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The Effects of School Bullying Victimization on Cognitive, Noncognitive, and Friendship Outcomes*

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Abstract

This study investigated the effects of bullying victimization on cognitive, noncognitive, and friendship outcomes using panel data collected from elementary school students in a Japanese city. Employing a value-added model that controls for prior outcomes, our findings revealed that bullying victimization significantly impairs both cognitive and noncognitive development and weakens friendship formation. Furthermore, a high prevalence of bullying victimization within the classroom was found to negatively impact cognitive outcomes in subsequent years. These findings underscore the importance of effective school bullying prevention in fostering human and social capital among school-aged children.

Keywords: School Bullying, Academic Performance, Noncognitive Skills, Friendship, Japan
JEL Classification: I21

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1. Introduction

In most advanced economies, primary and lower-secondary education is compulsory and forms the foundation for human capital development. These stages equip students with essential skills that are critical for further academic progression and long-term success in the labor market. The quality of education at these levels plays a pivotal role in shaping students' academic outcomes and economic prospects, underscoring the importance of maintaining high educational standards.

Despite its importance of ensuring high-quality education, bullying in schools remains a widespread and persistent global issue. According to the 2019 Trends in International Mathematics and Science Study (TIMSS), 29% of fourth graders and 23% of eighth graders across 64 countries reported experiencing bullying at least once a month, with 8% and 6% experiencing bullying weekly, respectively (Mullis et al., 2020). While Japan reported the lowest frequency of bullying among TIMSS participants at both grade levels, domestic trends revealed a troubling rise in the number of recognized cases. In the 2023 academic year, a total of 732,568 bullying cases were reported across all school levels, equating to 57.9 cases per 1,000 students—the highest rate recorded since 1985 (Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2024).

Bullying has well-documented adverse effects on the mental and physical health of both perpetrators and victims, as well as on their educational trajectories and labor market outcomes. Extensive psychology and education literature has shown that students who experience bullying are more likely to suffer from anxiety, depression, deteriorating physical health, suicidal ideation, and an increased use of tobacco and illicit drugs (Halliday et al., 2021; Moore et al., 2017; Schoeler et al., 2018). Moreover, school violence and delinquency generate negative spillover effects that adversely affect students beyond those who are directly involved (Ahn & Trogdon, 2017; Carrell & Hoekstra, 2010; Figlio, 2007). The significant social costs associated with school violence underscore the urgent need for effective preventive and intervention strategies.[1]

Previous economic research has highlighted the detrimental effects of bullying victimization on academic performance, educational attainment, labor market outcomes (Ammermueller, 2012; Brown & Taylor, 2008; Eriksen et al., 2014; Gorman et al., 2021; Ponzo, 2013), and noncognitive skills (Mori and Onozuka, 2024; Sarzosa, 2024; Sarzosa & Urzúa, 2021). However, the effect of bullying victimization on friendship formation in schools remains unexplored.

Friendship formation can be conceptualized as a form of social capital within an educational context (Coleman, 1988).[2] Recent research has increasingly emphasized its importance,

[1] For instance, Pereznieto et al. (2010) estimate that the economic burden of school violence in the United States amounts to approximately $7.9 billion per year.

[2] The concept of social capital has been extensively explored in the sociological and economic literature (Bourdieu, 1986; Coleman, 1988; Putnam, 1993). Coleman (1988) introduced the concept in the educational context, emphasizing its role in linking social networks to educational outcomes. Several mechanisms may explain how friendship networks influence academic performance, including joint production, social pressure, and mutual insurance within peer relationships (Lavy & Sand, 2019).

demonstrating that the size and characteristics of peer relationships significantly influence academic performance (Fletcher et al., 2020; Hill, 2015; Lavy & Sand, 2019) and educational attainment (Mora & Oreopoulos, 2011; Patacchini et al., 2017). Building on this understanding, this study extends the analysis of the consequences of bullying beyond cognitive and noncognitive outcomes to include the formation of friendships among students. In doing so, we aimed to provide a more comprehensive perspective on the effects of bullying victimization.

