Discipline Reform, School Culture, and Student Achievement

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(Job Market Paper)

October 2019

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Abstract

Does relaxing school discipline improve student achievement, or lead to classroom disorder? We study a 2012 reform in New York City public middle schools that eliminated suspensions for non-violent, disorderly behavior, replacing them with less disruptive interventions. Using a difference-in-differences framework, we exploit the sharp timing of the reform and natural variation in its impact to measure the effect of reducing suspensions on student achievement. Math scores of students in more-affected schools rose by 0.05 standard deviations relative to other schools over the three years after the policy change. Reading scores rose by 0.03 standard deviations. Only a small portion of these benefits can be explained by the direct impact of eliminating suspensions on students who would have been suspended under the old policy. Instead, test score gains are associated with improvements in school culture, as measured by the quality of student-teacher relationships and perceptions of safety.

JEL codes: H75, I2, J24

Keywords: education, student suspension, school discipline, human capital

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Thanks: We cannot thank Brian Hall, Lawrence Katz, Amanda Pallais, and Andrei Shleifer enough for their comments, guidance, and support. We are also indebted to Isaiah Andrews, Andrew Bacher-Hicks, Alex Bell, Sophie Calder-Wang, Raj Chetty, Olivia Chi, David Deming, Roland Fryer, Edward Glaeser, Nathan Hendren, Kosuke Imai, Jonathan Roth, and seminar participants at Harvard University. This project would not have been possible without the data and wealth of knowledge we received from dedicated public servants at the New York City Department of Education, especially Derek Li and Sophie Sharps. Johanna Miller and numerous unnamed educators provided valuable institutional knowledge. Financial support from an Inequality and Wealth Concentration Ph.D. Scholarship from the Multidisciplinary Program in Inequality & Social Policy at Harvard University is gratefully acknowledged.
1 Introduction

School discipline reforms have increasingly sought to limit the use of suspensions, which are punishments that exclude misbehaving students from class. These reforms are controversial. High suspension rates have been linked to lower test scores, higher drop-out rates, and increased criminal activity (Perry and Morris, 2014; Noltemeyer et al., 2015; Bacher-Hicks et al., 2019). But suspensions may help insulate other students from negative consequences of disruptive classroom behavior (Carrell and Hoekstra, 2010; Carrell et al., 2018). The threat of harsh punishment may also deter misbehavior in the first place. Indeed, strict discipline has been suggested as a reason why high-performing “no excuses” charter schools are so effective in raising test scores (Angrist et al., 2013). Finding the right balance has important implications for human capital development.

We study a 2012 reform in New York City public middle schools that eliminated suspensions for non-violent, disorderly behavior. Schools were forced to substitute to less disruptive punishments like removal from a single class, and were encouraged to employ non-punitive interventions. Our analysis tracks the test scores of two groups of students. The High Treatment group includes middle school students in school-grade cells with a history of dispensing suspensions for disorderly behavior, who were thus more affected by the reform. The Low Treatment group contains those in school-grades where such suspensions had rarely or never been used. Aside from suspension rates, these groups are similar in observable characteristics.

Using administrative data on students in grades 6-8 from the New York City Department of Education (NYCDOE), we adopt a difference-in-differences framework to exploit the sharp timing of the 2012 discipline reform, combined with the natural variation in its impact. Over the four years prior to the reform, average test scores and suspension rates for disorderly behavior moved largely in parallel in High and Low Treatment school-grades. Suspension rates for disorderly behavior then fell sharply to zero in both groups in 2012, but the drop was three times as large in the High Treatment group as in the Low Treatment group. Our key identifying assumption is that average test scores in the two groups would have continued to move together if the reform had not been implemented.

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Over the three years following the reform, average math scores for students in the High Treatment group rose by 0.05 standard deviations relative to the Low Treatment group. Reading scores rose by 0.03 standard deviations. These improvements are large relative to the financial cost of the reform; for comparison, the test score gains are equivalent to raising teacher quality by one third of a standard deviation (Chetty et al., 2014).

These results are robust to many alternative specifications, including different treatment definitions, allowing for linear differences in pre-trends, and balancing treatment groups on demographics. We also rule out the possibility that they are driven by two major policy changes around the time of the reform. Specifically, the timing of the switch to Common Core testing did not coincide with the test score gains we see, and the impact of the reform preceded the election of Mayor Bill de Blasio and his appointment of Chancellor Carmen Farina. Finally, we test several specific channels through which any other policy changes could have operated, including differential replacement of principals or relative changes in funding between the two treatment groups.

The achievement gains we see combine direct effects, behavioral effects, and spillovers. Direct effects arise from replacing suspensions with alternative interventions, holding student behavior fixed. This could lead to increased instructional time for those who would have been suspended, or the elimination of the stigma and psychological costs of suspension. Behavioral effects arise when students change their own behavior in response to the disciplinary regime. They could go in either direction: reducing the threat of suspension could induce more misbehavior, but de-emphasizing punishment could improve school culture and thus reduce misbehavior. Finally, both punishments and changes in behavior have the potential to cause spillovers between students. For example, keeping disruptive students in the classroom could prevent other students from learning. But positive changes in students’ behavior could benefit their peers.

We find little variation in treatment effects between students who are more or less likely to be suspended, which suggests that the gains are not driven by direct effects from replacing suspensions with other punishments. Test score gains for boys and girls are nearly identical, despite boys being suspended twice as often as girls; and gains are actually smaller for black students than for white or Hispanic students, despite black students being suspended far more frequently. Even when we use a richer set of demographics and baseline test scores to predict each student’s risk of suspension, treatment effects are similar across students with very different suspension likelihoods.

There are two additional reasons why our treatment effects cannot be explained by the direct impact of punishment substitution. First, few students were directly affected, because these suspensions only occurred occasionally. Second, we use the sharp timing
of each suspension to show that suspending a student for disruptive behavior has at most a 0.03 standard deviation effect on their math score that year. By contrast, if the achievement gains from the reform came solely from the elimination of the direct effect of each suspension, the implied impact per suspension would be 5 standard deviations. Such a large causal impact is implausible – far larger even than the cross-sectional relationship between suspension and test score performance.\(^5\)

Instead, test score gains are associated with improvements in school culture following the 2012 reform. Student and teacher survey responses reveal that school culture, as measured by the quality of student-teacher relationships and perceptions of safety, improved in High Treatment school-grades relative to Low Treatment school-grades. These cultural changes help explain why we see achievement gains for a broad range of students. Moreover, school-grades with larger improvements in culture also achieved larger test score gains. Back-of-the-envelope calculations based on the cross-sectional relationships between our measures of culture and test scores suggest that the observed effects on culture are large enough to explain the entire effect of the reform on achievement.

Our results address a key aspect of the policy debate surrounding school discipline. Almost everyone agrees that students learn more effectively in a safe and supportive environment, but there is disagreement about how to reach that goal. Calls for reform rely on the assumption that harsh discipline makes students feel less safe and supported, although their public focus is typically on racial gaps in suspension rates.\(^6\) Critics counter that reforms limiting suspension use have reduced safety and increased disruption in classrooms by making it difficult for teachers to manage misbehavior (Federal Commission on School Safety, 2018; Eden, 2017). The results here suggest that relaxing discipline can improve safety, student-teacher relationships, and test scores.

School Discipline in the Literature

This paper complements work by Bacher-Hicks et al. (2019) in Charlotte-Mecklenberg schools, which harnesses quasi-random assignment of students to schools with different suspension rates. They find that being assigned to a school with a higher suspension rate has substantial negative effects on long-run outcomes such as graduation and criminal activity. Our empirical approach circumvents the main limitation of Bacher-Hicks et al.’s

\(^5\)These short-term effects could compound over time. In Section 5, we discuss the dynamic effects we would need to account for the gains we see in achievement due to this reform.

\(^6\)For arguments made by reform advocates, see U.S. Department of Justice and U.S. Department of Education (2014); Losen and Skiba (2010); Liu (2013); Ofer et al. (2009); Dignity in Schools Campaign – New York (2013); Mukherjee (2007). Racial gaps in suspension rates are a problem if suspensions harm students. We do not directly address discrimination in punishment, but our results suggest that high suspension rates can be causally harmful. We also show that school-grades in which suspension rates declined for black and Hispanic students, relative to white students, experienced the largest overall achievement gains.
analysis, which is that differences in suspension rates across schools may be correlated with other factors that also affect student outcomes.

We also build on evidence from Philadelphia, where Lacoe and Steinberg (2019) use a similar discipline code change as an instrument for suspension. They find that suspensions negatively affect the test scores of both suspended students and their peers, under the assumption that students who had been suspended in the past would have been suspended again in the absence of the reform. Unfortunately, with only two years of data, they are limited in their ability to assess the validity of their empirical design. Related work by Lacoe and Steinberg (2018) suggests that the same reform increased truancy rates, despite having little impact on the total suspension rate in Philadelphia schools.

Kinsler (2013) takes a structural approach. Based on a model that accounts for potential spillovers from disruptive behavior, his calibration suggests that stricter discipline may have a positive effect on student performance through improvements in behavior. A critical assumption underlying this model is that principals know the effect of harsher discipline policy, and set policy optimally. Our reduced-form approach does not require us to make such an assumption. Moreover, our results suggest that behavior weakly improves rather than deteriorates as discipline policy is relaxed.

More broadly, we contribute to a literature spanning economics, sociology and education policy studying the associations between suspensions and test scores, drop-out rates and criminal behavior. For example, Cobb-Clark et al. (2015) argue that the relationship between suspensions and achievement can be fully explained by individual characteristics if the degree of selection on observables is similar to selection on unobservables. However, Perry and Morris (2014) suggest that suspensions adversely affect the peers of suspended students, based on regressions that control for student and school fixed effects. Noltemeyer et al. (2015) provide a broad meta-analysis of previous studies.

2 School Discipline in New York City

Discipline in New York City public schools is governed by the Citywide Standards of Intervention and Discipline Measures (“the discipline code”). Table 1 shows the five levels of disciplinary infractions. Level 1 infractions cover non-compliance such as being late for class, excessive noise, and disrespectful behavior. At the other extreme, Level 5 infractions are for severe misbehavior, which is usually dangerous or violent. The reform we study targeted Level 2 infractions. These are for disorderly behavior such as profane language and persistent non-compliance. Although these levels are associated with infractions, we occasionally refer to a suspension for Level \( x \) behavior as a “Level \( x \) suspension.”
Table 1. Levels of Disciplinary Infractions and Maximum Suspension Length

<table>
<thead>
<tr>
<th>Infractions</th>
<th>Description</th>
<th>Max. Susp. Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Uncooperative/non-compliant behavior</td>
<td>–</td>
</tr>
<tr>
<td>Level 2</td>
<td>Disorderly behavior</td>
<td>5 days †</td>
</tr>
<tr>
<td>Level 3</td>
<td>Disruptive behavior</td>
<td>10 days</td>
</tr>
<tr>
<td>Level 4</td>
<td>Aggressive or injurious/harmful behavior</td>
<td>1 year</td>
</tr>
<tr>
<td>Level 5</td>
<td>Seriously dangerous or violent behavior</td>
<td>1 year</td>
</tr>
</tbody>
</table>

† The discipline code reform in 2012 eliminated suspensions for Level 2 infractions.

Table notes. This table shows the five levels of infractions defined by the NYCDOE’s discipline code (2008, 2011, 2012, 2013, and 2015 editions). In rare cases, principal’s suspensions still occur for Level 1 infractions or Level 2 infractions after 2012 if a student receives more than three classroom removals in the same semester. Appendix Table F1 lists the most common infractions that lead to suspension.

For infractions at each level, the discipline code prescribes a range of allowable interventions. As a first step, schools may use guidance interventions such as counseling, which encourage positive behavior rather than punishing negative behavior. If guidance interventions are insufficient, punitive disciplinary measures may be taken. These range in severity from admonishment by a teacher to, in very limited cases, expulsion.

Three common punishments result in temporary exclusion from classroom instruction. First, students may be removed from a single class, which still allows them to attend other classes that day. Second, students may receive a principal’s suspension, in which case they miss all classes for between one and five days. During both classroom removals and principal’s suspensions, district rules require that students receive alternative instruction at a different location within the school. Third, for Level 3 infractions and above, schools can escalate the matter to the district-wide Office of Safety and Youth Development (OSYD) to request a superintendent’s suspension. These suspensions last for 6 days or longer, and are served at an alternative learning center or buddy school (New York City Department of Education, 2004). There are no true “out-of-school” suspensions in New York City schools, but the quality of the alternative instruction students receive varies, and is generally perceived to be an imperfect substitute for normal classroom instruction.

