Do Low-Income Students Have Equal Access to Effective Teachers?

Conference on Using Administrative Data for Program Evaluation and Research: Recent Successes and Next Steps

Hosted by the U.S. Census Bureau

Washington, DC   November 1-2, 2016

Philip Gleason

Senior Fellow, Mathematica Policy Research

Evidence Needed on Access to Effective Teachers

- **Large gap in achievement of low-income and high-income students**

- **Teachers vary considerably in their effectiveness at improving student achievement**

- **Do differences in students' access to effective teachers explain the student achievement gap?**

MATHEMATICA
Policy Research

Research Questions

- **Are low-income students taught by less effective teachers than high-income students?**

- **To what extent would providing equal access to effective teachers reduce the student achievement gap?**

MATHEMATICA
Policy Research

Study Approach

- **Recruit large number of districts (30)**

- **Obtain administrative data over time from each**

  - **Student characteristics/achievement, teacher characteristics, teacher-student links (grades 4-8)**

  - **2008-09 through 2012-13**

- **Measure teacher effectiveness**

- **Compare teachers of high- and low-income students**

Administrative Data

- **Student data**
  - **Scores on state assessments, linked over time**
  - **Free/reduced-price meal status**
  - **Race/ethnicity, ELL status, IEP status**

- **Teacher characteristics**
  - **School, grade, subject**
  - **Prior experience**
  - **Linked over time**

- **Teacher-student links**

Strengths of Administrative Data

- **Wide availability**

- **Consistency across districts and studies**

- **In many ways, data quality is high**
  - **Little missing data for many items**
  - **Less chance of response bias**
  - **Often used for operational purposes, so districts have incentive to ensure high quality**

- **Lower cost of collecting**

MATHEMATICA
Policy Research

Limitations of Administrative Data

- **Process to obtain data can be cumbersome**

- **Only certain kinds of information available**
  - **Only what is available and useful to districts**
  - **Little info on family background, attitudinal variables**

- **Data typically not collected for research purposes**
  - **Documentation often very limited**
  - **May affect what information is retained and how it is defined (e.g., experience)**

MATHEMATICA
Policy Research

Specific Data Issues: Measuring Family Income

- **Certification for free or reduced-price (RP) meals**
  - Low income if eligible: <185% of poverty

- **Limitations of measure**
  - Binary measure does not capture variation within either group
  - Some income-eligible households do not become certified
  - 9% of certified households are not eligible (Moore et al. 2015)

- **Interpretation of district data not clear in schools using USDA provisions to provide free meals to all**

Specific Data Issues: Teacher-Student Links

- **Data must correctly identify each student's English/language arts and math teacher**

    - **Also allows us to identify students who share classroom**

- **Data errors may be common if data not used for teacher evaluation**

    - **Random data errors**

    - **Classrooms with two teachers**

    - **Test scores assigned to homeroom rather than subject teacher**

- **Problems more common at elementary school level**

MATHEMATICA
Policy Research

Misclassification in Administrative Data

Grade	Percent of Teacher-Student Links That Are Incorrect	
Grade	Math	Reading
2010–2011		
Grade 4	17.4	16.0
Grade 5	15.9	14.0
Grade 6	6.5	6.3
Grade 7	2.5	4.1
Grade 8	4.4	4.0
2011–2012		
Grade 4	21.7	15.8
Grade 5	21.9	22.2
Grade 6	6.1	7.1
Grade 7	2.4	3.0
Grade 8	4.8	3.0

Source: Teh et al. (2013) using data from District of Columbia Public Schools.

Steps Taken to Address Data Issues

- **Data validation checks and cleaning**
  - Compare % free/RP in a school from year to year
  - Check # students per teacher, grades covered by teacher
  - Look for unusual situations

- **Follow up with districts to ask data-related questions**

- **Drop questionable data**
  - Dropped one district with unreliable free/RP data
  - Dropped 3 districts where teachers not linked over time
  - Dropped elementary grades in 14 districts with unreliable ES teacher-student links

MATHEMATICA
Policy Research

Study Sample and Methods: Measuring Access to Effective Teachers

Study Sample

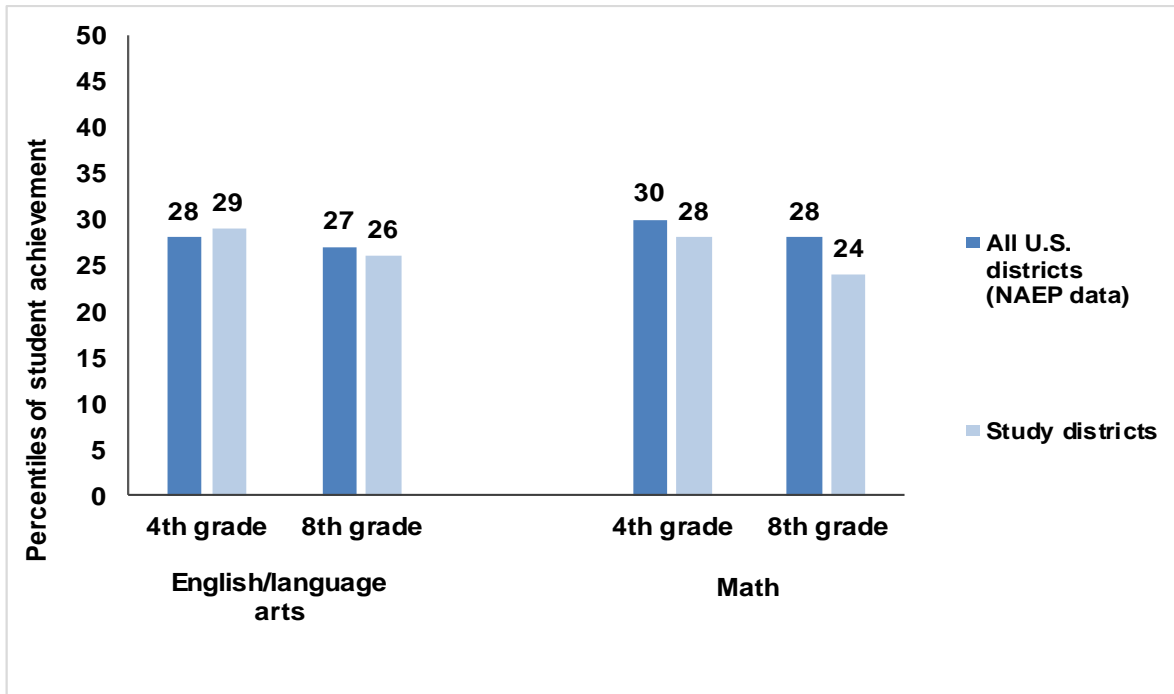|	All U.S. districts	100 largest U.S. districts	Study districts
District enrollment (district median)	1,000	70,000	70,000
Percentage of students eligible for free or reduced-price lunch	44%	53%	63%
Student race and ethnicity (percentages)			
White	55%	30%	23%
Black	17%	27%	29%
Hispanic	22%	34%	42%
Percentage English language learner students	9%	14%	19%