Using a value-added model that controlled for initial outcomes measured at the start of each school year, we assessed the impact of bullying victimization across multiple dimensions of student outcomes. The results indicated that students with lower academic performance, weaker noncognitive outcomes, and fewer friendships were more likely to experience bullying victimization. Bullying victimization negatively affects academic performance, noncognitive outcomes, and friendship formation. Specifically, a 1-standard- deviation (SD) increase in bullying victimization was associated with a 0.03 to 0.05 SD decline in test score growth, a 0.11 SD decrease in noncognitive outcomes, and a 0.23 SD reduction in friendship formation. Moreover, high classroom-level bullying victimization negatively affected students' cognitive outcomes the following year.

This study contributes to the literature on human capital formation by examining the effects of school bullying victimization on educational outcomes. Previous studies have established significant links between bullying and adverse academic and labor market outcomes across various contexts. Brown and Taylor (2008) found that school bullying in the UK led to lower educational attainment and reduced wages in adulthood. Using data from 11 European countries, Ammermueller (2012) reported that bullying significantly lowers educational attainment, which in turn negatively affects labor market earnings. Eriksen et al. (2014) addressed the endogeneity of bullying in Danish data and found that bullying between the ages of 10 and 12 years significantly reduced ninth-grade grade point average (GPA). Gorman et al. (2021) demonstrated that bullying during junior high school in England negatively affected academic performance, mental health, employment prospects, and income. Using Italian data, Ponzo (2013) found that bullying significantly lowers academic performance, with stronger effects at age 13 than at age 9.

With a special focus on noncognitive skills, Sarzosa and Urzúa (2021) and Sarzosa (2024) examined the effects of bullying on the dynamics of cognitive and noncognitive skill formation in South Korea. They found that students with weaker noncognitive skills were more likely to become victims of bullying. Furthermore, bullying at age 15 increases the likelihood of smoking and depression, reduces life satisfaction by age 18, and lowers university enrollment rates. Sarzosa (2024) further showed that bullying victimization at the age of 15 hinders the development of both cognitive and noncognitive skills, leading to widening skill gaps over time. The study also found that students with distinctive characteristics were more likely to be victims of bullying than their peers. These studies have shown that bullying in primary and secondary education can have significant adverse

effects on both short- and long-term outcomes. However, few empirical studies have investigated the effects of bullying on friendship formation. Our study extends the analysis of bullying consequences beyond cognitive and noncognitive outcomes to include the formation of friendships among students to provide a more comprehensive perspective on the effects of bullying victimization.

This study contributes to the strand of literature on bullying in Japan, which has been extensively conducted across various social science disciplines.[3] However, to the best of our knowledge, studies that have quantitatively examined the effects of bullying victimization on human capital outcomes, such as cognitive and noncognitive outcomes or career decisions, are limited because of the limited availability of longitudinal data linking bullying experiences to student outcomes in the Japanese context. As an exception, Tanaka and Morozumi (2019) analyzed the effect of additional teacher allocations on reported bullying using school-level data but found no significant effects. Nakamuro (2017) examined the relationship between class size and reported bullying cases and found no significant association. Tanaka et al. (2019) report that municipalities that transitioned early to a new educational board system experienced an increase in the number of reported bullying cases. Our study utilized panel data from a Japanese municipality to examine how bullying victimization in elementary school affects cognitive and noncognitive outcomes, as well as friendship formation.

The remainder of this paper is organized as follows. Section 2 provides the institutional background for this study. Section 3 describes the estimation model used in this study. Section 4 describes the data used in this study. Section 5 examines the determinants of bullying victimization. Section 6 presents our estimation results. Section 7 explores the heterogeneity of the effects. Section 8 investigates how classmates' bullying victimization affects student outcomes. Finally, Section 9 concludes the study.

2. Institutional Background

This section provides the institutional context relevant to the analysis.