In practice, implementation of the discipline code varies with the preferences of teachers and school administrators. Principals are ultimately responsible for student discipline. Some choose to interpret district guidelines more strictly than others. For their part, teachers engage in thousands of day-to-day interactions with students that do not

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7District guidelines about alternative instruction are clear, but in practice, effective implementation depends on coordination between teachers and administrators, sometimes at different schools. Teachers and administrators with whom we have spoken report that this coordination is sometimes quite poor.

8Teachers and administrators with whom we have spoken emphasize that principals shape the discipline cultures of schools. However, principals often delegate decisions regarding individual suspensions.
necessarily involve an infraction, but may nonetheless affect students’ future behavior. They are also generally the first decision-maker along the path to a suspension, deciding whether to handle misbehavior internally or report it to school administrators. Figure 1 provides a simplified outline of the process that leads to a suspension.9

Variation in discipline policy in New York City schools has mirrored nationwide trends. In 1998, the city’s Board of Education transferred responsibility for school safety to the New York Police Department, echoing then-Mayor Rudolph Giuliani’s “tough on crime” message. Thus began a period of aggressive discipline policy that was continued by Giuliani’s successor, Michael Bloomberg. In 2004, Bloomberg enacted the Impact Schools Initiative, which doubled police presence at targeted high-crime schools and called for zero tolerance toward disciplinary infractions. In 2006, he introduced a roving metal detector program at all middle and high schools. Over this period, the number of suspensions dispensed per year increased rapidly, peaking at nearly 74,000 in 2008 (see Figure 2).

In the 2010s, the NYCDOE began easing its reliance on suspensions in response to lobbying efforts from groups such as the New York Civil Liberties Union (NYCLU) and Teachers United, who argued that existing policies disproportionately harmed minority students.10 We study a reform in 2012 that was the first major step in this process. Specific-

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9The process is more complicated in practice. For example, a parent conference occurs before a principal’s suspension, and a hearing is held before a superintendent’s suspension.

10Our data confirm that the suspension rate is higher for minority students in New York City. Between
Figure 2. This figure shows the total number of principal’s and superintendent’s suspensions issued per year in the New York City public school system, including all suspensions and all students. The vertical red line indicates the timing of the reform. Data come from reports by the New York Civil Liberties Union.

As Figures 2 and 3 show, this prohibition had an immediate impact: suspensions for Level 2 infractions fell to zero, and the total suspension rate fell sharply as well. It is this reform that motivates our empirical strategy.

3 Data on School Discipline, Culture, and Achievement

To study the link between discipline and achievement in New York City, we combine administrative data on students and staff with public data on school culture and funding.

3.1 Administrative Data

Our main data source is comprised of administrative records from the NYCDOE covering all students in New York City public schools. New York City is the largest public school district in the United States, currently responsible for educating over 1.1 million students. In 2006 and 2016, black students made up 30 percent of enrollment but 45 percent of suspended students. Suspensions had already been prohibited for Level 1 infractions.
Suspension Rates by Infraction Level, Grades 6-8

Figure 3. This figure shows yearly suspension rates by infraction level for students in grades 6-8 in New York City public schools. Suspension rates are expressed as the number of suspensions per 100 students. Each panel contains suspensions for a given infraction level, with principal’s suspensions (1-5 days) in blue and superintendent’s suspensions (6+ days) in red. The vertical red lines indicate the timing of the reform. Data are from the New York City Department of Education.

in over 1,800 schools. From 2006 to 2015, we observe student demographic information, enrollment, attendance, disciplinary events, annual test scores for grades 3 through 8, and subject-specific test scores for higher grades.\(^\text{12}\) We also observe yearly staffing rosters with information on teachers and other school employees.

**Discipline**

We observe data on suspensions from the NYCDOE’s Suspensions and Office of Hearings Online system. Records include the start and end dates of each suspension, an infraction code, and scrambled identifiers to link suspensions to other NYCDOE data.\(^\text{13}\) However,

\(^{12}\)Throughout, we refer to the school year beginning in September 2006 as 2006, rather than 2006-07. From 2000 to 2005, we observe annual test score records for grades 3-8, but none of the other variables. We use these earlier test scores to link older students in our sample to their test scores from previous grades.

\(^{13}\)Some suspensions involve multiple infractions, so the most severe infraction is recorded.
we are limited in the other disciplinary outcomes we can observe because schools were not consistently required to report punishments such as classroom removals and guidance interventions. We also see yearly infraction counts by student from the NYDOE’s Online Occurrence Reporting System: for each student, we observe the total number of Level 1 through Level 3 infractions, and the total of Level 4 and Level 5 infractions.

Test scores
Each year, students in grades 3-8 take statewide exams in mathematics and “English / Language Arts” (ELA), which we refer to as “reading.” We standardize reported test scores to have zero mean and unit standard deviation within each grade-subject-year cell, which facilitates comparisons across tests. In Appendix C.6, we repeat our primary analysis using test score percentiles, with very similar results.

In 2012, state assessments were changed to align with a nationwide set of academic standards referred to as the Common Core. The timing of this change coincides with the reform that we study. However, the switch to the new tests is unlikely to have affected our results. Although a new testing methodology could in principle yield better or worse assessments of students’ knowledge, any differential impact on our two treatment groups would have been felt as a sharp change in 2012 rather than the gradual impact that we observe. We discuss this issue further in Appendix D.

Student characteristics
We observe student race and gender. We also see an indicator for whether the student has learned English as a second language (ELL), or has an Individual Education Plan due to special needs. As is standard in the education literature, we use an indicator of eligibility for free or reduced price lunch as a proxy for family income.

Staffing
We observe staffing data on teachers and other school personnel from the NYDOE’s human resources system. This includes salary, tenure at a given school, and total years in the district. We can tabulate counts of teachers, counselors, and psychologists. These variables help us better understand the mechanisms that drive our aggregate results.

Sample
We focus on middle school students in grades 6 to 8. Although annual test scores are available for students in grades 3 to 5, these students are subject to a different disciplinary regime. Moreover, students in grades 3 to 5 were affected by a contemporaneous policy

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14The discipline code lists infractions and available punishments separately for K-5 and 6-12 students.
change in 2012 that reduced the maximum length of suspensions for Level 3 behavior from 10 days to 5. Students in grades 6 to 8 were unaffected by this parallel reform.

We further restrict to school-grade combinations that appear in our data in every year. This yields a balanced panel at the school-grade level, which is the level of treatment in our quasi-experimental analysis. This balance ensures that selection of school-grades into and out of the sample does not affect our results. There is, however, no way to balance our sample at the individual student level, since we observe each student for a maximum of three years (grades 6 to 8) out of a ten-year period. We discuss balance on student characteristics in Section 4.1 and Appendix C.1.

Over our sample period, enrollment in charter schools increased from 1.3% to 9.7% of New York City students in grades 6-8. However, the NYCDOE does not collect disciplinary records for charter schools because they set their own discipline policies. We therefore omit charter school students from the analysis. In addition, we omit all homeschooled students and students in special-education-only schools. We show in Appendix E that our results are not driven by selective sorting of students.

Throughout the paper, we include all students who satisfy these restrictions. However, in Appendix C.8, we exclude accelerated students who go on to complete the New York State Regents exam in math one year early (in grade 8). We do this to rule out any possibility that our results are driven by a testing waiver that was received by the NYCDOE from the United States Department of Education in 2013 to avoid ‘double testing’ accelerated students via both New York State Regents exams and the standardized exams normally administered in grades 6 through 8. Our results are unaffected.

3.2 School Characteristics

Survey Responses

Students in grades 6-12, their teachers, and their parents complete an annual survey designed to assess schools’ efficacy in supporting student success. We use answers to these surveys to measure two important dimensions of school culture: the quality of student-teacher relationships and feelings of safety at school. We provide a detailed explanation of how we use the survey data in Section 6, and present evidence that improvements in culture are important in driving the gains from the 2012 reform.

Funding

We obtained school-level data on per-student school expenditures from the Research Alliance for New York City Schools, an organization based out of New York University’s Steinhardt School of Culture, Education, and Human Development. These data include
total expenditures, as well as expenditures broken down into classroom instruction, instructional support services, leadership/supervision/support, ancillary support services (food, transportation, school safety, building services), and other costs.

3.3 Descriptive Statistics

Table 2 shows summary statistics for our sample of middle school students for the period prior to the discipline reform of 2012. As a share of all enrollment, 15 percent of students are white, 28 percent are black and 40 percent are Hispanic. Although 84 percent of all middle school students are eligible for free or reduced-price lunch, poverty rates are much higher among black and Hispanic students than white students. We also see evidence of academic achievement gaps by race and by sex: the unconditional gaps between average test scores of white and black students are $0.63\sigma$ in reading and $0.73\sigma$ in math; girls score $0.25\sigma$ better than boys in reading and $0.077\sigma$ better in math.

Across all students and infractions, there were over 11 suspensions per 100 students per year from 2006 to 2011. Over half of these are for Level 4 infractions, for aggressive or injurious behavior. Suspensions for Level 2 infractions, which provide us with our quasi-experimental variation, make up five percent of the total. Like test scores, suspension rates vary dramatically by sex and race. Boys are suspended more than twice as often as girls (16 per 100 students, compared to 7); and black students are suspended nearly 2.5 times as often as white students (18 per 100 students, compared to 7).

Black and Hispanic students attend schools with more resources than white students, as measured by traditional school inputs. Their schools spend almost $2,000 more per student and have smaller class sizes, although their teachers earn lower salaries. This distribution of resources may reflect efforts to address racial achievement gaps.

Relationship between suspensions and test scores

Figure 4 shows the powerful negative unconditional relationship between suspensions and test scores in our data. For both math and reading, suspension rates fall as exam performance rises: students with a one percentile higher math score are 0.3 percent less likely to be suspended, with only a slightly weaker association between suspension and reading scores. This relationship is consistent with suspensions being causally harmful. However, it is also consistent with students who are disadvantaged or less able performing worse on standardized tests for those reasons, while also behaving badly.

15 About two-thirds of all suspensions go to students who only get suspended once per year. See Appendix Figure F1 for a breakdown of annual suspension frequencies for suspended students.
### Table 2. Summary Statistics for Grades 6-8, 2006-2011

<table>
<thead>
<tr>
<th></th>
<th>All Students</th>
<th>Boys</th>
<th>Girls</th>
<th>Black</th>
<th>Hispanic</th>
<th>White</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of Enrollment</td>
<td>1.000</td>
<td>0.509</td>
<td>0.491</td>
<td>0.280</td>
<td>0.404</td>
<td>0.149</td>
<td>0.166</td>
</tr>
<tr>
<td>% Free Lunch</td>
<td>0.839</td>
<td>0.839</td>
<td>0.839</td>
<td>0.868</td>
<td>0.917</td>
<td>0.569</td>
<td>0.841</td>
</tr>
<tr>
<td>% ELL</td>
<td>0.120</td>
<td>0.132</td>
<td>0.107</td>
<td>0.025</td>
<td>0.199</td>
<td>0.054</td>
<td>0.146</td>
</tr>
<tr>
<td>Test Scores (Math)</td>
<td>-0.000</td>
<td>-0.038</td>
<td>0.039</td>
<td>-0.298</td>
<td>-0.237</td>
<td>0.427</td>
<td>0.684</td>
</tr>
<tr>
<td>Test Scores (Reading)</td>
<td>-0.000</td>
<td>-0.122</td>
<td>0.125</td>
<td>-0.155</td>
<td>-0.231</td>
<td>0.472</td>
<td>0.398</td>
</tr>
<tr>
<td>Susp. / 100 (All)</td>
<td>11.3</td>
<td>15.6</td>
<td>6.8</td>
<td>17.9</td>
<td>11.4</td>
<td>7.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Susp. / 100 (Level 2)</td>
<td>0.6</td>
<td>0.8</td>
<td>0.3</td>
<td>0.9</td>
<td>0.6</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Susp. / 100 (Level 3)</td>
<td>3.5</td>
<td>4.8</td>
<td>2.1</td>
<td>5.3</td>
<td>3.5</td>
<td>2.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Susp. / 100 (Level 4)</td>
<td>6.1</td>
<td>8.5</td>
<td>3.7</td>
<td>9.7</td>
<td>6.2</td>
<td>3.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Susp. / 100 (Level 5)</td>
<td>1.1</td>
<td>1.5</td>
<td>0.6</td>
<td>1.9</td>
<td>1.0</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Expenditure / Student</td>
<td>16,892</td>
<td>16,933</td>
<td>16,848</td>
<td>17,457</td>
<td>17,407</td>
<td>15,792</td>
<td>15,673</td>
</tr>
<tr>
<td>Teacher Salary</td>
<td>68,706</td>
<td>68,756</td>
<td>68,654</td>
<td>68,315</td>
<td>67,516</td>
<td>70,921</td>
<td>70,268</td>
</tr>
<tr>
<td>Avg. School-Grade Size</td>
<td>292.0</td>
<td>294.5</td>
<td>289.5</td>
<td>235.4</td>
<td>280.6</td>
<td>339.0</td>
<td>373.0</td>
</tr>
<tr>
<td>Students per Teacher</td>
<td>14.3</td>
<td>14.3</td>
<td>14.4</td>
<td>13.9</td>
<td>13.7</td>
<td>15.5</td>
<td>15.4</td>
</tr>
<tr>
<td>Students per Counselor</td>
<td>286.5</td>
<td>284.2</td>
<td>288.9</td>
<td>275.1</td>
<td>257.8</td>
<td>335.5</td>
<td>331.0</td>
</tr>
</tbody>
</table>