Source: 2008–2009 Common Core of Data.
Note: District enrollment is based on the size of the median district; the other characteristics are based on student-weighted averages for all districts. District enrollment is rounded to the nearest 10,000 to maintain confidentiality.

- **Study districts similar in size to 100 largest districts.**

- **Diverse in terms of student socio-economic status as well as race and ethnicity.**

MATHEMATICA
Policy Research

Low-, Medium-, and high-Poverty Schools

Study Sample

Average Student Achievement Gap by Poverty Status

- **Sizable achievement gaps in study districts**

- **Substantial variation in teacher effectiveness**

Source: Author calculations based on the 2009 National Assessment of Education Progress (NAEP) for all U.S. districts and for large city districts in NAEP's Urban District Assessment; and district administrative data for all 26 study districts in 2009.
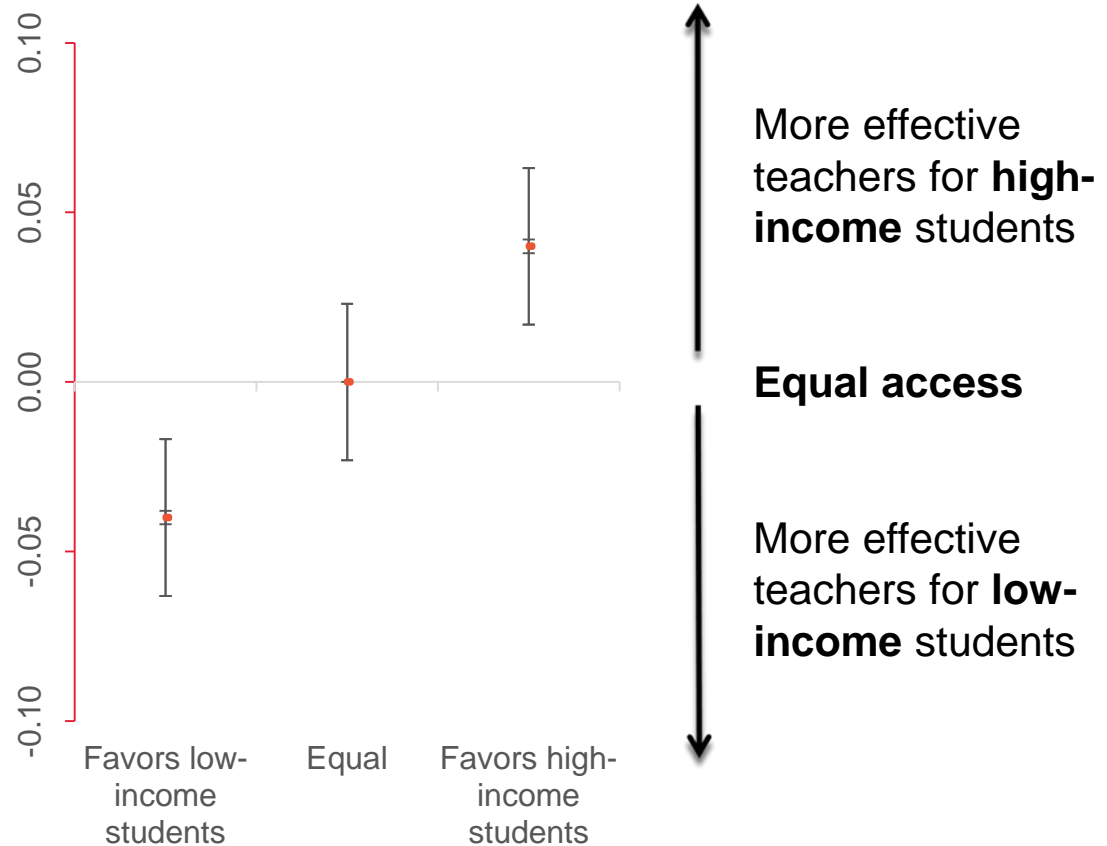Notes: The achievement gap is the difference in student achievement between students who are eligible for a free or reduced-price lunch and students who are ineligible for this benefit.

