

Right-sizing the Classroom

Making the Most of Great Teachers

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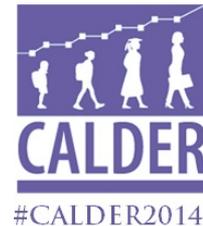
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Given what we know – the status quo cannot be optimal

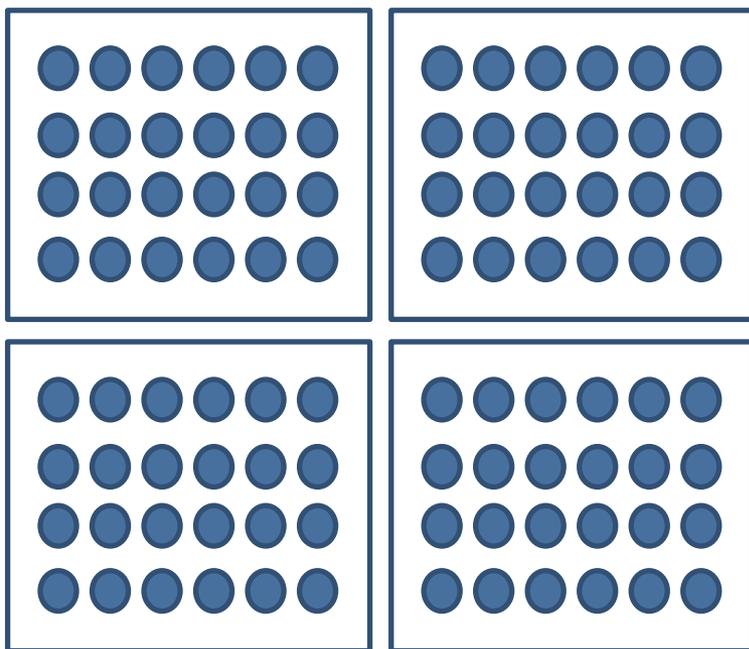


- An effective teacher can impact a variety of important student outcomes
- Yet, teacher productivity varies considerably, both *within* and across schools

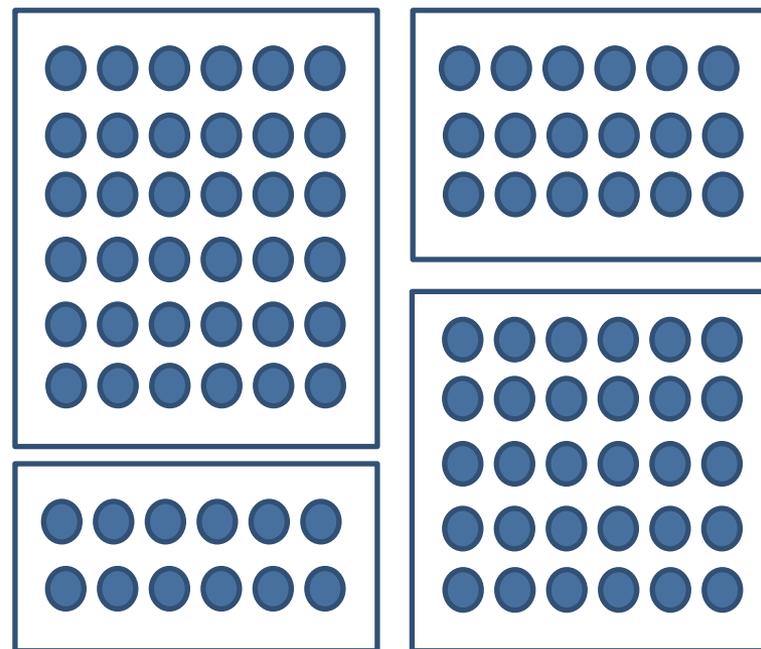
If teachers make such a difference and vary so much—
why are students equally assigned across all teachers?

What if...we tried playing to our strengths in schools?

Typical method



Class-size shifting



Prior research tilts toward teachers

Teacher Quality

- Large impacts on students across multiple contexts
 - Significant results across subjects and grades, though sizes vary
- Good teacher = extra $\frac{1}{4}$ to $\frac{1}{2}$ year of learning

Class Size

- Small impacts, that are near zero in some contexts
 - Largest in lower grades, initial exposure
- Equivalent impact of 10 to 20 student reduction in class size

Sources: Hanushek and Rivkin, 2010; Nye, et al., 2004; Whitehurst and Chingos, 2011.