*Table notes.* This table shows summary statistics for the pre-reform period (2006-2011) in our analysis sample, which includes students in grades 6-8 who do not attend charter schools, schools that open or close between 2006 and 2015, or special-education-only schools. Test scores are standardized within this sample in subject-grade-year cells. Suspension rates are expressed as the number of suspensions per 100 students. Expenditure data are from the Research Alliance for New York City Schools; other data are from the New York City Department of Education.
Suspension Rates and Test Performance for Grades 6-8, 2006-2011

Figure 4. This figure shows the relationships between suspension rates and contemporaneous test scores in math and reading for our sample of middle school students (grades 6-8) prior to the discipline reform. Students are grouped into bins based on their percentile scores. The figure shows the number of suspensions per 100 students in each bin plotted against the average percentile score in each bin. Data are from the New York City Department of Education.
In Appendix A, we use regressions with fixed effects to demonstrate that most of the cross-sectional relationship between test scores and suspensions is explained by fixed differences between schools and students. Nonetheless, being suspended predicts lower than usual test scores for the affected student, holding fixed her grade and the school she attends. These negative conditional relationships are stronger for higher-level suspensions. Of course, even these conditional relationships may be plagued by selection concerns, which motivate the empirical designs that we focus on in this paper.

4 Natural Experiment: Relaxing Student Discipline

To estimate the causal effect of reducing suspension use in New York City schools, we exploit a natural experiment induced by the 2012 change to the discipline code. We show that average test scores increased for those more affected by the policy change, relative to those who were less affected. These benefits were shared across a wide range of students, including those who were unlikely to have been suspended themselves. Our results are robust to many alternative specifications, including controlling for separate linear trends for each treatment group, and different ways of defining treatment intensity.

4.1 Empirical Strategy

The reform we study prohibited schools from suspending students for single instances of disorderly behavior, which are classified as Level 2 infractions, starting with the 2012 school year. At the same time, new language was added to the discipline code to encourage specific alternatives. First, light-touch interventions were encouraged early in the disciplinary process (progressive discipline), with the aim of preventing more serious misbehavior in the future rather than punishing in the present. Second, “restorative interventions” were promoted. These focus on improving behavior through building relationships between students, or between students and teachers, often through peer mediation.

Our empirical strategy hinges on the fact that the 2012 policy change affected some students more than others. This variation allows us to compare the changes in test scores between groups of students that were affected to different degrees in a difference-in-differences framework. Specifically, the impact of the policy change depended on the extent to which each student’s school used suspensions as a punishment for disorderly behavior. A school did not need to make any changes if it had always relied on other tools such as classroom removals or loss of access to extracurricular activities. But a school that had relied heavily on principal’s suspensions was forced to find alternatives.
Although schools were encouraged to shift towards more progressive discipline, conversations with school personnel suggest a combination of several responses. First, schools turned to less disruptive punishments for disorderly behavior, such as removal from a single class. This substitution from missing all classes to missing only one class prevents one negative student-teacher relationship from disrupting learning across the board. Second, schools incorporate more restorative interventions. However, because these interventions require time and training to perform effectively, the extent of substitution was limited at first.\textsuperscript{16} Third, the policy change signaled that the district was serious about reducing its reliance on suspensions, which caused some teachers and administrators to rethink their interactions with students more broadly.

We argue that the reductions in suspension rates induced by the reform are plausibly exogenous because of the sharp timing of the change. Figure 3 shows that suspensions for Level 2 infractions dropped sharply to zero between 2011 and 2012. Total suspensions for middle school students fell by 22 percent, although not all of this decline was necessarily a direct result of the reform. Our conversations with school personnel suggest that the policy change was unanticipated, and our analysis shows no evidence of anticipatory effects; in fact, suspensions for Level 2 infractions were at a five-year high in 2011.\textsuperscript{17}

**Definition of treatment groups**

To efficiently capture variation in the impact of the reform, we define two groups: one with students who are more affected, and one with students who are less affected. First, we define a measure of treatment intensity, which is the policy-induced reduction in the number of suspensions per 100 students for Level 2 behavior in a given school-grade. Second, we divide school-grades into those for which the reform caused above-median reductions in suspension rates (“High Treatment”), and those with below-median reductions (“Low Treatment”). The main reason that we define treatment at the school-grade level is that both principals and teachers play important roles in student discipline.\textsuperscript{18}

Although we cannot directly observe the policy-induced reduction in the suspension rate for any school-grade, we can estimate it. Since Level 2 suspension rates fall to zero in 2012, the policy-induced reduction is equal to the suspension rate that would have prevailed absent the reform ($s_{jt}^{L2}$). We approximate this counterfactual suspension rate by

\textsuperscript{16}We do not observe restorative interventions because they did not have the same reporting requirements as suspensions. But according to one teacher whose school used restorative interventions in the post-reform period, there were too many disciplinary issues to resolve all of them in such a resource-intensive way. Restorative interventions were thus part of the solution, but did not replace traditional punitive discipline.

\textsuperscript{17}Some teachers were involved in lobbying efforts that led to the reform, but the proposed changes to the discipline code were not announced until June 2012 – too late to affect suspensions in the 2011 school year.

\textsuperscript{18}Teachers have discretion over when to escalate misbehavior, but final decisions are made at higher levels. Additionally, teachers affect student behavior through everyday interactions in class.
using the average suspension rate during the 2006 and 2007 school years ($\hat{s}_{j}^{L2}$). The High Treatment group is then defined to contain students in school-grades with $\hat{s}_{j}^{L2}$ greater than the median, and the Low Treatment group contains the remaining students. Discretization in this manner simplifies the analysis, and has the advantage that we do not need to assume that the effect of treatment is directly proportional to $\hat{s}_{j}^{L2}$.

Our treatment group definitions capture meaningful variation in policy impact. In Panel A of Figure 5, we show the evolution of the Level 2 suspension rate, $s_{j}^{L2}$, in each group. The initial gap in suspension rates is around one per hundred students. The gap then narrows initially due to mean reversion, before stabilizing at 0.6 per 100 students. This initial mean reversion motivates our use of 2006 and 2007 to define treatment, while omitting this period from the analysis of outcomes. In the 2012 school year, the Level 2 suspension rate falls sharply to zero, implying a policy impact that is nearly three times larger for the High than the Low Treatment group.

The impact of the policy was not necessarily limited to suspensions for Level 2 infractions. Panel B of Figure 5 shows that total suspensions dropped sharply in the High Treatment group between 2011 and 2012, separate from the secular downward trend throughout the sample period. The relative magnitude of this drop is roughly 2.5 suspensions per 100 students, which is much more than can be explained by the elimination of Level 2 suspensions alone. This is not surprising: all three of the potential responses by educators might be expected to affect suspensions for Level 3-5 infractions as well.

Our results are robust to specifying treatment in many alternative ways. First, in Appendix C.2, we use $\hat{s}_{j}^{L2}$ as a continuous measure of treatment. Second, in Appendix C.3, we define our treatment groups using the full pre-period rather than only 2006 and 2007. Third, Appendix C.4 generalizes to a larger number of discrete treatment groups. Finally, Appendix C.5 shows results when treatment is defined using total rather than Level 2 suspension rates. Our results are largely unchanged in every case.

Since students are not randomly assigned to schools, there are some differences between the two treatment groups. Table 3 presents baseline characteristics by group. Students in the High Treatment group have lower test scores than those in the Low Treatment group by about 0.04 standard deviations, and higher suspension rates for all types of infractions. This is unsurprising given the correlation between suspension rates and test scores, although the test score differences are not statistically significant. High Treatment school-grades are also larger, have slightly more white and slightly fewer black and His-

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19Using only these early years to define our treatment groups avoids conflating treatment effects with mean reversion. Figure 5 shows that our definition captures stable differences in suspension rates for Level 2 infractions during the pre-reform period, after some initial mean reversion between 2007 and 2008.

20For more discussion of how the policy change affected non-Level-2 suspensions, see Appendix B.
Figure 5. This figure shows trends in suspension rates for our below-median treatment intensity group (Low Treatment) and our above-median treatment intensity group (High Treatment). Panel A plots suspension rates for Level 2 infractions only; Panel B plots suspension rates for all infractions. The shaded years are used to assign treatment, and are excluded from our estimates of treatment effects. The vertical red line shows the timing of the reform. Data are from the New York City Department of Education.
panic students, and have relatively more 8th than 6th graders. In Appendix C.1, we show that our results are robust to balancing on these covariates.

Table 3. Pre-Period Treatment Group Characteristics, Grades 6-8

<table>
<thead>
<tr>
<th>Variable</th>
<th>Below-Median</th>
<th>Above-Median</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Scores (Math)</td>
<td>0.021</td>
<td>-0.020</td>
<td>(0.254)</td>
</tr>
<tr>
<td>Test Scores (Reading)</td>
<td>0.019</td>
<td>-0.019</td>
<td>(0.247)</td>
</tr>
<tr>
<td>% Black</td>
<td>0.280</td>
<td>0.267</td>
<td>(0.532)</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>0.423</td>
<td>0.390</td>
<td>(0.099)*</td>
</tr>
<tr>
<td>% White</td>
<td>0.127</td>
<td>0.169</td>
<td>(0.011)**</td>
</tr>
<tr>
<td>% Male</td>
<td>0.506</td>
<td>0.513</td>
<td>(0.010)**</td>
</tr>
<tr>
<td>% Free Lunch</td>
<td>0.861</td>
<td>0.841</td>
<td>(0.148)</td>
</tr>
<tr>
<td>Susp. / 100 (Level 2)</td>
<td>0.278</td>
<td>0.903</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Susp. / 100 (Level 3)</td>
<td>1.858</td>
<td>5.091</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Susp. / 100 (Level 4)</td>
<td>4.835</td>
<td>8.029</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Susp. / 100 (Level 5)</td>
<td>0.964</td>
<td>1.084</td>
<td>(0.083)*</td>
</tr>
<tr>
<td>% Grade 6</td>
<td>0.384</td>
<td>0.263</td>
<td>(0.001)***</td>
</tr>
<tr>
<td>% Grade 7</td>
<td>0.315</td>
<td>0.363</td>
<td>(0.200)</td>
</tr>
<tr>
<td>% Grade 8</td>
<td>0.301</td>
<td>0.374</td>
<td>(0.056)*</td>
</tr>
<tr>
<td>Expenditure / Student</td>
<td>17,143</td>
<td>17,350</td>
<td>(0.302)</td>
</tr>
<tr>
<td>Teacher Salary</td>
<td>70,622</td>
<td>71,880</td>
<td>(0.001)***</td>
</tr>
<tr>
<td>Avg. School-Grade Size</td>
<td>257.2</td>
<td>316.8</td>
<td>(0.000)***</td>
</tr>
<tr>
<td>Students per Teacher</td>
<td>14.6</td>
<td>14.4</td>
<td>(0.118)</td>
</tr>
<tr>
<td>Students per Counselor</td>
<td>293.2</td>
<td>286.8</td>
<td>(0.538)</td>
</tr>
</tbody>
</table>

Table notes. This table compares the High and Low Treatment groups on a number of pre-reform characteristics, averaged over 2008-2011. The third column contains p-values from pairwise comparisons between groups with standard errors clustered at the school-grade level. Test scores are standardized within the sample in subject-grade-year cells. Suspension rates are expressed as the number of suspensions per 100 students. Data are from the New York City Department of Education, and include students in grades 6-8.

