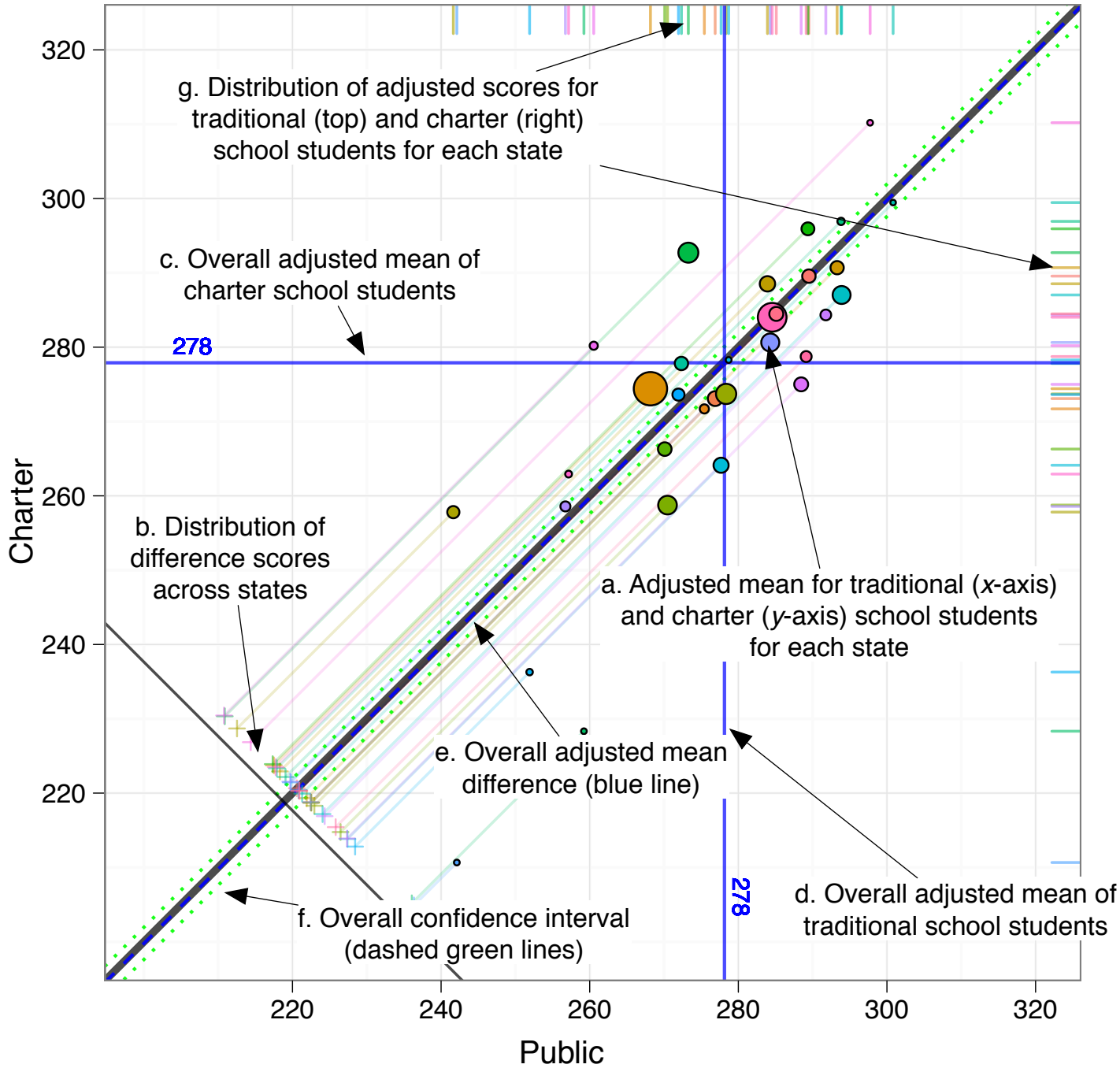
1. Are you Hispanic or Latino? [No, I am not Hispanic or Latino; Yes, I am Mexican, Mexican American, or Chicano; Yes, I am Puerto Rican or Puerto Rican American; Yes, I am Cuban or Cuban American; Yes, I am from some other Hispanic or Latino background]
2. Which of the following best describes you? [White; Black or African American; Asian; American Indian or Alaska Native; Native Hawaiian or other Pacific Islander]
3. Does your family get a newspaper at least four times a week?
4. Does your family get any magazines regularly?
5. About how many books are there in your home?
6. Is there a computer at home that you use?
7. Is there an encyclopedia in your home? It could be a set of books, or it could be on the computer.
8. About how many pages a day do you have to read in school and for homework?
9. How often do you talk about thinks you have studied in school with someone in your family?
10. How many days were you absent from school in the last month?
11. How far in school did your mother go? [Grade 8 Only]