This proposed strategy is not new

- Secretary Duncan, Bill Gates, and others have promoted it
- Underlying objective in Public Impact's *Opportunity Culture* initiative; class-size shifting is one of their many models
- Prior research studies have investigated this interplay, though not as directly as I do here
 - Woessman and West, 2006; Barrett and Toma, 2013

Intuition behind Class Size Shifting



- Reallocate more students into strongest teachers' classes away from weakest teachers
 - Exposes more students to excellent teaching
 - Weak teachers focus on fewer students, opportunity to improve practice
- Balancing Act: Learning can improve when three if the sum of three components is positive:
 - Difference in expected learning between Teacher A and Teacher B
 - Class-size “penalty” to Teacher A’s class, due to influx of students
 - Class-size “benefit” to Teacher B’s class, due to shrinking class

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Data

- North Carolina student-teacher linked administrative data
- Grades 5 and 8; Math, Reading, and Science
- Four school years:
 - 2007-08 through 2009-10 – inform expectations of teacher performance, other parameters for the simulation
 - 2010-11 – target year
- Focus specifically on school where students can be reallocated across teachers

Most schools are eligible

	5th	8th grade		
	grade	Math	Reading	Science
1 teacher	186	189	148	235
2 teachers	201	143	106	140
3 teachers	279	130	93	130
4 teachers	293	108	87	85
5+ teachers	451	176	280	113
Total	1,410	746	714	703

Note: Count of unique schools serving the particular grade / grade-subject combination. The number of available teachers in the rows represent unique teacher identifiers.

Simulation Methods

1. Use first three years of data to estimate key parameters
 1. *Estimated coefficients on class size, classroom composition, experience*
 2. *Estimate teacher value-added based on averaged gains*

[See here](#)
2. Use target year of data to generate results
 1. *Observed assignment of class sizes across teachers in NC*
 2. *Simulate data where students are randomly sorted and assigned to teachers based on prior effectiveness*

Outcome Measures

1. Mean change in student learning
2. Proportion of students assigned to top-quartile teachers
3. Proportion of FRL students assigned to top-quartile teachers

Target Year Current Assignments

Table 3. Snapshot of Observed Class Size Assignment in North Carolina

	Grade 5			Grade 8		
	Math	Reading	Science	Math	Reading	Science
Average class-size deviation within school	2.738	3.073	1.743	5.587	5.689	3.816
Within-school correlation of expected teacher performance and class size	0.045	0.086	0.050	0.022	0.012	0.025