Estimating treatment effects

Using the variation provided by the 2012 reform, we estimate the effect of reducing schools’ reliance on suspensions in a difference-in-differences framework. Our analysis relies on the parallel trends assumption, i.e. that the test scores in our Low and High Treatment groups would have moved together if the reform had not been implemented. Importantly, there is no need to assume that changes in suspension rates were randomly assigned. This would be unreasonable, since pre-period suspension rates could be associated with many characteristics of schools, teachers, students, and administrators.
For each outcome $y_{ijt}$, we estimate Equation 1 using data from 2008 to 2015.

$$y_{ijt} = \alpha_j + \gamma_t + \sum_{k \neq 2011} \rho_k \left[ \mathbb{1}(t = k) \times \mathbb{1}(s_{ij}^{L2} \geq \text{Median}(s_{ij}^{L2})) \right] + \beta X_{ijt} + \varepsilon_{ijt}$$ (1)

In this equation, $\alpha_j$ and $\gamma_t$ are school-grade and year fixed effects, and $X_{ijt}$ includes race, gender, English Language Learner status, and free or reduced price lunch status. Our primary outcomes of interest are annual student exam scores in math and reading.

The coefficients, $\rho_k$, measure the difference in the gap between the High Treatment and Low Treatment groups in each year, relative to the gap in 2011. Prior to the reform, we would hope to (and do) see parallel trends for the two groups, as reflected by $\rho_k \approx 0$ in all pre-period years. Then, if relaxing the discipline policy had a positive causal effect on average achievement, $\rho_k$ would rise from 2012 onward as the test scores of the High Treatment and Low Treatment groups converge toward each other. Conversely, a negative causal effect would lead to diverging test scores and falling values of $\rho_k$ over time.

The most important threat to our identification is that schools implemented other contemporaneous policy changes – or were hit by contemporaneous shocks – that differentially affected schools with higher versus lower predicted suspensions. We discuss briefly below why it is unlikely that such violations of our parallel trends assumption are driving our results, with a more detailed discussion available in Appendix D.

### 4.2 Impact on Average Achievement

Our results suggest that eliminating suspensions for Level 2 infractions was, on average, beneficial for student achievement in New York City schools. In fact, the reform entirely closed the gap in math test scores between the High and Low treatment groups.

Figure 6 shows how math scores evolve in each treatment group. The top panel shows the average levels of standardized scores; the bottom panel shows estimated treatment effects ($\rho_k$) from Equation 1, with 95 percent confidence intervals. Prior to the 2012 reform, average test scores are roughly 0.04 standard deviations higher in the Low Treatment group than in the High Treatment group. The average scores of the two groups evolve in parallel, and $\rho_k$ is not statistically different from zero in any pre-treatment year.

Following the 2012 reform, there was a substantial relative improvement in High Treatment school-grades. Gains occurred gradually, reaching a maximum of 0.05 standard deviations in 2014. At this point, the original gap in test scores between the High and Low Treatment groups had been entirely closed. These treatment effects are large, especially given the simplicity of the reform and its low financial cost. By comparison, the gains are
Discipline Reform and Math Achievement, Grades 6-8

Figure 6. This figure shows the effects of the reform on student math achievement. Panel A plots average standardized math scores in each treatment group over time. Panel B plots the estimated treatment effects, \( \rho_{k} \), from Equation 1. Each point measures the gap in test scores between the High and Low treatment groups relative to 2011, conditional on year and school-grade fixed effects and demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
equivalent to improving teacher value-added by one-third of a standard deviation (Chetty et al., 2014). They are also about one-quarter of the benefit of a smaller class in grades K-3 under Tennessee’s Project STAR (Krueger, 1999). However, Krueger estimated that implementing equivalent class size reductions more widely would have cost $2,151 per student for each of the four years of the intervention.21

Our estimates of impact of the reform are robust to generalizations of our approach. Table 4 shows the results of several alternative specifications. Column 1 shows our baseline yearly estimates from Equation 1. In Column 2, we remove student demographic controls. In Column 3, we add these back along with controls for baseline math and reading test scores from grade 3 as a noisy measure of student ability.22 In Column 4, we allow the two treatment groups to follow distinct linear trends. In Column 5, we add controls for suspensions for higher-level infractions that were not directly affected by the reform.23 Our results are qualitatively unchanged in all cases.

There are three reasons why only a small portion of these gains can be explained by the direct impact of changing the punishments for students who would have been suspended under the old policy. First, suspensions dropped immediately, but the test score gains were realized with a lag. Second, we show in Section 4.3 that gains are realized even by students who are unlikely to be suspended. Third, we show in Section 5 that principal’s suspensions have no more than a 0.03 standard deviation direct impact each in the year they occur. By contrast, if the overall gain in test scores came solely from the elimination of the direct effects of Level 2 suspensions, each suspension must have raised the affected student’s score by 5 standard deviations. Even if the entire reduction in suspension use for all infractions was induced by the policy, the implied effect per suspension would be 1.2 standard deviations. Such gains are implausibly large, given that students who are suspended perform 0.6 standard deviations worse unconditionally in our data.24

Figure 7 shows that reading scores follow a similar pattern, but with smaller treatment effects. Columns 6-10 of Table 4 show that the statistical significance levels of the reading estimates are thus more fragile. Controlling for separate linear trends for each treatment group further reduces the size of the reading estimates: in that specification, we cannot conclude that the effects are different from those for math, but neither can we rule out the possibility that the reform had no impact on reading scores. This stems from a gradual increase in the reading scores of the High Treatment group relative to the Low Treatment

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21 These calculations underestimate the cost today, since expenditure per student has increased over time.

22 We use grade 3 scores to avoid controls that are endogenous to the reform. Note that only 6th graders in 2015 have grade 3 scores from 2012 or later. Our results are robust to the exclusion of these students.

23 Higher-level suspensions may still respond endogenously as students and teachers adapt their behavior.

24 The upper bound on direct effects we estimate captures the short-term impact. Effects may compound over time, but it would take aggressive assumptions about dynamics to reach $1.2\sigma$ or $5\sigma$ over four years.
Table 4. Estimated Treatment Effects on Standardized Test Scores, Grades 6-8

<table>
<thead>
<tr>
<th></th>
<th>(1) Math</th>
<th>(2) Math</th>
<th>(3) Math</th>
<th>(4) Math</th>
<th>(5) Math</th>
<th>(6) Reading</th>
<th>(7) Reading</th>
<th>(8) Reading</th>
<th>(9) Reading</th>
<th>(10) Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho^{2012}$</td>
<td>0.00286 (0.0118)</td>
<td>0.00535 (0.0119)</td>
<td>0.00520 (0.0113)</td>
<td>0.000316 (0.0134)</td>
<td>-0.000934 (0.0118)</td>
<td>-0.000832 (0.00965)</td>
<td>0.00225 (0.0101)</td>
<td>-0.00136 (0.00894)</td>
<td>-0.00262 (0.0116)</td>
<td>-0.00385 (0.00956)</td>
</tr>
<tr>
<td>$\rho^{2013}$</td>
<td>0.0310** (0.0133)</td>
<td>0.0347** (0.0137)</td>
<td>0.0359*** (0.0130)</td>
<td>0.0279 (0.0174)</td>
<td>0.0271** (0.0131)</td>
<td>0.0151 (0.0114)</td>
<td>0.0191 (0.0120)</td>
<td>0.0174* (0.00999)</td>
<td>0.00996 (0.0161)</td>
<td>0.0120 (0.0114)</td>
</tr>
<tr>
<td>$\rho^{2014}$</td>
<td>0.0504*** (0.0138)</td>
<td>0.0566*** (0.0145)</td>
<td>0.0552*** (0.0132)</td>
<td>0.0468** (0.0208)</td>
<td>0.0439*** (0.0137)</td>
<td>0.0285** (0.0120)</td>
<td>0.0323** (0.0131)</td>
<td>0.0331*** (0.0107)</td>
<td>0.0200 (0.0196)</td>
<td>0.0234* (0.0120)</td>
</tr>
<tr>
<td>$\rho^{2015}$</td>
<td>0.0415*** (0.0152)</td>
<td>0.0459*** (0.0160)</td>
<td>0.0428*** (0.0140)</td>
<td>0.0373 (0.0247)</td>
<td>0.0335** (0.0151)</td>
<td>0.0196 (0.0134)</td>
<td>0.0238 (0.0147)</td>
<td>0.0206* (0.0117)</td>
<td>0.00778 (0.0242)</td>
<td>0.0134 (0.0134)</td>
</tr>
</tbody>
</table>

| Stud. Dem. | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Prior Scores | No | No | Yes | No | No | No | No | Yes | No | No |
| Time Trends | No | No | No | Yes | No | No | No | Yes | No | No |
| Other Susp. | No | No | No | No | Yes | No | No | No | Yes | No |
| #Observ. | 1350764 | 1350764 | 1073398 | 1350764 | 1350764 | 1327997 | 1327997 | 1078783 | 1327997 | 1327997 |
| #Clusters | 1063 | 1063 | 1061 | 1063 | 1063 | 1063 | 1063 | 1063 | 1063 | 1063 |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table notes. Columns (1) and (6) of this table show estimated treatment effects, $\rho_k$, from Equation 1. The dependent variable is a student’s standardized test score in math or reading. Controls include demographics and fixed effects for year and school-grade. Columns (2) and (7) remove student demographic controls, leaving only the two-way fixed effects. Columns (3) and (8) add controls for student test scores in grade 3. Columns (4) and (9) include time trends by treatment group. Columns (5) and (10) include controls for non-Level-2 suspensions. Standard errors in all specifications are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Figure 7. This figure shows the effects of the 2012 reform on reading achievement. Panel A plots average standardized reading scores in each treatment group over time. Panel B plots the estimated treatment effects, $\rho_{kt}$, from Equation 1. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
group prior to the reform, although no pre-period coefficient is statistically significant.

The pattern of test score gains we observe in math and reading cannot easily be explained by other policy changes. In Section 7, we rule out policies that operate through funding and staffing. In Appendix D, we then discuss why the timing of the test score effects we see in Figures 6 and 7 cannot be explained by specific reforms such as the revision of state assessments to align with the Common Core in 2012, the election of Mayor Bill de Blasio, or his appointment of Chancellor Carmen Fariña. In our conversations with school administrators and staff, we have not become aware of any other policy change that could drive our effects. Furthermore, since the High Treatment group has slightly fewer minority students than the Low Treatment group (see Table 3), policies aimed at closing the achievement gap would bias against our treatment effects.

4.3 Treatment Effect Heterogeneity

We next show that the benefits of the 2012 discipline reform were broad-based. Students benefited even if they would have been unlikely to be suspended themselves.

4.3.1 By Demographic Group

Panel A of Figure 8 shows that treatment effects on math scores for boys and girls – obtained by estimating Equation 1 for each group – are nearly identical. The results for reading are similar (see Appendix Figure F2). This is despite boys being suspended twice as often as girls prior to the reform: from 2008 to 2011, middle school boys in New York City schools averaged 15.9 suspensions per 100 students for any infraction and 0.8 suspensions per 100 students for disorderly behavior, compared to 7.1 and 0.37 for girls.

The treatment effects by race in Panel B are also suggestive of smaller gains for black students, even though black students are much more likely to be suspended.

However, it is difficult to draw strong conclusions, since the scores of students from each race in the High Treatment group do not move with their same-race peers in the Low Treatment group prior to the reform. The pre-trends are more consistent for reading (see Appendix Figure F2), with the results suggesting that the largest gains were for white students.

4.3.2 By Suspension Risk

We refine this subgroup analysis by directly estimating an individual’s likelihood of receiving any suspension (their “suspension risk”). To do so, we estimate the relationship

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25The suspension rate for black students is around 18.9 per 100 (1.0 per 100 for Level 2 infractions), compared to 11.6 per 100 (0.6 per 100) for Hispanic students, and 7.2 per 100 (0.4 per 100) for white students.
Figure 8. This figure shows the effects of the reform on math achievement for demographic subgroups. Panel A plots the estimated treatment effects $\rho_k$ from Equation 1 for boys and girls. Panel B splits by racial group. Each point measures the gap in test scores between the High and Low treatment groups relative to 2011, conditional on year and school-grade fixed effects and other demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
between individual characteristics and suspension outcomes in 2006-2007. Then we use those estimated parameters to generate predictions for 2008-2015.

We model the probability that student \( i \) received at least one suspension (i.e., \( S_{ijt} > 0 \)) in year \( t \) using a logit specification.

\[
Pr(S_{ijt} > 0 \mid X_{ijt}) = \frac{1}{1 + e^{-(\alpha + \beta X_{ijt} + \epsilon_{ijt})}}
\]  

The matrix \( X_{ijt} \) includes: (1) demographics (race, gender, English Language Learner, free lunch status); and (2) grade 3 test scores for math and reading as proxies for ability.