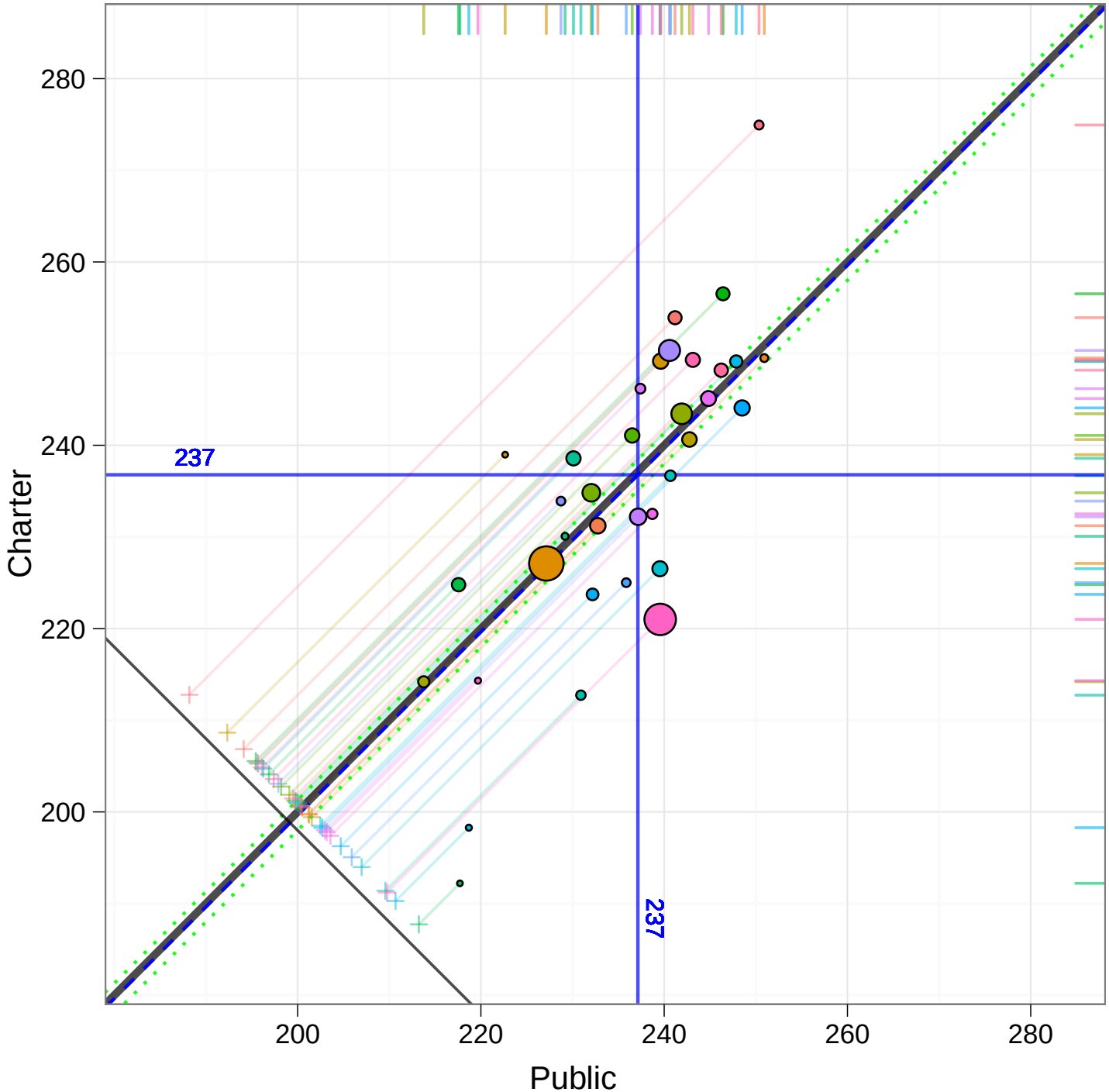
Missing Data

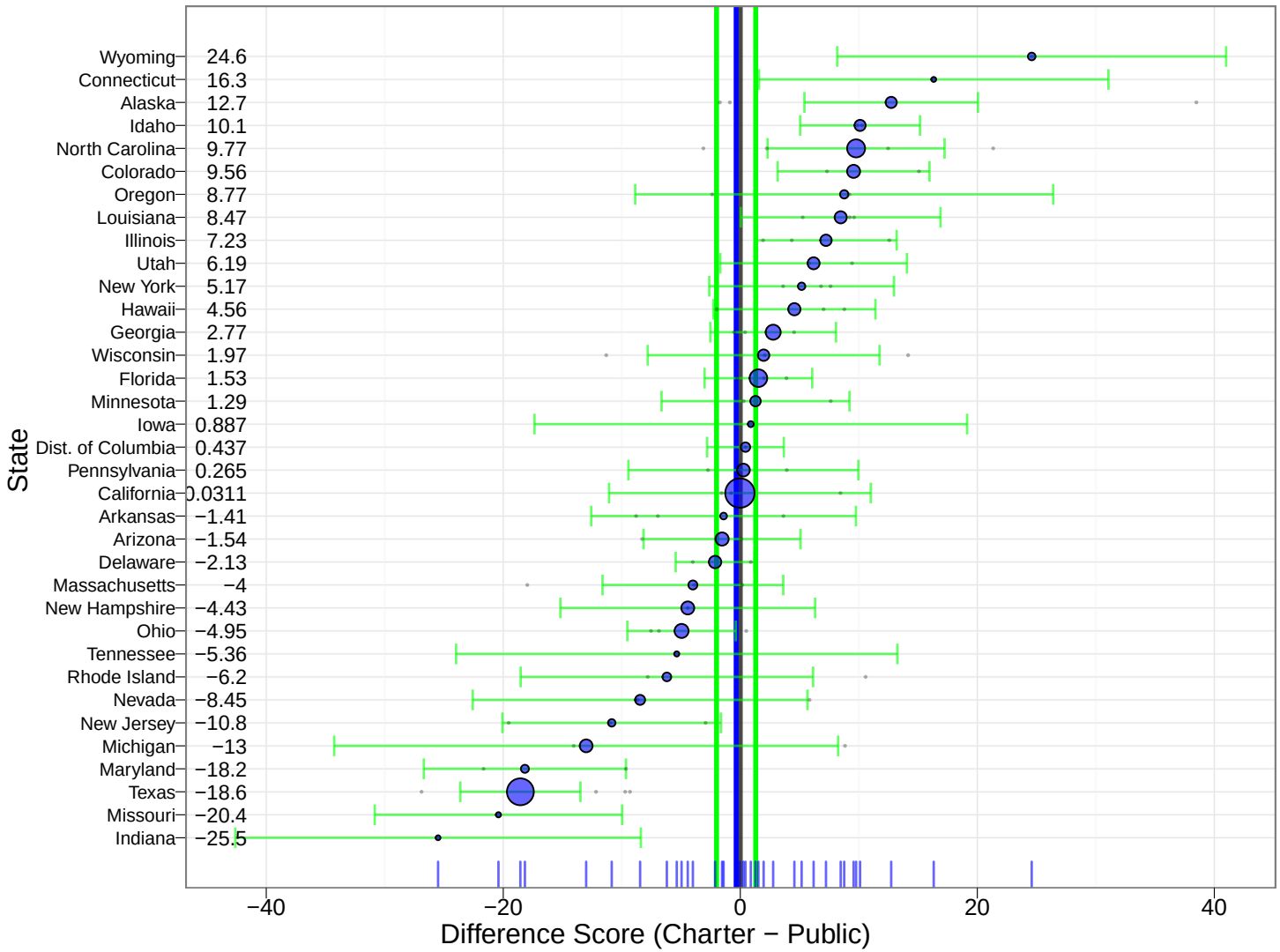


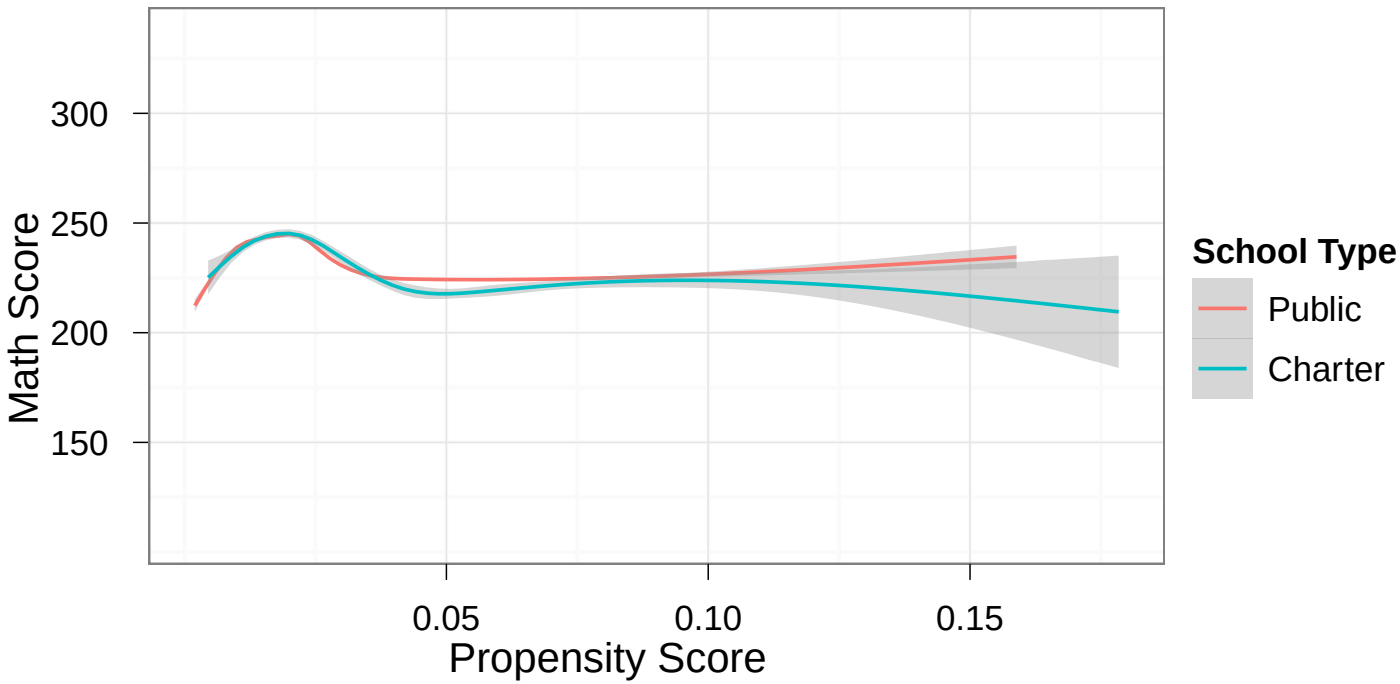
For the logistic regression models the `MICE` (van Buuren & Groothuis-Oudshoorn, n.d.) package will be used to impute missing values.