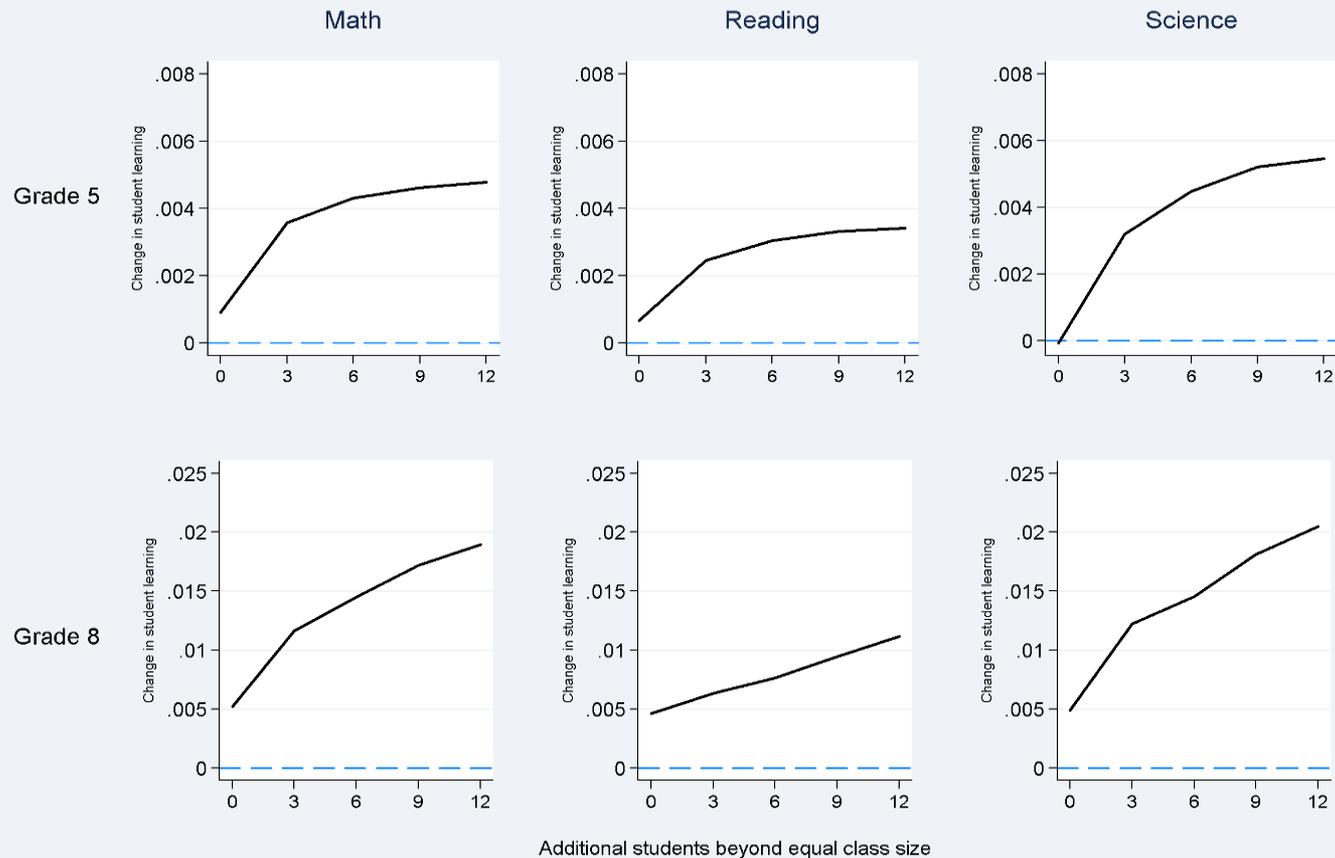
Gap in Access Apparent in Data

Table 3. Snapshot of Observed Class Size Assignment in North Carolina

	Grade 5			Grade 8		
	Math	Reading	Science	Math	Reading	Science
Proportion of students assigned to top-quartile teachers	0.258	0.287	0.237	0.251	0.244	0.254
Proportion of FRL students assigned to top-quartile teachers	0.235	0.260	0.217	0.232	0.243	0.226

Note – Strategically assigning students only remediates within-school gaps, not across-school gaps