**Table 5. Pre-Period Characteristics by Suspension Risk Quartile, Grades 6-8**

<table>
<thead>
<tr>
<th></th>
<th>Quartile 1</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Scores</td>
<td>0.866</td>
<td>0.119</td>
<td>-0.116</td>
<td>-0.539</td>
</tr>
<tr>
<td>Reading Scores</td>
<td>0.829</td>
<td>0.184</td>
<td>-0.057</td>
<td>-0.493</td>
</tr>
<tr>
<td>% Black</td>
<td>0.015</td>
<td>0.177</td>
<td>0.390</td>
<td>0.577</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>0.149</td>
<td>0.558</td>
<td>0.444</td>
<td>0.390</td>
</tr>
<tr>
<td>% White</td>
<td>0.270</td>
<td>0.200</td>
<td>0.157</td>
<td>0.025</td>
</tr>
<tr>
<td>% Male</td>
<td>0.281</td>
<td>0.230</td>
<td>0.536</td>
<td>0.934</td>
</tr>
<tr>
<td>% Free Lunch</td>
<td>0.699</td>
<td>0.826</td>
<td>0.880</td>
<td>0.933</td>
</tr>
<tr>
<td>Susp. / 100 (All)</td>
<td>2.531</td>
<td>6.976</td>
<td>13.510</td>
<td>24.643</td>
</tr>
<tr>
<td>Susp. / 100 (Level 2)</td>
<td>0.114</td>
<td>0.345</td>
<td>0.723</td>
<td>1.319</td>
</tr>
<tr>
<td>Total Students</td>
<td>360,184</td>
<td>359,991</td>
<td>360,083</td>
<td>359,983</td>
</tr>
</tbody>
</table>

*Table notes.* This table shows characteristics by suspension risk quartile, averaged over 2008-2011. Quartile 1 contains students with the lowest suspension risk, quartile 4 the highest. Test scores are standardized within subject-grade-year cells. Suspension rates are expressed as the number of suspensions per 100 students. Data are from the New York City Department of Education, and include students from grades 6 through 8.

Table 5 shows summary statistics by suspension risk quartile prior to the reform. Students in the lowest risk quartile (Quartile 1) score 1.4 standard deviations higher on their math exams than students in the highest quartile (Quartile 4), and 1.3 standard deviations higher in reading. Similarly, 15 percent of students in Quartile 1 are black or Hispanic, compared to 97 percent in Quartile 4. Actual suspension rates are 10 times higher in Quartile 4 than Quartile 1, both for all suspensions and suspensions for Level 2 infractions.

**Estimating treatment effects by quartile of suspension risk**

Next, we estimate Equation 1 by quartile of suspension risk. For each quartile, Figure 9 plots the estimated treatment effect in 2014 \( (\rho_{2014}) \), along with its 95 percent confidence

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26 Appendix Figure F3 shows results from the same exercise with predictions for Level 2 suspensions.
Figure 9. This figure shows the effects of the 2012 discipline reform on test scores for students in different quartiles of predicted suspension risk. Panel A plots the estimated treatment effects from Equation 1 in 2014 only on math scores in each risk quartile. Panel B plots estimated treatment effects in 2014 on reading scores in each risk quartile. The vertical blue lines show 95 percent confidence intervals. The red dashed line shows the estimated treatment effect in 2014 for the full sample. The green line shows actual suspension rates for all infractions within each quartile over the 2008-2011 period. Data are from the New York City Department of Education, and include students from grades 6 through 8.
These coefficients measure how the test score gap between High and Low treatment groups changed between 2011 and 2014. For comparison, our estimates for the full sample – 0.05σ for math and 0.03σ for reading – are shown as red dashed lines. The green line plots the number of suspensions of any type per 100 students in each quartile.

The gradient of treatment effects by suspension likelihood is relatively flat for both math and reading, although we lack the power to rule out small differences across quartiles. The smallest point estimates for both subjects are in the highest risk quartile, despite suspension rates increasing sharply across quartiles. Imprecision of the estimates makes us reluctant to draw strong conclusions from this result, but it is plausible that the disadvantaged and underperforming students who are at the highest risk of suspension are not in a position to benefit as much from the changes brought by the reform.

Our results by demographic group and by suspension risk suggest broad-based gains that are not strongly correlated with a student’s own likelihood of suspension. This reinforces the conclusion we drew from our aggregate results: the gains from this reform cannot have been driven by the direct effects of eliminating suspensions on students who would have been suspended. If this were the case, then we would expect to see small improvements for groups with low suspension likelihoods.

### 5 Bounding Direct Suspension Effects with Sharp Timing

We next explicitly estimate an upper bound for the short-term direct impact of suspension, exploiting the timing of each suspension relative to the dates of standardized tests. The results suggest that direct effects are too small to explain any significant part of the aggregate effects of the reform. Said differently, the short-term disruption from missing class while serving a suspension cannot be driving our results. However, it is important to note that our approach here cannot measure the long-term direct impact of suspension.

We first calculate the time between the start of each suspension and the 3-5 day testing window for each exam. Then we use the following regression to compare the scores of students suspended before and after the exam, excluding those suspended during the testing window (time 0) because we don’t observe the exact exam date for each student.

\[
y_{ijt} = \alpha_j + \gamma_t + \delta_i + \sum_{k \neq 0} \beta_k \mathbb{1} [S_{ikt} \geq 1] + \epsilon_{ijt} \tag{3}
\]

\footnote{Event study graphs for each quartile are available as Appendix Figures F4 and F5.}
The coefficients on the suspension indicators compare the test scores of students who are suspended in month \( k \) (relative to the exam) to students who are not. This group of students who are not suspended in month \( k \) contains both those who are not suspended at all that year, and those who are suspended, but not in that month. The comparisons are conditional on student, school-grade, and calendar-year fixed effects.

The difference between \( \beta_{-1} \) and \( \beta_1 \) provides our upper bound on the short-term direct impact of suspension. Mechanically, the comparison of the two coefficients captures the difference in scores between students who are suspended in the month prior to the exam, and those suspended just following the exam. Part of this difference reflects the causal effect of suspension on student achievement. However, it also captures the effect of any shock that led that student to misbehave, and any direct effect of the misbehavior itself. Examples of such shocks could include parental divorce or the incarceration of a family member. Nonetheless, \( \beta_1 - \beta_{-1} \) is an upper bound for the short-term impact of suspension providing that such negative shocks lower students’ test scores on average.

**Bunching of suspension dates**

Our identification requires local variation in the timing of suspensions to be as good as random, conditional on student behavior. However, the suspension rates in Figure 10 show some evidence of manipulation: there are fewer suspensions than usual during exam windows, followed by spikes immediately after.\(^{28}\) This is consistent with, for instance, schools postponing suspensions to avoid interfering with standardized testing. We therefore exclude students who are suspended between two weeks before and two weeks after the testing window. As an example, “month 1” will thus include suspensions occurring from two weeks after the exam to one month and two weeks after the exam.

**Results of the bounding exercise**

Figure 11 plots the coefficients on the monthly indicators in Equation 3. Receiving a principal’s suspension has no more than a 0.03 standard deviation causal impact on a student’s math score later that year, since the 95 percent confidence interval for \( \beta_1 - \beta_{-1} \) ranges from -0.015 to 0.03 standard deviations. There is a much clearer discontinuity after the exam window for superintendent’s suspensions, but even those longer punishments for more serious infractions have at most a 0.11 standard deviation impact. We obtain qualitatively similar results for reading (see Appendix Figure F10).

These estimates are small relative to the aggregate math score gain of 0.05 standard

\(^{28}\)Suspensions spike twice after the testing window for reading, with the larger spike coming on Day 9. The second spike corresponds to the end of the testing window for math a week later. See Appendix Figure F9 for separate daily suspension charts and exam dates for each year.
Figure 10. This figure shows the relationship between daily suspension rates and the exam windows in the 2011 school year. The blue bars show the number of suspensions issued each day to students in grades 6-8. The dark red shaded regions are the exam windows for math (Panel A) and reading (Panel B). The light red shaded regions are within two weeks of the exam window, and are excluded from the analysis. Data are from the New York City Department of Education, and include students in grades 6-8.

deviations per student by 2014. Moreover, there is a gap of only 0.6 suspensions for disorderly behavior per 100 students per year between our treatment groups, since these suspensions were relatively rare. Thus, if we assume that the direct effects we measure do not compound over time, at most 0.4 percent of the aggregate gains can be explained via this channel. By contrast, our calculations in Section 4.2 showed that the direct impact of each suspension would have to have been 1.2 standard deviations to explain the overall effect of the reform on math scores, and even then only if we assume that the reform was responsible for the entire reduction in suspension rates for all infractions.

6 Impact of the 2012 Reform on School Culture

We propose an alternative channel of improvements in school culture. Survey responses indicate that the relaxation of discipline policy in 2012 led to improvements in student-teacher relationships and perceptions of safety. Moreover, improvements in school culture are positively associated with test score gains.

This pattern of results is consistent with our conversations with teachers and reform advocates, who highlighted several mechanisms by which school culture could affect student achievement. First, both students and teachers may work harder when they feel supported and respected. Second, students and teachers may reallocate effort away from avoiding and enforcing discipline. Third, students may become more engaged if they
perceive that teachers and administrators are less biased and more reasonable. Our results here are an important contribution to the debate surrounding school discipline, since much of the disagreement between proponents and opponents of discipline reform can be traced to beliefs about the relationship between strict, punitive discipline and school culture. Indeed, a stated justification for the introduction of zero tolerance school discipline was that it was necessary to maintain a safe school environment that is conducive to learning (Skiba and Knesting, 2001; American Psychological Association Zero Tolerance Task Force, 2008). This logic is supported by evidence that there may be large spillover effects from disruptive students on their peers (Carrell and Hoekstra, 2010; Carrell et al., 2018). Similar logic underlies the strict discipline policies of No Excuses charter schools, the practices of which have collectively been shown to raise student achievement (Angrist et al., 2013; Dobbie and Fryer, 2013).

The potential for improvements in school culture has also underpinned arguments for relaxing school discipline. This was an important basis for the push by the New York City Civil Liberties Union (NYCLU) and other advocacy groups that led to the 2012 discipline reform we study in this paper (Mukherjee, 2007; Miller et al., 2011). On a national scale,
the Departments of Justice and Education issued a *Dear Colleague* letter to schools in 2014, urging them to reduce suspension use. They argued that doing so would improve school cultures by reducing perceptions that discipline policy was biased and unduly harsh. It has proven difficult, however, for researchers to prove that there is a positive causal impact of relaxing discipline on school culture.\(^{29}\)

### 6.1 Empirical Strategy

To quantify the effect of this reform on school culture, we construct several measures of culture from student and teacher survey responses and estimate treatment effects on these outcomes in the same way that we did for achievement in Section 4. The questions we analyze are shown in Table 6; they relate to student-teacher relationships, behavior, or feelings of safety at school.

**Student-teacher relationship**

As a proxy for the quality of student-teacher relationships, we look at responses of students and teachers to the question of whether “most students at my school treat adults with respect.” Responses are on a four-point scale from “strongly agree” to “strongly disagree.”\(^{30}\) We code these responses so that higher is better. We then standardize the numeric responses within each year, and report results in standard deviation units.\(^{31}\)

**Perceptions of safety and behavior**

We create two indices to measure how safe students and teachers feel: one directly measures safety, and the other student behavior. The behavior questions ask about incidents such as bullying and fighting. Answers are on a four-point scale from “none of the time” to “all of the time.” The safety questions ask students whether they feel safe in areas such as classrooms, bathrooms, and hallways; teachers are asked whether order and discipline are maintained at school, and whether crime and violence are a problem. Answers range from “strongly agree” to “strongly disagree.” Responses are coded so that higher numbers reflect better outcomes, and standardized by year. To construct each index, we average the standardized responses across questions, and re-standardize the combined index.

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\(^{29}\) Teachers and students feel less safe in schools with high suspension rates but a causal link is hard to establish (Skiba and Knesting, 2001; Lacoe and Steinberg, 2018).

\(^{30}\) From 2006 to 2011, the student (but not the teacher) question contained a “don’t know” option. We exclude these responses. The share of students selecting the “don’t know” option is roughly 7% in both the High and Low Treatment groups. Other culture measures have consistent response options over time.