MATHEMATICA Policy Research

Measuring Access to Effective Teachers

- **Measure teacher effectiveness with value-added model.**

- **Define students eligible for free or reduced-price meals as low-income.**

- **Find difference between *average* value added of teachers of high- and low-income students (Effective Teaching Gap).**

Effective Teaching Gap
**(3 Hypothetical Districts)**

More effective teachers for **high-income** students

Equal access

More effective teachers for **low-income** students

MATHEMATICA
Policy Research

Findings: Access to Effective Teachers

MATHEMATICA
Policy Research

Small Differences in Effectiveness of Teachers of High- and Low-Income Students

**Average teacher effectiveness for high- and low-income students**
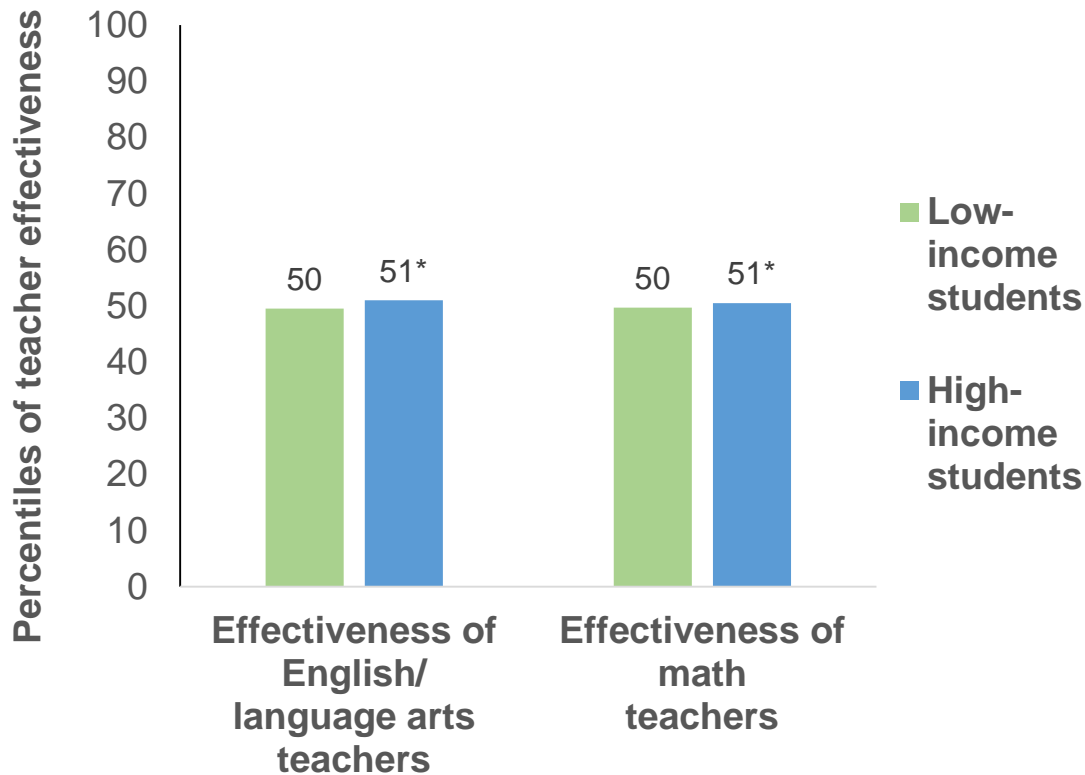
- **Effective teaching gap in ELA: 0.005**

- **Effective teaching gap in math: 0.004**

Results for 26 districts for years 1 to 5. Includes grades 4 to 8 for 12 districts and grades 6 to 8 for 14 districts. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts.
* Differences are statistically significant at the 0.05 level.

MATHEMATICA Policy Research

ETG Bart Chart

High- and Low-Income Students have Similar Chances of Having Most Effective, Least Effective Teachers