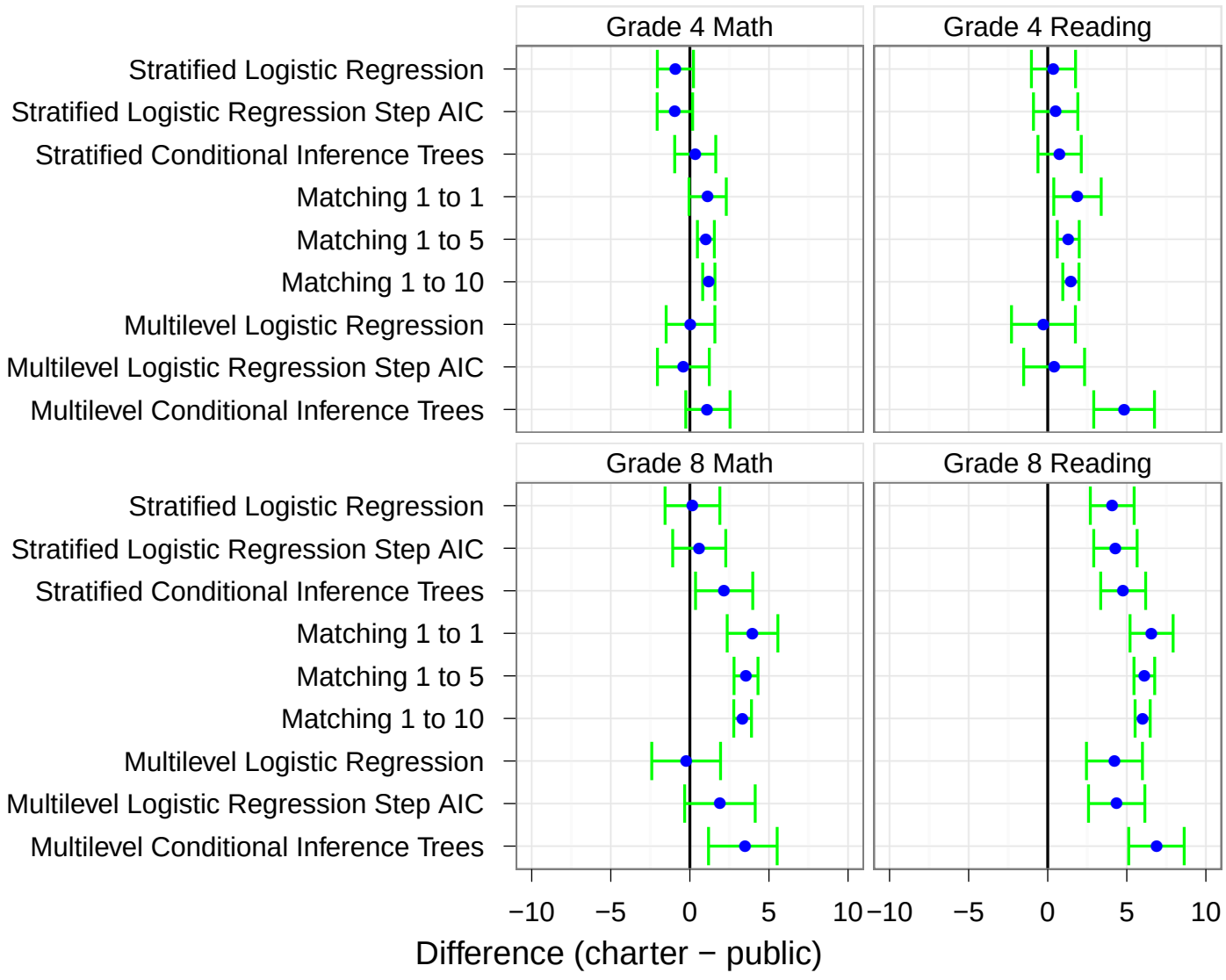

talkstudies
race
pagesread
newspapers
magazines
lunch
langinhome
iep
gender
encyclopedia
ell
daysabsent
computer
books
birthyear
birthmonth
Use computer at school for math
0
26
3
3
0
11
1
1
0
0
5
2
3
4
0
0
0
Alaska
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
Dist. of Columbia
Florida
Georgia
Hawaii
Idaho
Illinois
Indiana
Iowa
Louisiana
Maryland
Massachusetts
Michigan
Minnesota
Missouri
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
Tennessee
Texas
Utah
Wisconsin
Wyoming
Depth
1.0
1.5
2.0
2.5
3.0


g. Distribution of adjusted scores for traditional (top) and charter (right) school students for each state
c. Overall adjusted mean of charter school students
278
b. Distribution of difference scores across states
a. Adjusted mean for traditional (x-axis) and charter (y-axis) school students for each state
e. Overall adjusted mean difference (blue line)
f. Overall confidence interval (dashed green lines)
278
d. Overall adjusted mean of traditional school students
Charter
Public
320
300
280
260
240
220
220
240
260
280
300
320


280
260
240
220
200
Charter
237
237
200
220
240
260
280
Public


State
Wyoming 24.6
Connecticut 16.3
Alaska 12.7
Idaho 10.1
North Carolina 9.77
Colorado 9.56
Oregon 8.77
Louisiana 8.47
Illinois 7.23
Utah 6.19
New York 5.17
Hawaii 4.56
Georgia 2.77
Wisconsin 1.97
Florida 1.53
Minnesota 1.29
Iowa 0.887
Dist. of Columbia 0.437