\(^ {31}\) There were other small changes to the survey that make us reluctant to compare raw response levels. These include changes to the question order, the order of responses, and minor changes to wording.
Table 6. Survey Questions on School Culture

<table>
<thead>
<tr>
<th>Student Survey Questions</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respect</strong></td>
<td>2008-2013</td>
</tr>
<tr>
<td>• Most students at my school treat adults with respect.</td>
<td></td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
<td>2008-2015</td>
</tr>
<tr>
<td>• Students threaten or bully other students at school.</td>
<td></td>
</tr>
<tr>
<td>• Students get into physical fights at my school.</td>
<td></td>
</tr>
<tr>
<td>• Students use alcohol or drugs while at school.</td>
<td></td>
</tr>
<tr>
<td>• There is gang activity at my school.</td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>2008-2015</td>
</tr>
<tr>
<td>• I am safe in my classes.</td>
<td></td>
</tr>
<tr>
<td>• I am safe in the bathrooms, hallways, and locker rooms at my school.</td>
<td></td>
</tr>
<tr>
<td>• I feel safe on school property outside my school building.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher Survey Questions</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respect</strong></td>
<td>2008-2013</td>
</tr>
<tr>
<td>• At my school, most students treat adults with respect.</td>
<td></td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
<td>2008-2013</td>
</tr>
<tr>
<td>• Students in my school are often threatened or bullied.</td>
<td></td>
</tr>
<tr>
<td>• Students use of alcohol and illegal drugs in school is a problem at my school.</td>
<td></td>
</tr>
<tr>
<td>• There are conflicts at my school based on race, color, creed, ethnicity, national origin, citizenship/immigration status, etc.</td>
<td></td>
</tr>
<tr>
<td>• Gang activity is a problem at my school.</td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>2008-2013</td>
</tr>
<tr>
<td>• Order and discipline are maintained at my school.</td>
<td></td>
</tr>
<tr>
<td>• I am safe at my school.</td>
<td></td>
</tr>
<tr>
<td>• Crime and violence are a problem at my school</td>
<td></td>
</tr>
</tbody>
</table>

**Table notes.** This table displays the survey questions that we use to measure respect, behavior, and safety. The right column indicates the years in which data for each group of questions is available. The exact presentation of these questions changed slightly over time. In particular: (1) the order of responses changed for some questions (strongly agree = 1 vs. strongly disagree = 1); (2) some questions had small changes to wording that didn’t affect their meaning; and (3) the order of questions within the survey varied.

**Perceptions of bias**

We cannot directly measure perceptions of bias, but we do find a pattern in our results that is consistent with reduced bias playing a role in the test score improvements we observe. Specifically, we show in Appendix Figure F6 that school-grades that reduced suspension rates for black and Hispanic students, relative to white students, also achieved larger average achievement gains across all students.

**Estimating treatment effects**

For each culture measure, we estimate Equation 4, which is analogous to Equation 1 but with no individual-level controls because outcomes vary at the school level.

\[
y_{ijt} = \alpha_j + \gamma_t + \sum_{k \neq 2011} \rho_k \left[ \mathbb{1}(t = k) \times \mathbb{1}(\hat{s}_{ij}^{L2} \geq \text{Median}((\hat{s}_{ij}^{L2})) \right] + \varepsilon_{ijt} \tag{4}
\]
Just as with test scores, treatment effects are given by the yearly $\rho_k$ coefficients. These can be interpreted as the difference on a given culture metric between the High and Low Treatment groups relative to the difference in 2011, just prior to the reform.

### 6.2 Treatment Effects on Culture

Figure 12 (Panels A-C) and Table 7 display our estimates of $\rho_k$ in Equation 4 for each measure of school culture. We find positive effects on both student and teacher assessments of student-teacher relationships, feelings of personal safety, and perceptions of student behavior. Prior to the reform, the average levels of all the culture measures evolve largely in parallel for the High and Low Treatment groups, and $\rho_k$ is not statistically different from zero in any year. All measures then show a relative improvement in the High Treatment group after the reform was implemented in 2012. The gains reported by teachers are generally larger, and eventuate more quickly, than those for students.

<table>
<thead>
<tr>
<th>Table 7. Estimated Treatment Effects on School Culture Outcomes, Grades 6-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Respect (Students)</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>$\rho^{2012}$</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>$\rho^{2013}$</td>
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<tr>
<td></td>
</tr>
<tr>
<td>$\rho^{2014}$</td>
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<tr>
<td></td>
</tr>
<tr>
<td>$\rho^{2015}$</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>Clusters</td>
</tr>
</tbody>
</table>

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table notes.** This table shows estimated treatment effects $\rho_k$ from Equation 4 on our six culture outcomes. Controls include year and school-grade fixed effects. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.

**Linking culture and test score gains**

There are two senses in which these improvements in culture are consistent with the gains in achievement. First, school-grades with larger improvements in culture also saw greater...

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32 Appendix Figure F7 shows the levels of our standardized culture measures in each group over time.
**Figure 12.** This figure shows the effects of the 2012 discipline reform on our three measures of school culture and the relationship between improvements in culture and test score gains at the school-grade level. Panel A plots the estimated treatment effects $\rho_k$ from Equation 4 on respect, with student responses in green and teacher responses in dark red. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. In Panel D, we calculate the changes in student and teacher respect between 2011 and 2013 in each school-grade and create binned scatterplots against the corresponding changes in math test scores. Bins of teacher responses are in blue and bins of student responses are in dark red. Panels B and E repeat the same analysis for perceptions of student behavior, and panels C and F do the same for safety. Culture metrics are standardized within each year. Test scores are standardized within the sample in grade-year cells. Standard errors in all regressions are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
test score gains. Second, the relative improvements in culture and test scores are remark-ably consistent with the cross-sectional relationships between these measures.

Panels D to F of Figure 12 compare the change in each culture measure to the math score gain in each school-grade. For all three measures, there is a positive correlation between culture improvements and math score improvements. The same is true for reading (see Appendix Figure F8). Although our identification strategy does not tell us the nature of the relationship between culture and achievement, these correlations are consistent with school culture being an important driver of the test score gains from the reform.

Comparing the sizes of gains in culture and achievement, the respect measure reported by teachers improved by 0.15 standard deviations in the High Treatment group relative to the Low Treatment group, while the gain in test scores was 0.05 standard deviations. The cross-sectional correlation between our teacher respect measure and math scores is 0.32. Thus, if we were to draw two random students and observed a difference of 0.15 standard deviations in teachers’ assessments of respect at their schools, we would indeed predict the test score of the student at the higher-respect school to be 0.05 standard deviations higher. The 0.15 standard deviation improvement in teachers’ perceptions of student behavior predicts the same 0.05 standard deviation math gain.\footnote{Teacher perceptions of behavior improve by 0.15\(\sigma\). Given a cross-sectional correlation between the behavior index for teachers and math scores of 0.28, this also predicts a 0.05\(\sigma\) higher math score.}

7 Ruling out Other Potential Mechanisms

Our final step is to provide suggestive evidence that the benefits of the reform were not driven by staffing or funding changes. Additionally, we show in Appendix E that our results are not driven by changes in student or teacher composition.

Principal and teacher turnover

Principals and teachers are the primary drivers of variation in discipline policy and school culture within New York City, since all schools face the same set of district policies. In conjunction with the change in the discipline code in 2012, it is conceivable that principals and teachers who favored strict, punitive discipline could have been replaced by others whose views were more aligned with the effort to reduce suspension rates.

Figure 13 shows the results when we estimate Equation 4 using principal and teacher tenure, which suggest otherwise. First, Panel A shows that there is a relative trend in teacher tenure in High Treatment school-grades, but that there is no differential effect at the time of the reform. Second, Panel B shows that principal tenure increased in High
Average Tenure by Treatment Group, Grades 6-8

A. Teachers

B. Principals

Figure 13. This figure shows the effects of the 2012 discipline reform on principal and teacher tenure. Panel A plots estimated treatment effects from Equation 4 for teacher tenure; Panel B plots the same for principal tenure. Each point measures the gap in tenure between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.

Treatment schools relative to Low Treatment schools, which is inconsistent with the replacement of high-suspension principals. This shift is driven by the departures of a small number of principals with very long tenure from schools in the Low Treatment group. In Figure 14, we assess the impact of these principals by dropping all schools with long-tenured principals from both treatment groups. In this sample, there is no relative change in tenure, yet our treatment effects on test scores and school culture are even larger.

School resources

The 2012 reform encouraged a shift toward restorative interventions instead of suspensions. Such counseling-based interventions are resource-intensive, since they require investment in training and personnel. If additional resources were allocated to High Treatment schools, this could itself contribute to culture and test score improvements.

If anything, High Treatment school-grades became worse off in terms of per-student funding and the number students per counselor.\textsuperscript{34} Panel A of Figure 15 plots the coefficients from Equation 4 for total per-pupil expenditure. Funding decreased in the High Treatment group relative to the Low Treatment group. Panel B shows that there was little effect on the number of students per counselor. These results are consistent with complaints by teachers about the lack of new funding for counselors and psychologists to accompany the move toward guidance-based interventions (Baker, 2012).

\textsuperscript{34}We classify a staff member as a counselor if they are recorded as a guidance counselor or a psychologist.
Figure 14. This figure shows the effects of the 2012 discipline reform on principal tenure, math test scores, student-teacher respect, and perceptions of safety for a sub-sample of schools that excludes long-tenured principals (over 10 years). Each point measures the gap in the relevant outcome between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.

8 Conclusion

Recent reforms across the United States have aimed to reduce suspension use. This paper provides evidence that a reform eliminating suspensions for disorderly behavior in New York City led to significant gains in test scores for students in schools that were more affected by the change, relative to other schools. Our results suggest that these gains were driven by cultural changes that benefited a wide range students, even those who would not have been suspended under the previous regime. By contrast, we rule out the possibility that any significant part of the gains came from the elimination of the direct impact of suspension on students who would themselves have been suspended.

Our results will be encouraging for those who seek to further reduce the reliance of
Figure 15. This figure shows the effects of the 2012 discipline reform on school resources. The green lines plot the estimated treatment effects $\rho_k$ from Equation 4. Each point measures the difference between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.

schools on suspensions and other exclusionary punishments. The improvements we see in school culture contrast sharply with the stated justifications behind strict discipline policies and high suspension rates. However, we urge caution when generalizing from our results to other types of discipline reform, especially those that target higher-level suspensions. The 2012 reform in New York City that we study here was the first step in easing a very strict discipline code. The reform targeted the most discretionary suspensions, which were most likely to be perceived as overly harsh or unfair. It is an open question whether changes to policies that target punishments for more serious infractions would lead to cultural and achievement gains similar to those we document here.

More broadly, this paper contributes to our understanding of the factors that make schools effective. It is well-documented that students’ academic achievement can be improved by effective teachers (Chetty et al., 2011), and by high-performing charter schools (Angrist et al., 2013). We also have some appreciation for the package of practices that makes such schools effective; this tends to include harsh discipline, along with frequent teacher feedback, data-driven instruction, high-dosage tutoring, and increased instructional time (Dobbie and Fryer, 2013; Fryer, 2014). However, our results suggest that instituting a harsh discipline code does not by itself raise the average achievement, at least in the cross-section of New York City public schools that we study.
References


A  Decomposition of Variation using Fixed Effects

In this appendix, we show that most of the negative covariation between suspensions and test scores is explained by differences between schools and between the types of students who do and do not get suspended within a school. Yet, student performance is still lower in years with a suspension relative to years without a suspension. Like Lacoe and Steinberg (2019), we exploit the panel structure of our data through regressions with individual student fixed effects and find similar results in New York as they did in Philadelphia. Comparing the results here to those in Section 5, we show that our timing analysis offers meaningful improvements over fixed effects, especially for shorter suspensions.

Specifically, we estimate the following model on data prior to the removal of suspensions for Level 2 infractions in 2012:

\[ y_{ijt} = \eta_i + \theta_j + \gamma_t + \beta 1(s_{ijt} > 0) + \epsilon_{ijt} \]  

(5)

where \( y_{ijt} \) is the test score of student \( i \) in school-grade \( j \) in year \( t \); \( 1(s_{ijt} > 0) \) indicates that student \( i \) was suspended during year \( t \); and \( \eta_i \), \( \theta_j \), and \( \gamma_t \) are fixed effects.

The coefficient \( \beta \) measures the association between suspension rates and test scores, conditional on student characteristics. As such, this approach eliminates the possibility that \( \beta \) simply captures variation across students (e.g., due to differences in family background) that leads to both lower test scores and higher suspension rates. Instead, it is an estimate of the extent to which being suspended predicts lower than usual test scores for the affected student – holding fixed her grade and the school she attends.