Percentage of low-income and high-income students taught by teachers at different levels of effectiveness, math
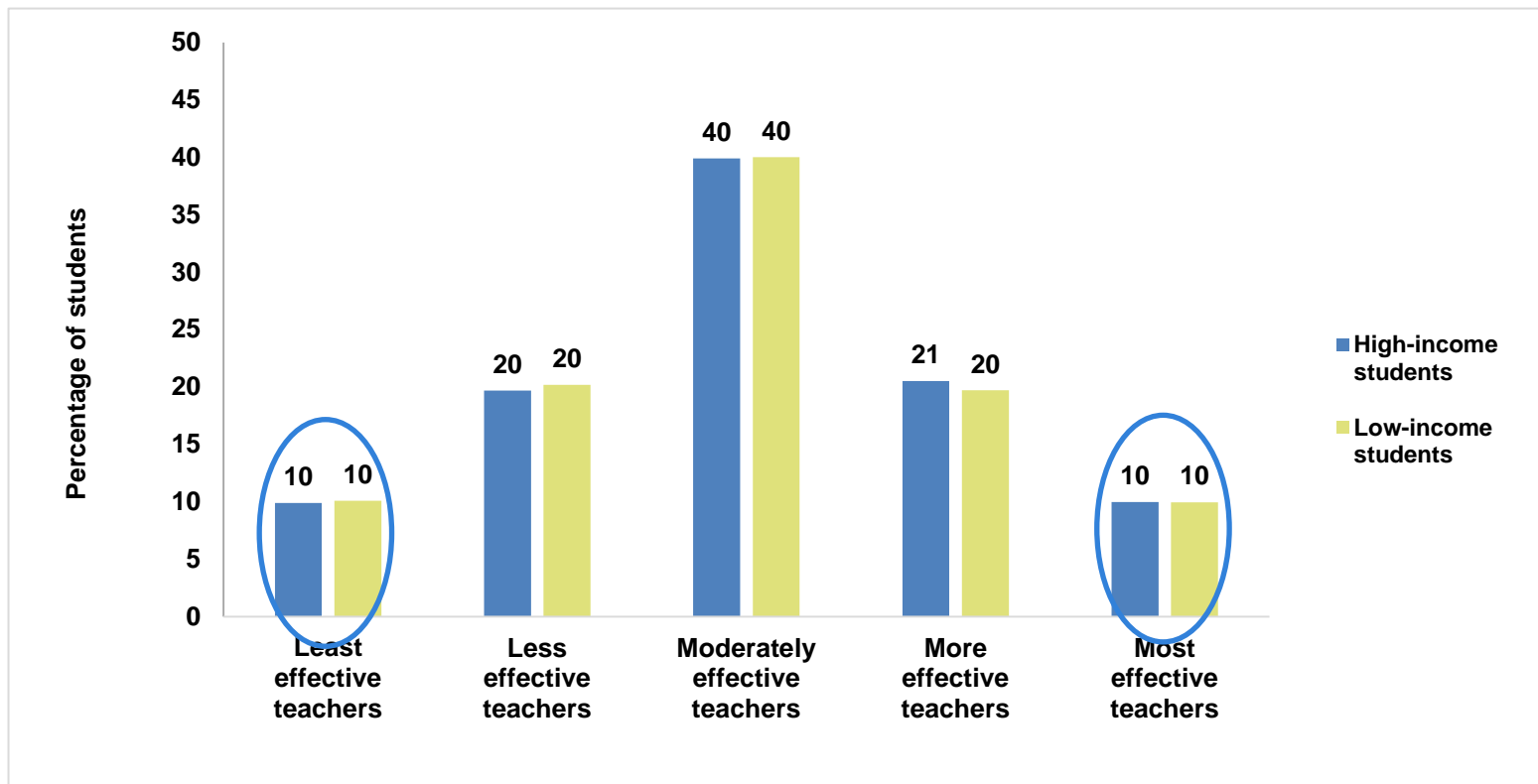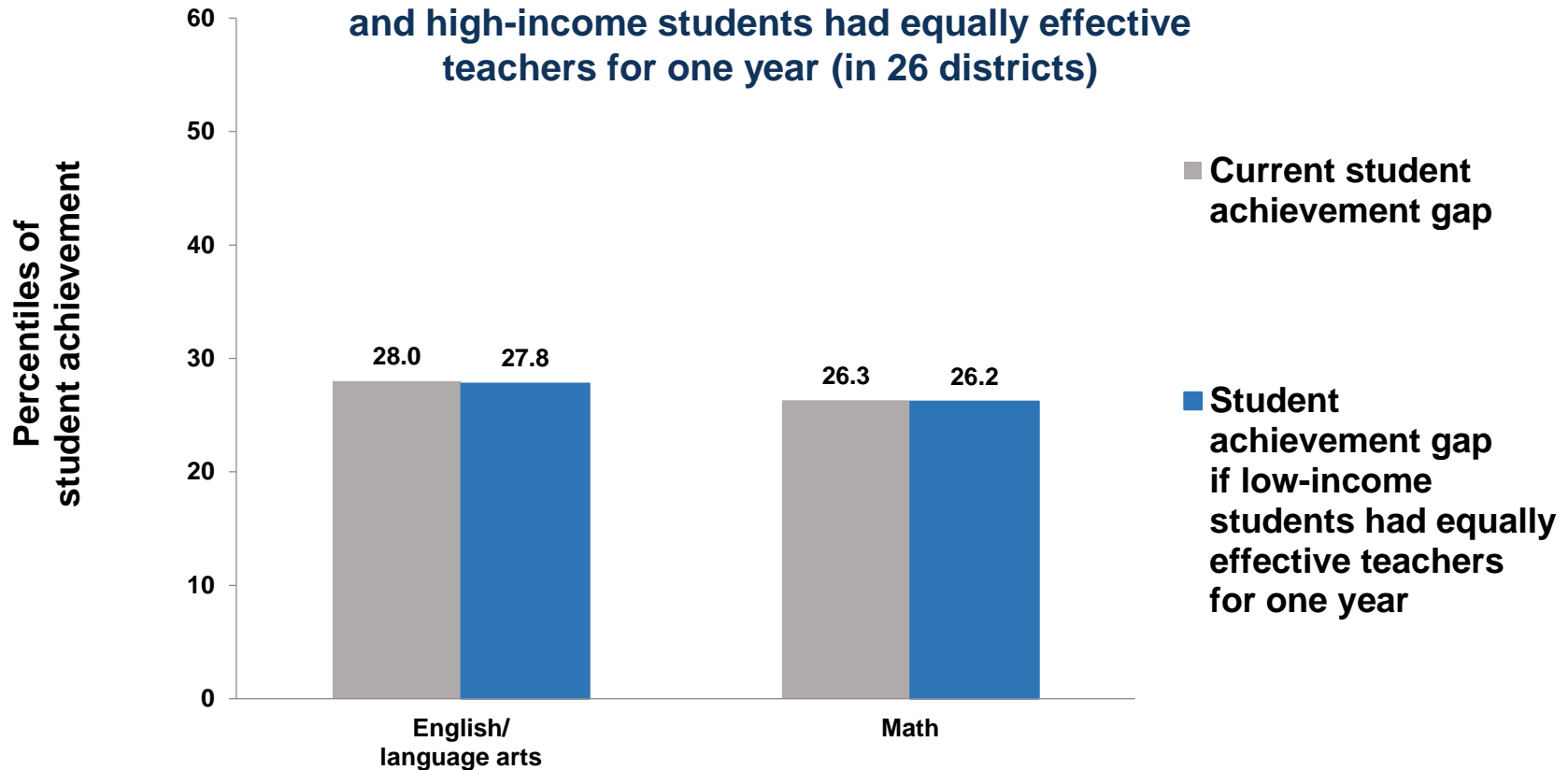

Note: The "least effective" teachers are those below the 10th percentile in the distribution of teacher effectiveness. Teachers between the 10th and 30th percentiles are "less effective," those between the 30th and 70th percentiles are "moderately effective," those between the 70th and 90th percentiles are "more effective," and those above the 90th percentile are "most effective"