Students Gain in Simulated Classrooms

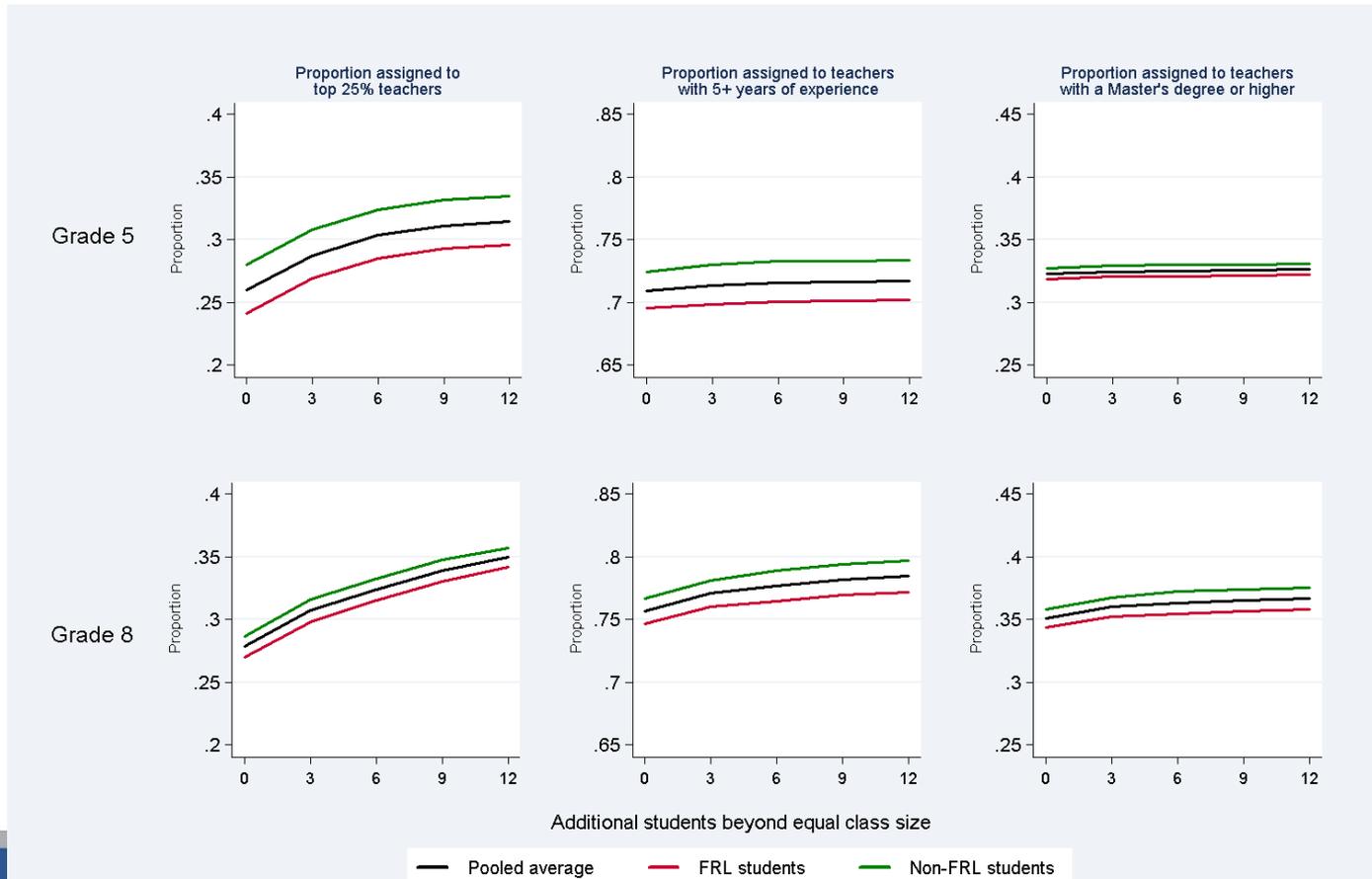


Additional students beyond equal class size on the x-axis is determined separately within each grade and school, so total class size for the largest classes may vary across the sample. Changes in student learning on the y-axis is measured in student standard deviation units, and averaged across all students in schools and classrooms where class-size shifting is possible.

Results are particularly strong in 8th grade

- Even moving 6 students is nearly 2 weeks in 8th grade math and science
 - Essentially equivalent to current levels of class size differences observed
 - Equivalent to removing bottom 5% of teachers, without removing them!
- Maximum gains for 5th grade are roughly equal to 2 days
- Why the difference?
 - Past performance more reliable predictor in 8th grade
 - Self-contained vs. single-subject assignments