Pennsylvania 0.265
California 0.0311
Arkansas −1.41
Arizona −1.54
Delaware −2.13
Massachusetts −4
New Hampshire −4.43
Ohio −4.95
Tennessee −5.36
Rhode Island −6.2
Nevada −8.45
New Jersey −10.8
Michigan −13
Maryland −18.2
Texas −18.6
Missouri −20.4
Indiana −25.5
−40
−20
0
20
40
Difference Score (Charter − Public)


Math Score
300
250
200
150
0.05
0.10
0.15
Propensity Score
School Type
Public
Charter


Grade 4 Math
Grade 4 Reading
Grade 8 Math
Grade 8 Reading
Stratified Logistic Regression
Stratified Logistic Regression Step AIC
Stratified Conditional Inference Trees
Matching 1 to 1
Matching 1 to 5
Matching 1 to 10
Multilevel Logistic Regression
Multilevel Logistic Regression Step AIC
Multilevel Conditional Inference Trees
−10
−5
0
5
10
Difference (charter − public)

Related Projects

- All of the R and LaTeX code will be available on Github (`http://github.com/jbryer/Dissertation`).
- `multilevelPSA` - An R package for the methods outlined here. Hosted at `http://github.com/jbryer/multilevelPSA`
- `naepR` - An R package for accessing and analyzing NAEP data. This work is being supported by Educational Testing Services.
- I am writing a chapter on using NAEP with R for the *NAEP Primer* with Emmanual Sikali.

Thank You

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http://bryer.org
http://github.com/jbryer/Dissertation
http://github.com/jbryer/multilevelpsa

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