Results for 26 districts for years 1 to 5. Includes grades 4 to 8 for 12 districts and grades 6 to 8 for 14 districts. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts.
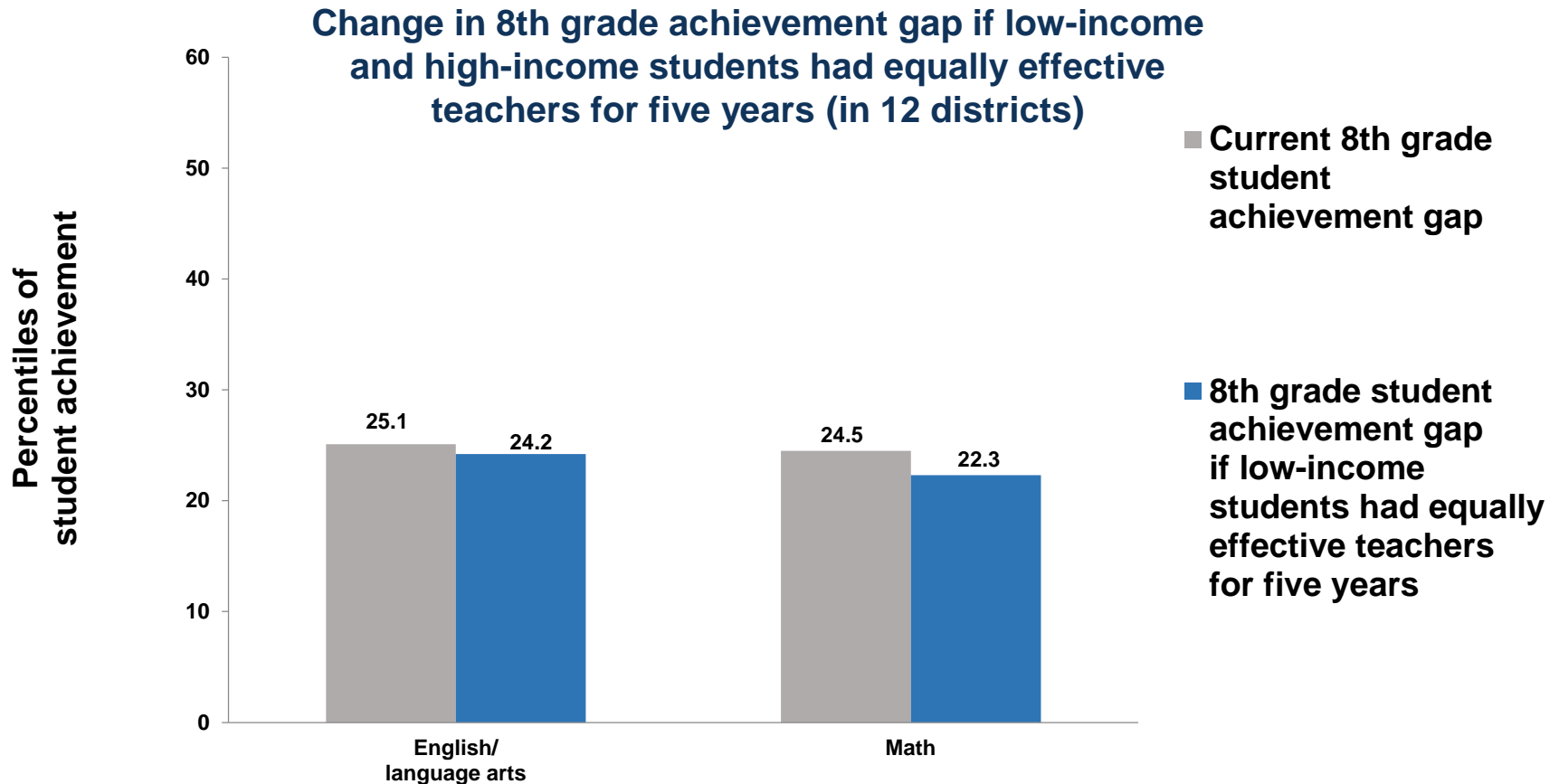
MATHEMATICA
Policy Research

In Average District, Equal Access to Effective Teachers Would Not Change the Achievement Gap in One Year

Change in student achievement gap if low-income and high-income students had equally effective teachers for one year (in 26 districts)

Legend:
- ■ (gray) **Current student achievement gap**
- ■ (blue) **Student achievement gap if low-income students had equally effective teachers for one year**