Since longer suspensions for more severe behavior may have different effects, we also estimate versions with separate indicators for infraction severity or type of suspension:

\[ y_{ijt} = \sum_{k=2}^{5} \beta_k 1(s_{ijt}^{L_k} > 0) + \eta_i + \theta_j + \gamma_t + \epsilon_{ijt} \]  

(6)

\[ y_{ijt} = \beta_P 1(s_{ijt}^{P} > 0) + \beta_S 1(s_{ijt}^{S} > 0) + \eta_i + \theta_j + \gamma_t + \epsilon_{ijt} \]  

(7)

where \( 1(s_{ijt}^{L_2} > 0) \) is an indicator for having at least one suspension for Level 2 behavior during that school year, and so on, and \( s_{ijt}^{P} \) and \( s_{ijt}^{S} \) refer to principal’s and superintendent’s suspensions. The coefficient \( \beta_x \) is the effect of having a particular level/type of suspension conditional on one’s record of suspensions of other levels/types.
The results are shown in Tables A1 and A2 for math and reading. Column (1) in each table shows unconditional correlations between suspensions and test scores for middle school students. Students with at least one suspension in a given year perform 0.64σ worse on average in math and 0.51σ worse in reading. Adding school-grade and year fixed effects in Column (2) reduces the magnitudes of the effects by 20-25 percent. Most of the relationship between suspensions and test scores cannot therefore be explained by differences across schools. Rather, even within school-grades, students who get suspended fare much worse than those who do not get suspended.

Even when student fixed effects are added in Column (3), there remains a negative and statistically significant relationship between suspensions and test scores. The magnitudes of the coefficients are reduced, but effect sizes are meaningful. Students who are suspended at least once score 0.06σ lower in math and 0.03σ lower in reading. These results are similar to Lacoe and Steinberg (2019), who found effects of 0.04σ in math and reading for middle school students in Philadelphia. In New York, these negative relationships are stronger for suspensions for higher-level infractions and for superintendent’s suspensions relative to principal’s suspensions, as shown in Columns (4) and (5).

As with our timing analysis in Section 5, these fixed effects estimates are upper bounds on the causal effect of a suspension: we do not observe student-specific shocks that may contribute to both misbehavior and poor exam performance, and these shocks are likely to operate in the same direction as the suspension effect. Comparing the math results in Figure 10 to Column (5) of Table A1, the fixed effects analysis overstates the direct effect of an individual suspension, although results are somewhat more precise. The implied upper bounds of 0.05σ and 0.11σ are meaningfully different from the timing analysis for principal’s suspensions but not for superintendent’s suspensions.

In summary, students within schools who get suspended are different from those who do not, yet a given student’s performance is also lower in years in which they are suspended. Our timing analysis offers improvements over the fixed effects analysis in bounding effects on the suspended students, especially for shorter suspensions.

B Natural Experiment: Impact on Total Suspension Rate

Although the 2012 discipline reform explicitly banned suspensions for Level 2 infractions only, Panel B of Figure 5 shows that the drop in total suspensions was larger than the drop

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35Similar estimates are produced by regressions with individual fixed effects but no school-grade effects.

36Lacoe and Steinberg (2019) found smaller and insignificant effects from suspensions for classroom disorder, which are broadly similar to our suspensions for Level 2 infractions.
Table A1. Regressions of Standardized Math Scores on Suspensions, Grades 6-8

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Suspension</td>
<td>-0.642***</td>
<td>-0.512***</td>
<td>-0.059***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.009)</td>
<td>(0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal’s</td>
<td></td>
<td></td>
<td>-0.043***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superintendent’s</td>
<td></td>
<td></td>
<td></td>
<td>-0.102***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td></td>
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* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table notes. This table decomposes the unconditional correlation between math scores and suspensions using fixed effects. The dependent variable is the student’s math test score, standardized within a grade-year cell. Column (1) shows the unconditional correlation between math scores and suspensions for middle school students. Column (2) adds fixed effects for school-grade and year, and Column (3) adds individual student fixed effects to fully reflect $\beta$ in Equation 5. Column (4) provides separate estimates of $\beta$ for principal’s and superintendent’s suspensions using Equation 6. Column (5) provides separate estimates of $\beta$ by infraction level using Equation 7. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
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* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table notes. This table decomposes the unconditional correlation between reading scores and suspensions using fixed effects. The dependent variable is the student’s reading test score, standardized within a grade-year cell. Column (1) shows the unconditional correlation between reading scores and suspensions for middle school students. Column (2) adds fixed effects for school-grade and year, and Column (3) adds individual student fixed effects to fully reflect $\beta$ in Equation 5. Column (4) provides separate estimates of $\beta$ for principal’s and superintendent’s suspensions using Equation 6. Column (5) provides separate estimates of $\beta$ by infraction level using Equation 7. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
in Level 2 suspensions alone. Figure B1 shows the effects of the reform on other principal’s suspensions and superintendent’s suspensions. There is a clear drop in other principal’s suspensions in the High Treatment group in 2012, separate from the steady convergence between the two groups over time. Policy effects on superintendent’s suspensions are more muted, which is unsurprising given that superintendent’s suspensions are rarer and typically less discretionary because they are for more serious misbehavior.

Effects on higher-level suspensions could come through either improvements in behavior or from changes in enforcement. The former are difficult to measure precisely in our setting. Although we can verify that disciplinary infractions fall in the High Treatment group after 2012, under-reporting is a potentially serious issue if educators become more likely to deal with misbehavior informally. Nonetheless, in Panel B of Figure 12, we show that teachers do perceive student behavior to improve.

C Natural Experiment: Robustness Checks

Our estimated aggregate treatment effects in Section 4 are robust to a wide variety of alternative specifications, which we summarize in this Appendix.

C.1 Re-balancing the Treatment Groups

As discussed in Section 4 and shown in Table 3, our High and Low Treatment groups are not perfectly balanced on demographics. This is not necessarily a problem for identification, but we show here that our estimates are nearly identical when we re-balance the Low Treatment group to have the same demographic mix as the High Treatment group. This suggests that our results cannot be driven by separate policies designed, for example, to benefit minority students relative to white students.

For each student $i$, we estimate the probability of being in a High Treatment school-grade ($T_i = 1$) with a simple logit regression:

$$p_i = \Pr(T_i = 1|X_i) = \frac{1}{1 + e^{-\phi}}$$

$$\phi = \alpha + \beta X_i + \epsilon_i$$

where $X_i$ includes individual-level covariates. We estimate $\alpha$ and $\beta$ on data for 2008-2011 only, and then use these estimates to generate propensity scores $\hat{p}_i$ for 2008-2015.
Discipline Reform and Non-Level-2 Suspensions, Grades 6-8

A. Other Principal’s Suspensions

B. Estimated Treatment Effects on Other Principal’s Suspensions

C. Superintendent’s Suspensions

D. Estimated Treatment Effects on Superintendent’s Suspensions

Figure B1. This figure shows the effects of the 2012 discipline reform on non-Level-2 suspensions. Panel A plots average rates of principal’s suspensions for Level 3-5 infractions in each treatment group over time. Panel B plots the estimated treatment effects, $\rho_k$, from Equation 1. Each point measures the gap in suspension rates between the High Treatment and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. Panels C and D repeat the same analysis for superintendent’s suspensions. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
We then translate our propensity scores into regression weights, $w_i$:

$$w_i = T_i + (1 - T_i) \frac{\hat{p}_i}{1 - \hat{p}_i}$$

where $\hat{p}_i$ is the propensity score for student $i$. For students in the High Treatment group, $w_i = 1$ by definition. But $w_i$ re-balances the covariate distribution in the Low Treatment group to match that of the High Treatment group on average over 2008-2011.

We first re-balance on demographic characteristics - race, sex, ELL status, free lunch status, and grade. Figure C1 plots the difference between the High and Low Treatment group means for the unweighted sample in blue and the re-weighted sample in red. Because the demographic variables are discrete, we are able to achieve perfect balance on these measures over the pre-reform period. Figure C2 shows treatment effects for the unweighted and re-weighted samples. The estimates for the re-weighted sample in blue are indistinguishable from our unweighted estimates in green, which tells us that differences in test score trends by demographic group are not driving our primary results.

Since balancing on demographics makes the sample less balanced on grade 3 test scores, Figure C3 repeats the same analysis, but re-balancing on grade 3 test scores rather than demographics. The re-weighted groups are then slightly less balanced on demographics. Regardless, Figure C4 shows that treatment effects are barely affected by the...
Robustness Check: Re-Weighting on Demographics

Figure C2. This figure compares estimated treatment effects on achievement in the baseline sample with a sample that was re-weighted to be balanced on demographics in the pre-period. In each panel, we plot two sets of treatment effects $\rho_k$, both estimated using Equation 1. Treatment effects using the baseline sample are in green and treatment effects using the re-weighted sample are in blue. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the baseline sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students in grades 6-8.

weighting. In fact, re-balancing on any combination of observables, including suspensions for non-Level-2 infractions, produces similar results.

C.2 Continuous Definition of Treatment

As an additional robustness check, we include results using a continuous definition of treatment. Specifically, we estimate the following specification:

$$y_{ijt} = \alpha_j + \gamma_t + \sum_{k \neq 2011} \rho_k \left[ \mathbb{1}(t = k) \times \hat{s}_j^{L2} \right] + \beta X_{ijt} + \varepsilon_{ijt}$$

(8)

where $\hat{s}_j^{L2}$ is the average actual suspension rate for Level 2 infractions in 2006 and 2007.

We prefer the discrete specification in Section 4 because we have no ex ante reason to think that treatment effects should be linear in the policy-induced reduction in suspensions, or in the pre-period suspension rates that we use as a proxy for treatment intensity. Nonetheless, Panel A of Figure C5 shows that our results for math are consistent with the discrete specification. The reading results, shown in Panel B, are less robust: we see a similar pattern of improvements from 2012-2015, but high pre-period suspension rates are associated with lower test scores in 2012 relative to 2011. However, the results are noisier for reading, and none of coefficients are significantly different from zero.
Figure C3. This figure plots the average pre-period difference between the High Treatment group and the Low Treatment group over several demographic characteristics. Positive point estimates reflect higher shares/scores in the High Treatment group. Average differences from our baseline, unweighted sample are in blue, and average differences from the sample re-weighted by grade 3 test scores are in red. Data are from the New York City Department of Education, and include students in grades 6-8.

Robustness Check: Re-Weighting on Grade 3 Test Scores

Figure C4. This figure compares estimated treatment effects on achievement in the baseline sample with a sample that was re-weighted to be balanced on grade 3 test scores in the pre-period. In each panel, we plot two sets of treatment effects $\rho_k$, both estimated using Equation 1. Treatment effects using the baseline sample are in green and treatment effects using the re-weighted sample are in blue. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the baseline sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
Robustness Check: Continuous Treatment Intensity

Figure C5. This figure shows the effects of the 2012 discipline reform on achievement when treatment intensity is measured continuously. Each panel plots the estimated treatment effects $\rho_k$ from Equation 8. Each point measures the change in the slope of the test score-treatment intensity gradient relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.

C.3 Alternative Prediction Period

We also include results using suspension rates over the entire 2006–2011 period to define our treatment groups. This may allow us to better distinguish between school-grades with similar suspension rates. However, the disadvantage of this longer base period is that there may be residual mean reversion at the time of treatment. When treatment is defined based on the shorter time period that we use in our main analysis, such mean reversion is not an issue. The results are shown in Figure C6, and are qualitatively unchanged.

C.4 Additional Treatment Group Bins

Conditional on using a discrete specification and estimating treatment intensity using 2006 and 2007 data, our choice of splitting at the median is unimportant. To verify this, we calculate the change in math test scores between 2011 and 2014 for each school-grade. We then calculate treatment intensity within bins of these test score changes. Figure C7 displays the results. For math, treatment intensity and math test score improvements are tightly linked: the school-grades that improve between 2011 and 2014 are the ones with the highest treatment intensities. This is consistent with the two-group and continuous specifications above. For reading, the relationship is positive but noisier.
Robustness Check: Treatment Defined on 2006-2011

Figure C6. This figure shows the effects of the 2012 discipline reform on achievement when treatment intensity is estimated from average suspension rates for Level 2 infractions in 2006-2011. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.

Robustness Check: Test Score Improvements and Treatment Intensity

Figure C7. This figure shows the relationship between test score improvements and treatment intensity. We calculate the change in math test scores for each school-grade between 2011 and 2014 and then create a binned scatterplot of those changes against estimated treatment intensity. Panel A plots this relationship for math score improvements and Panel B plots it for reading improvements. Test scores are standardized within the sample in grade-year cells. Data are from the New York City Department of Education, and include students from grades 6 through 8.
C.5 Treatment Based on All Suspensions

In our primary specification, we define treatment using suspension rates for Level 2 infractions. We view this as the logical choice, since these are the suspensions eliminated by the policy change. Moreover, higher-level suspensions fluctuate more, are more strongly correlated with test scores, and may also be more correlated with factors other than treatment intensity. In particular, they were trending downward in the High Treatment group relative to the Low Treatment group before 2011. Nonetheless, Figure C8 shows that the pattern of results is similar when treatment is defined using 2006-2007 suspension rates for all infractions, although the test score gains are more muted.

C.6 Percentiles of Achievement

The patterns of treatment effects for both math and reading are unchanged when we use percentiles instead of standardized scores, as shown in Figure C9.