Access Gaps Still Persist



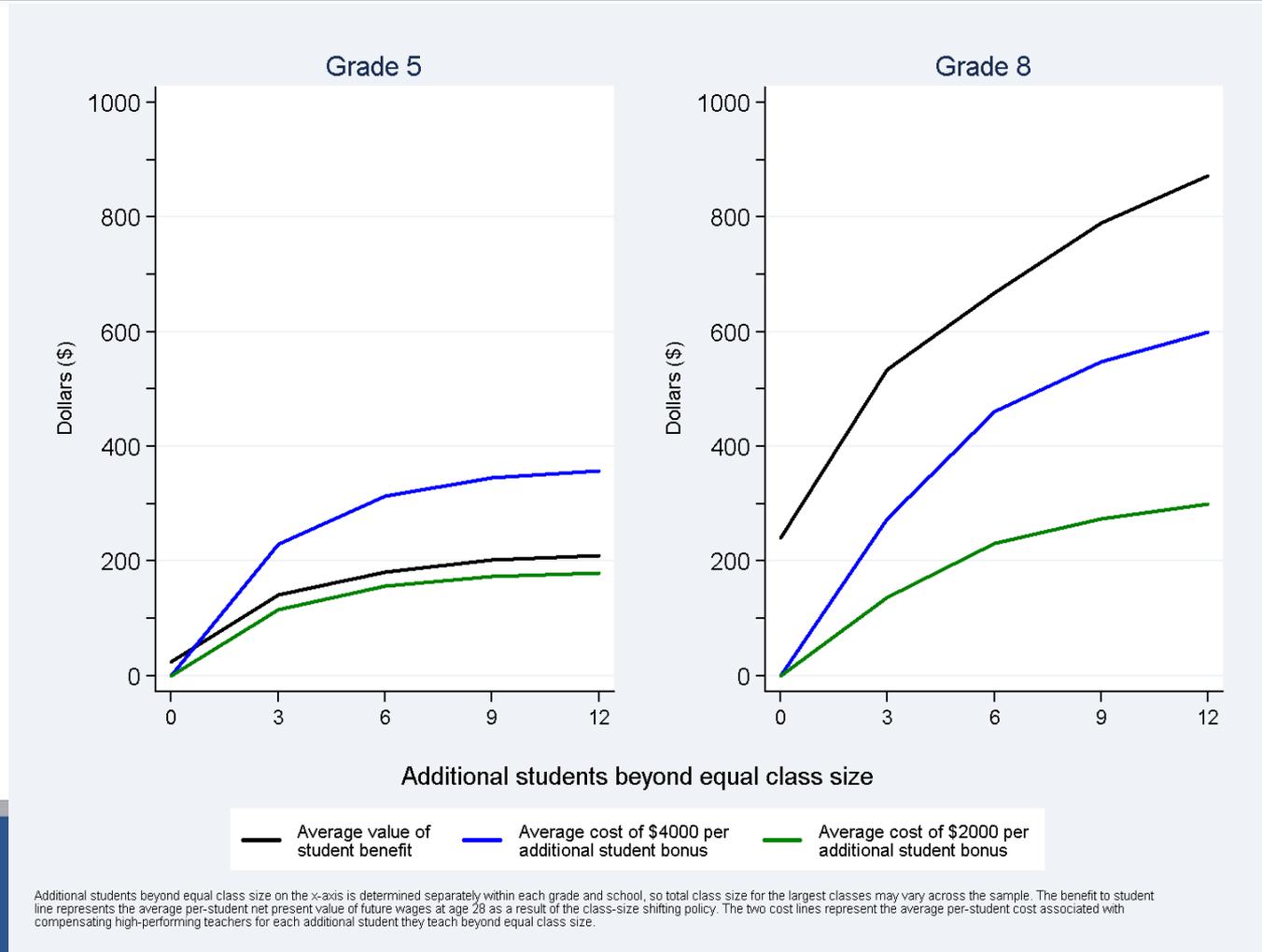
Additional students beyond equal class size on the x-axis is determined separately within each grade and school, so total class size for the largest classes may vary across the sample. The proportion measures describe the proportion of students assigned to teachers with the given characteristics. These proportions are calculated across all students, and on FRL and non-FRL student subgroups.

Willingness, Compensation

- Teacher / parent surveys suggest some support
 - 83% of teachers choose money over smaller classes
 - 73% of parents choose top teacher over smaller classes

- How to reward teachers, so this isn't a punishment?
 - Non-monetary – aides, status, removing out-of-classroom work
 - Monetary – bonuses using money from savings due to fewer remedial instructors, or lowering pay for leading smaller classes

Net Value of Learning Gains



Conclusion

- **Efficient** – Class-size shifting can make educationally significant improvements in student learning, esp. 8th grade
 - Caveats: assuming linear class size, performance invariant to mixing classes
- **No change in equity** – No relative improvement in student access to effective teachers
- **Feasibility issues**
 - Laws, policies, collective bargaining agreements may need to change
 - Could disrupt dynamic among workforce

Estimated Parameters Based on Prior Years

Table 2. Estimated Class-size Effects and Teacher Value-added Variation

	Grade 5			Grade 8		
	Math	Reading	Science	Math	Reading	Science
Class size	-0.0052*** (0.0005)	-0.0020*** (0.0005)	-0.0047*** (0.0005)	-0.0035*** (0.0002)	0.0000 (0.0003)	-0.0024*** (0.0003)
Standard deviation of EB-adjusted teacher FE	0.1513	0.0801	0.1927	0.1333	0.0612	0.1500

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