Y-axis: **Percentiles of student achievement**

English/language arts: 28.0 (gray), 27.8 (blue)
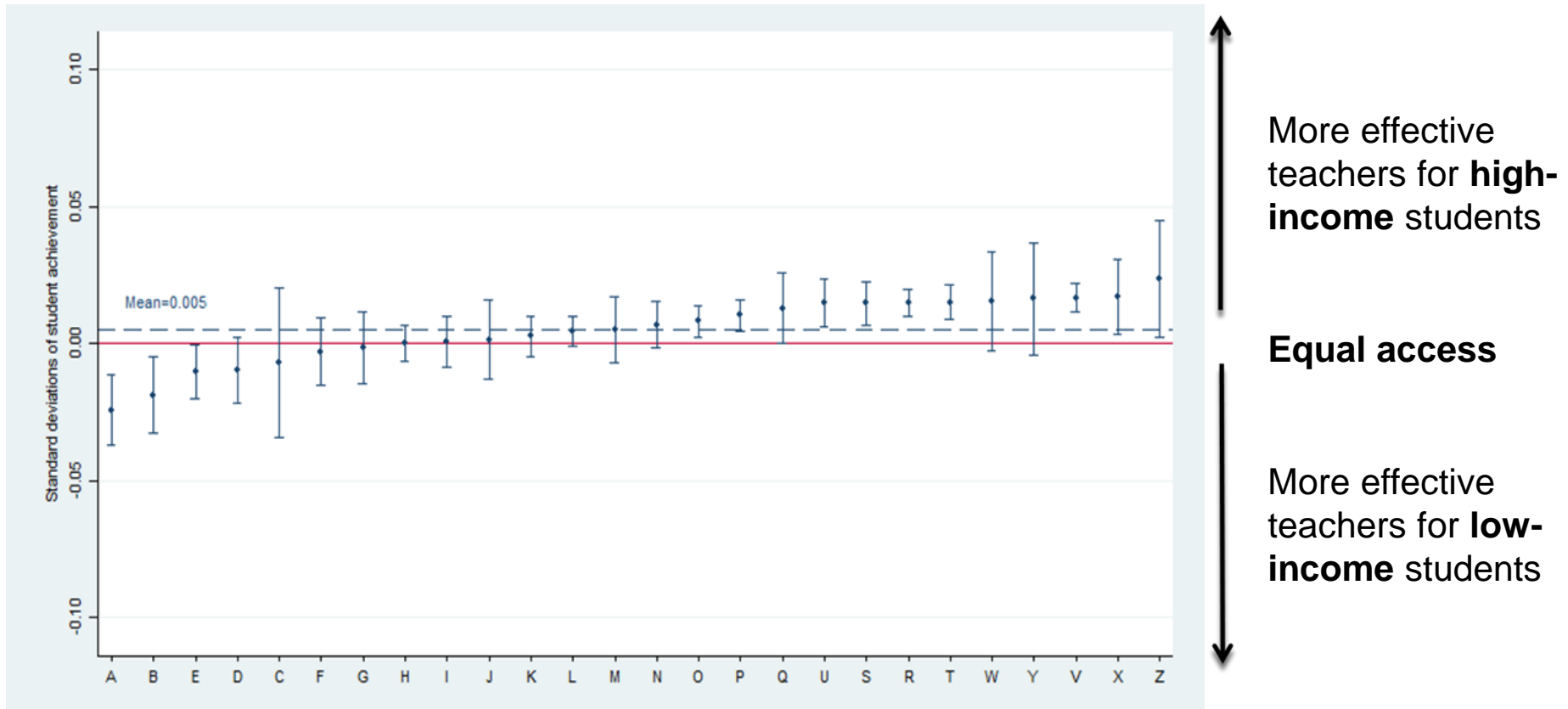Math: 26.3 (gray), 26.2 (blue)

Results are based on 14 districts for grades 6 to 8 and 12 districts for grades 4 to 8, for years 1 to 5. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts. These results are based on a value-added model that accounts for classroom characteristics.

In Average District, Equal Access to Effective Teachers Would Not Change the Achievement Gap Over Five Years

Change in 8th grade achievement gap if low-income and high-income students had equally effective teachers for five years (in 12 districts)

■ **Current 8th grade student achievement gap**

■ **8th grade student achievement gap if low-income students had equally effective teachers for five years**

Percentiles of student achievement

Category	Current gap	Equal teachers gap
English/language arts	25.1	24.2
Math	24.5	22.3

Results are based on 12 districts for the change in the student achievement gap over grades 4 to 8 for years 1 to 5. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts.
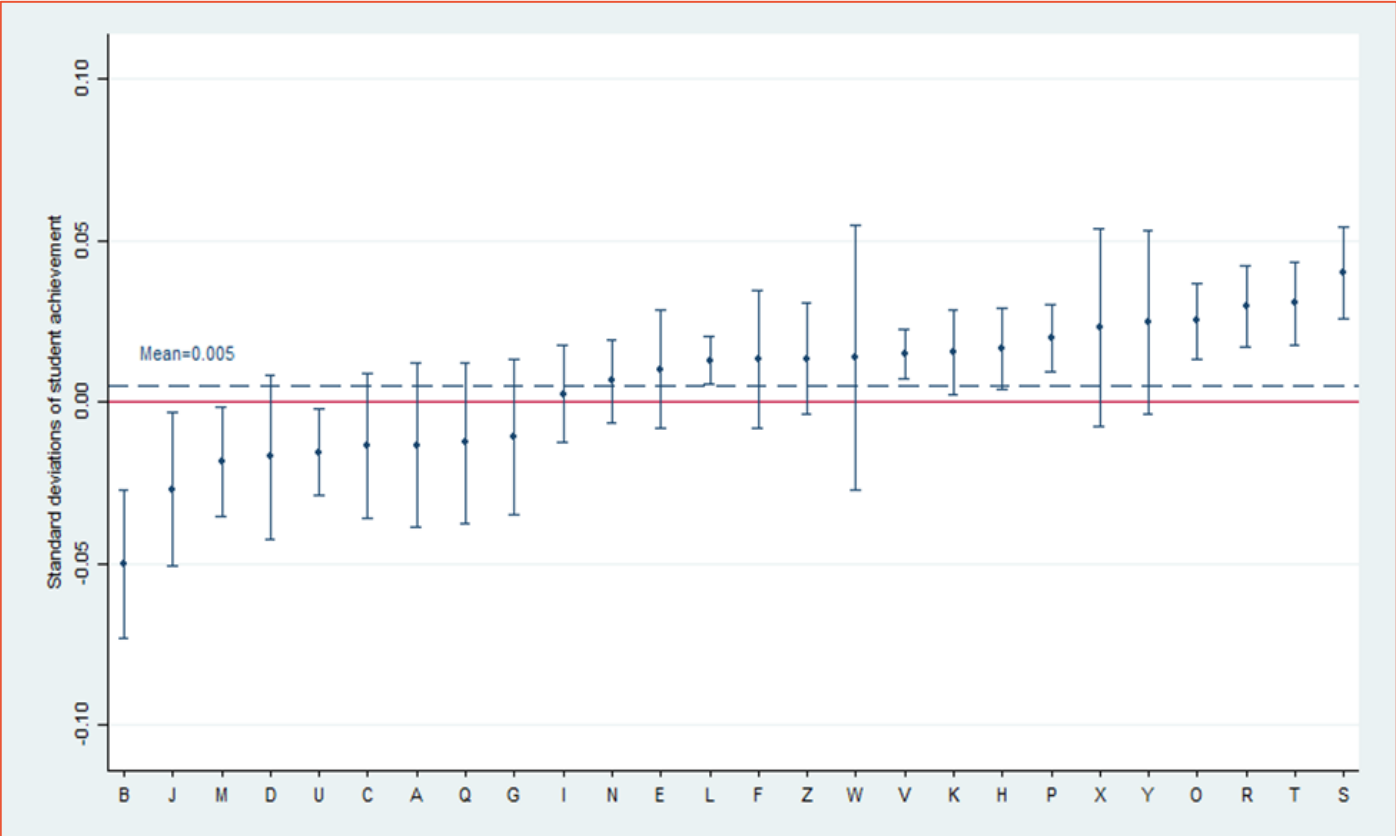
MATHEMATICA
Policy Research