C.7 All School-Grades

Figure C10 shows that our results are robust to expanding our sample to include school-grades that enter or leave the data during the 2006-2015 period.

C.8 Adjustment for 2013 Testing Waiver

During the 2013 school year, the NYCDOE obtained a waiver from the federal government to allow accelerated students in grade 8 who were sitting the New York City regents exam in mathematics to avoid “double-testing” by skipping the statewide grade 8 math exam. This produces a sharp reduction in the number of eighth grade students in our data in 2013. To avoid any concern that this sudden change in composition is driving our results, we adjust for it here by omitting any student who is eventually observed to sit the regents exam for math in grade 8.\textsuperscript{37} Excluding these students eliminates the jump in our sample size in 2013. Moreover, since there is no sharp change in the percentage of students sitting the regents exam in grade 8 (see Figure C11), the restriction effectively mitigates the impact of the change in composition in 2013. Treatment effects in the restricted sample are shown in Figure C12. They are qualitatively similar to our results in the full sample.

\textsuperscript{37}This also requires us to drop 6th graders in 2014 and 2015 and 7th graders in 2015, because we do not observe whether they take the regents exam. Results are again unchanged if we instead predict which of these students will take the regents exam using their past math scores.
Robustness Check: Treatment Defined Using All Suspensions

A. Level 2 Suspensions

B. All Suspensions

C. Math

D. Reading

Figure C8. This figure shows the effects of the 2012 discipline reform on achievement when treatment intensity is estimated using suspension rates for all infractions in 2006-2007 rather than Level 2 infractions. Panels A and B plot average suspension rates for both Level 2 infractions (Panel A) and all infractions (Panel B) in the new treatment groups. Panels C and D plot the estimated treatment effects $\rho_k$ from Equation 1. Each point measures the gap in test scores between the High Treatment and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Robustness Check: Test Score Percentiles

A. Math

B. Reading

Figure C9. This figure shows the effects of the 2012 discipline reform on student math and reading achievement measured in percentiles rather than standardized scores. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1. Each point measures the gap in test scores between the High Treatment and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.

Robustness Check: All School Grades

A. Math

B. Reading

Figure C10. This figure shows the effects of the 2012 discipline reform on student math and reading achievement in a sample of all school-grades, not just those that form a balanced panel. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1. Each point measures the gap in test scores between the High Treatment and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and student demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Figure C11. This figure shows the share of grade 8 students who take the Regents exam in mathematics, with and without taking the regular grade 8 exam. Data are from the New York City Department of Education.

Figure C12. This figure shows the effects of the 2012 discipline reform on student math and reading achievement in a sample that excludes students who go on to take the Regents exam in math as 8th graders, or who do not reach 8th grade by 2015. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
D  Contemporaneous Policy Changes

We next discuss why our results are unlikely to be driven by the switch to Common Core in 2012 or the leadership transition to Mayor Bill de Blasio and Chancellor Carmen Fariña.

Common Core

Starting with the 2012 school year, all schools in New York State implemented a new set of learning standards called the Common Core, aimed at improving college and career readiness. This included revisions to standardized math and reading exams to better align with the new standards. Since standardized exams are a noisy measure of achievement, changing the standardized exam to a different noisy signal could produce a mechanical shift in the distribution of test scores. If this affected our treatment groups differently, it could in principle generate spurious treatment effects.

There are two reasons why the switch to the new exam is unlikely to be driving our treatment effects. First, mechanical effects from the switch would produce a sharp change in 2012, but our treatment effects gradually ramp up over the post-reform period. Second, Figure D1 shows that the correlation between last year’s test score and this year’s test score for a given student remains stable before and after the change in testing regimes. In other words, relative exam performance under the old testing regime (2011) predicts relative exam performance under the new testing regime (2012) just as well as past performance predicts current performance under the same regime.

Change in district leadership

In January 2014, Bill de Blasio took over as Mayor after running a campaign focused on social justice issues, including what he described as overly-harsh school discipline. He immediately appointed Carmen Fariña as School Chancellor. Together, they advocated for further reductions in suspension rates.

This change in leadership cannot be driving our results, although it may be amplify them from 2014 onward. First, de Blasio and Fariña didn’t make revisions to the discipline code in February 2015, only two months before exams for the 2014 school year (Decker and Snyder, 2015). These revisions cannot explain the test score gains we see in 2013 or the school culture improvements we see from 2012. They are also unlikely to have affected 2014 outcomes. Furthermore, our analysis in Section 7 reveals no evidence that Blasio and Fariña targeted high-suspension teachers and principals whose views on discipline were less progressive than their own. Nor is there evidence of extra resources being funneled into high-suspension schools. Nonetheless, there does remain the possibility that their public messaging could have induced schools to reduce suspension use on their own.
Correlation between Current and Lagged Test Scores, Grades 6-8

Figure D1. This figure plots the correlation between current and lagged test scores over time. For each year, we regress standardized test scores on last year’s standardized test scores. We then plot the coefficients for math in blue and the coefficients for reading in red. The vertical red line indicates the timing of the switch to the Common Core testing regime. Data are from the New York City Department of Education, and include students from grades 6 through 8.

E Student and Teacher Composition

Teacher quality

We find no evidence that the gains from the reform were driven by High Treatment school-grades attracting better teachers, as measured by pay and experience. Panel A of Figure E1 plots yearly treatment effects on teacher salaries, and Panel B plots the coefficients for teacher experience. In both, there is a secular decline in the High Treatment group relative to the Low Treatment group, but no change in the relationship after the reform.

Student enrollment and composition

Figure E2 shows results from the same exercise for enrollment levels. Before 2012, school-grades in the High Treatment group had been shrinking relative to those in the Low Treatment group. However, they began to expand slightly after the reform. To the extent that these pre-trends would have continued, this suggests a positive treatment effect on enrollment, which is consistent with students sorting into schools with improving cultures. Nonetheless, Figure E3 does not suggest changes in student composition based on prior

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38 Teacher salary and years of experience are highly correlated in New York City. Starting salary varies with prior experience, degrees earned, and academic coursework, but then increases each year with experience. See https://www.schools.nyc.gov/careers/working-at-the-doe/benefits-and-pay.
Treatment Effects on Teacher Quality, Grades 6-8

Figure E1. This figure shows the effects of the 2012 discipline reform on teacher salary and experience. The green lines plot the estimated treatment effects $\rho_k$ from Equation 4. Each point measures the difference between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.

Our results are therefore unlikely to have been driven by mechanical changes in composition, or by peer effects from any such compositional change.
Enrollment in School-Grade, Grades 6-8

![Graph showing enrollment trends from 2008 to 2015.](image)

**Dependent mean = 287**

**Figure E2.** This figure shows effects of the 2012 reform on enrollment. The green line plots the estimated treatment effects $\rho_k$ from Equation 4. Each point measures the difference between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.

Average Third-Grade Test Scores, Grades 6-8

![Graph showing average test scores from 2008 to 2015.](image)

**A. Math**

**Dependent mean = 0.038**

**B. Reading**

**Dependent mean = 0.05**

**Figure E3.** This figure shows the effects of the 2012 reform on school-grade quality, as measured by average math and reading test scores from grade 3. The green lines plot the estimated treatment effects $\rho_k$ from Equation 4. Each point measures difference between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
Supplementary Figures

Table F1. Most Common Infractions Leading to Suspension

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Level 2 Infractions

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<td>3,847</td>
<td>Profane or abusive language or gestures</td>
</tr>
<tr>
<td>2</td>
<td>2,957</td>
<td>Persistent non-compliance</td>
</tr>
<tr>
<td>2</td>
<td>400</td>
<td>Lying to school personnel</td>
</tr>
<tr>
<td>2</td>
<td>283</td>
<td>Misusing property belonging to others</td>
</tr>
<tr>
<td>2</td>
<td>199</td>
<td>Smoking</td>
</tr>
<tr>
<td>2</td>
<td>175</td>
<td>Disruptive behavior on school bus</td>
</tr>
</tbody>
</table>

Table notes. This table shows the most common infractions that led to suspension for students in grades 6-8 from 2006 to 2011. The top panel shows all infractions; the lower panel limits to Level 2 infractions, which are prohibited by the 2012 reform. Data are from the New York City Department of Education.

Figure F1. This figure shows the distribution of suspensions per year for all students with at least one suspension in that year, pooled across 2006-2011. Each observation is a student-year combination. Data are from the New York City Department of Education.
Heterogeneity in Reading Treatment Effects, Grades 6-8

A. By Sex

Figure F2. This figure shows the effects of the 2012 discipline reform on student reading achievement for specific demographic subgroups. Panel A plots the estimated treatment effects $\rho_k$ from Equation 1 separately for boys and girls. Panel B plots estimated treatment effects separately for black, Hispanic, and white students. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
Heterogeneity in Treatment Effects by Level 2 Suspension Risk

Figure F3. This figure shows the effects of the 2012 discipline reform on test scores for students in different quartiles of predicted suspension risk for Level 2 infractions only. Panel A plots the estimated treatment effects from Equation 1 in 2014 only on math scores in each risk quartile. Panel B plots estimated treatment effects in 2014 on reading scores in each risk quartile. The vertical blue lines show 95 percent confidence intervals. The red dashed line shows the estimated treatment effect in 2014 for the full sample. The green line shows actual suspension rates for all infractions within each quartile over the 2008-2011 period. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Math Treatment Effects by Quartile of Suspension Risk

A. Quartile 1

B. Quartile 2

C. Quartile 3

D. Quartile 4

Figure F4. This figure shows the effects of the 2012 reform on student math achievement by quartile of predicted suspension risk. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1 for a given risk quartile. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
Reading Treatment Effects by Quartile of Suspension Risk

A. Quartile 1

B. Quartile 2

C. Quartile 3

D. Quartile 4

Figure F5. This figure shows the effects of the 2012 reform on student reading achievement by quartile of predicted suspension risk. Each panel plots the estimated treatment effects $\rho_k$ from Equation 1 for a given risk quartile. Each point measures the gap in test scores between the High and Low Treatment groups relative to 2011, conditional on year and school-grade fixed effects and demographic controls. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Test scores are standardized within the sample in grade-year cells. Standard errors are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6-8.
Changing Racial Discipline Gaps and Test Score Improvements, Grades 6-8

Figure F6. This figure shows the relationship between test score improvements and changes in the racial discipline gap. We define the racial discipline gap as the suspension rate for black/Hispanic students minus the rate for white students. For each school-grade, we calculate the change in test scores and the change in the racial discipline gap between 2011 and 2014. Panel A shows a binned scatterplot of these changes for math, and Panel B shows the same for reading. Test scores are standardized within the sample in grade-year cells. Data are from the New York City Department of Education, and include students from grades 6-8.
School Culture Metrics by Treatment Group

A. Respect (Students)  
B. Behavior Index (Students)  
C. Safety Index (Students)  

D. Respect (Teachers)  
E. Behavior Index (Teachers)  
F. Safety Index (Teachers)  

Figure F7. This figure shows average levels of our standardized culture metrics in each treatment group over time. Panels A-C plot student responses and Panels D-F plot teacher responses. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Treatment Effects on School Culture versus Reading Score Gains, Grades 6-8

A. Respect for Adults vs. Reading Gains

B. Student Behavior vs. Reading Gains

C. School Safety vs. Reading Gains

Figure F8. This figure shows the relationship between improvements in culture and test score gains in reading at the school-grade level. In Panel A, we calculate the changes in student and teacher respect between 2011 and 2013 in each school-grade and create binned scatterplots against the corresponding changes in reading test scores. Bins of teacher responses are in blue and bins of student responses are in dark red. Panel B repeats the same analysis for perceptions of student behavior, and Panel C does the same for safety. Culture metrics are standardized within each year. Test scores are standardized within the sample in grade-year cells. Standard errors in all regressions are clustered at the school-grade level. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Figure F9. This figure shows the relationship between daily suspension rates and the math and reading exam windows in each school year. Suspension timing for 2011 is Figure 10 in the main text. The blue bars show the number of suspensions issued each day to students in grades 6-8. The light red shaded regions are the exam windows for math and reading. Data are from the New York City Department of Education, and include students from grades 6 through 8.
Figure F10. This table shows the monthly coefficients $\beta_k$ from Equation 3. These coefficients compare the test scores of students who are suspended in month $k$ to students who are not, conditional on year, individual student, and school-grade fixed effects. Estimates for principal’s suspensions are in green and superintendent’s suspensions are in dark red. The vertical bars show 95 percent confidence intervals, and the red line indicates the timing of the reform. Standard errors are clustered by student. Data are from the New York City Department of Education, and include students from grades 6 through 8.