Gap in Access to Effective Teaching in ELA, by District

Results for 26 districts for years 1 to 5. Includes grades 4 to 8 for 12 districts and grades 6 to 8 for 14 districts. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts. Districts are ordered according to the size of each district's Effective Teaching Gap (ETG) in ELA. ETGs are computed within each district-grade-year combination and averaged with equal weight across years within each district. The points represent the district-level ETGs and the vertical lines show the 95-percent confidence intervals around each point. The cross-district average of 0.005 standard deviations is shown by the dashed horizontal line.

MATHEMATICA
Policy Research

Gap in Access to Effective Teaching in Math, by District

More effective teachers for **high-income** students

Equal access

More effective teachers for **low-income** students

Results for 26 districts for years 1 to 5. Includes grades 4 to 8 for 12 districts and grades 6 to 8 for 14 districts. District-level results are weighted across grades and years by the number of students. Overall results are weighted equally across districts. Districts are ordered according to the size of each district's Effective Teaching Gap (ETG) in math and labeled according to their ETG in ELA. ETGs are computed within each district-grade-year combination and averaged with equal weight across years within each district. The points represent the district-level ETGs and the vertical lines show the 95-percent confidence intervals around each point. The cross-district average of 0.005 standard deviations is shown by the dashed horizontal line.

Summary: Using Administrative Data in Education Studies

- **The good…**
  - Data readily available and usually well-maintained
  - Includes info on a critically important outcome (achievement)
  - Makes a wide range of research more feasible

- **The bad…**
  - Available info somewhat limited
  - Overreliance on student scores on state tests??
  - Free/reduced-price status highly imperfect as measure of SES

- **And the ugly…**
  - Process of getting the data can be challenging
  - Data documentation can be difficult to obtain and incomplete
  - Not always obvious to researchers where data are flawed

MATHEMATICA
Policy Research

For More Information

To read the full study report:

http://ies.ed.gov/ncee/pubs/20174008/

- **Philip Gleason**

  - **PGleason@mathematica-mpr.com**

MATHEMATICA
Policy Research

Auxiliary Slides

MATHEMATICA
Policy Research

Value-Added Model

- **Each grade-subject-year estimated separately**

- **Account for common student characteristics**
  - **Baseline pre-tests in ELA and math (accounting for measurement error)**
  - **Free or reduced-price lunch (FRL)**
  - **Limited English proficiency**
  - **Special education status**
  - **Gender**
  - **Race/ethnicity**
  - **Changed schools during year**

- **Account for classroom characteristics**
  - **Average student test scores**
  - **Variability of student test scores**
  - **Proportion of low-income students**

- **Teacher fixed effects**

MATHEMATICA
Policy Research

Back

Effective Teaching Gap: Hypothetical Example

Back
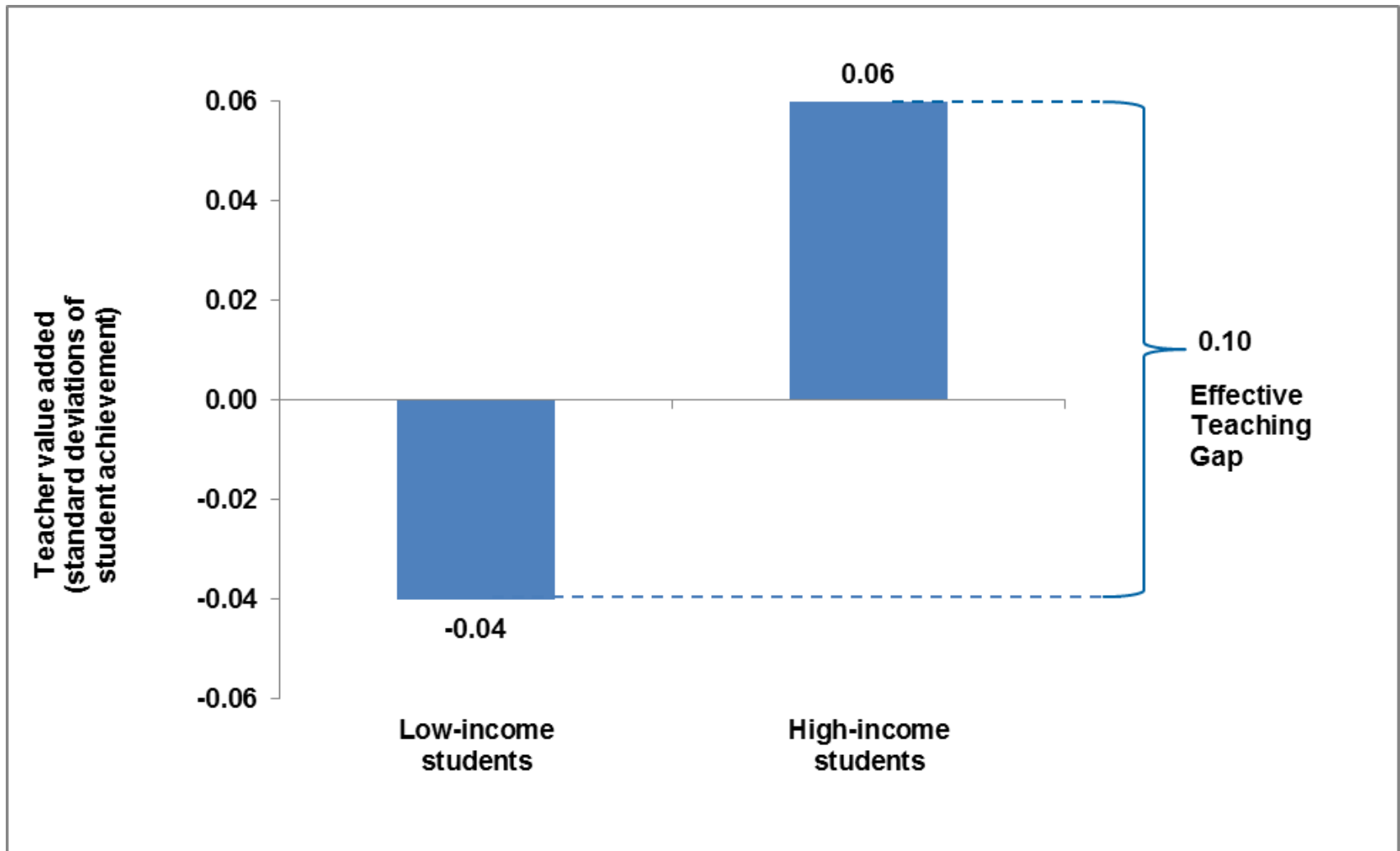
Small Average Difference in Teacher Effectiveness
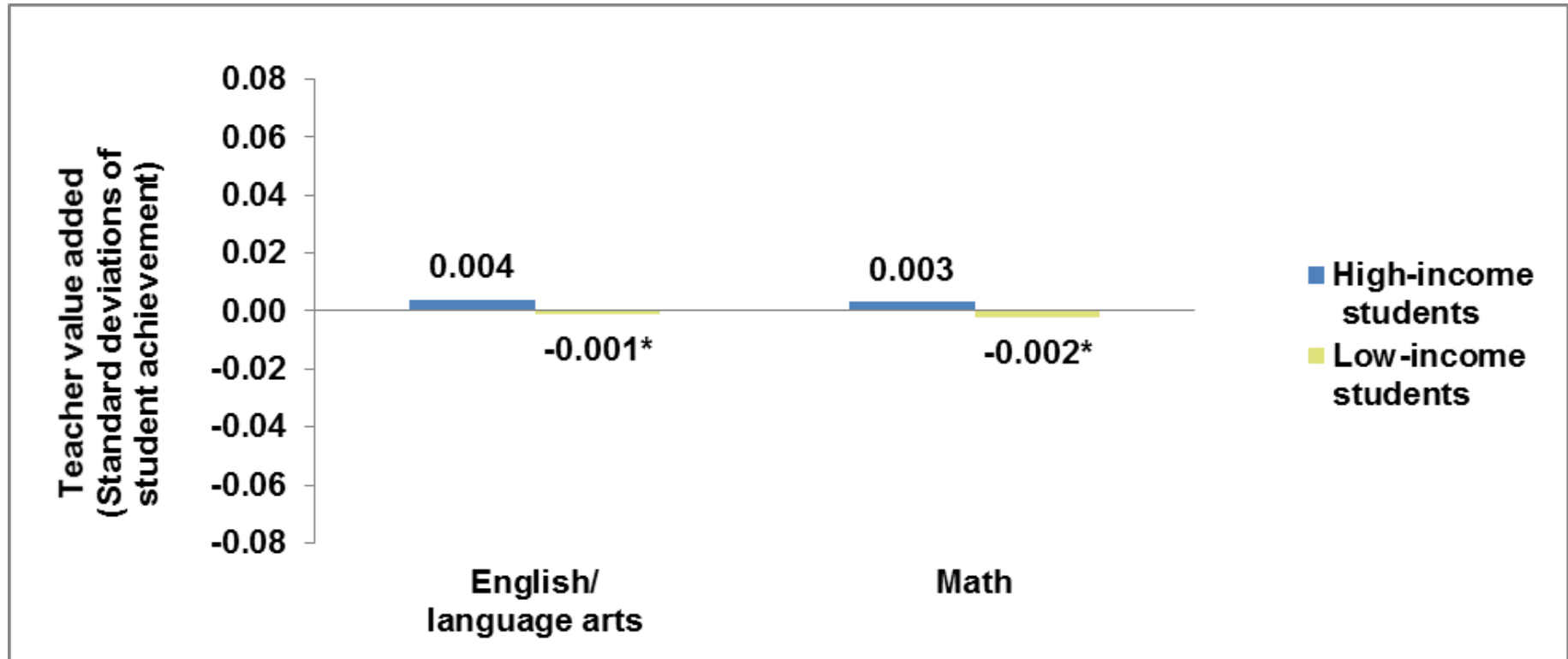
Source: Author's calculations based on district administrative data.

* Differences in the value added of the teachers of high-income and low-income students are statistically significant at the 0.05 level, two-tailed test.

MATHEMATICA
Policy Research

Back