2.1. Japan's Compulsory Education System

In Japan, compulsory education spans nine years, comprising six years of elementary school and three years of junior high school. Children enter elementary school in April, following their sixth birthday. Students are typically assigned to public schools based on their residential areas and are

[3] These studies have primarily been descriptive or correlational. For example, Morita et al. (1999) analyze survey data from over 7,000 participants, providing a comprehensive description of bullying dynamics from the perspectives of students, teachers, and parents. Hojo (2023) and Sudo (2014) use TIMSS data to examine the determinants of bullying victimization, reporting that gender and academic performance are associated with the likelihood of being bullied. In the field of education, studies have examined how teacher–student relationships influence bullying dynamics (Akiba, 2004; Akiba, Shimizu, & Zhuang, 2010), while comparative research has explored bullying in Japan and the UK (Kanetsuna & Smith, 2002).

entitled to free education during this period, with no tuition or mandatory fees.[4] Although families may opt to attend private schools, most students attend designated public schools.[5]

In elementary school, students are assigned to a homeroom class in which they take most of the subjects together. Class formation generally considers various factors including students' individual characteristics and attitudes. The data used in this study, covering the academic year 2014–2016, reflected a maximum class size of 40 students.

2.2. Bullying Incidence in Japanese Schools

Over the past decade, the number of recognized bullying cases in Japanese schools has increased significantly. According to Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT, 2024), the total number of reported bullying incidents increased from approximately 186,000 in the 2013 school year to an unprecedented high of approximately 733,000 in 2023. In per capita terms, the incidence reached 57.9 cases per 1,000 students in 2023, the highest level since the records began. This rising trend briefly reversed during the 2020 school closures caused by the COVID-19 pandemic but subsequently resumed its upward trajectory.

Substantial regional variations exist across Japan. Prefectures such as Yamagata, Fukui, and Hokkaido had the highest incidence rates, exceeding 100 cases per 1,000 students. Conversely, the Ehime and Nagasaki Prefectures reported the lowest rates, below 20 cases per 1,000 students. Moreover, designated metropolitan areas reported higher incidence rates (73.0 cases per 1,000 students) than the national average, suggesting more frequent recognition of bullying in urban regions.

Bullying incidents are most frequently reported at the elementary school level. In 2023, approximately 589,000 cases (approximately 80% of all incidents) were recognized in elementary schools, compared to approximately 123,000 in junior high schools, and roughly 18,000 in high schools. The per capita incidence was notably higher in elementary schools (96.5 cases per 1, 000 students) than in junior high (38.1) and high schools (5.5).[6]

2.3. Japan's Anti-Bullying Measures

In July 2012, a student's death by suicide in Otsu City, Shiga Prefecture, attributed to bullying, underscored the urgent need for comprehensive anti-bullying measures. In response, the Act for the

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[4] Municipal Boards of Education in Japan are responsible for assigning students to elementary and junior high schools. Typically, each school has a designated school area, and students are allocated based on their residential address. However, some municipalities have introduced a school choice system to accommodate regional needs. As of May 2022, 23% of Boards of Education overseeing multiple elementary schools and 20% overseeing multiple junior high schools had implemented a school choice system (MEXT, 2022).

[5] According to the 2023 MEXT School Basic Survey, 98.1% of elementary school students in Japan were enrolled in public schools.

[6] It should be noted that the observed increase and regional variations might reflect not only differences in actual bullying occurrences but also variations in schools' efforts to identify and report even minor bullying incidents. (Tanaka et al., 2019).

Promotion of Measures to Prevent Bullying was enacted in June 2013 and took effect in September of the same year.[7] This law established a framework for systematic anti-bullying initiatives requiring both the national government and schools to develop basic bullying prevention policies. Schools are also mandated to establish specialized organizations to implement these measures and ensure consistent prevention and intervention efforts.

2.4. Overview of the Academic Assessments Used in This Study

To address regional educational needs, some municipalities have conducted their own local academic assessments in addition to the National Assessment of Academic Ability, which has been administered by MEXT since 2007. Although these local assessments have more limited coverage than national assessments, they often include a broader range of grade levels and enable longitudinal tracking of the same student cohorts, providing detailed insights into student progress and learning outcomes.

This study uses data from a municipal academic assessment conducted in a Japanese city. The dataset follows a cohort of students who were in fourth grade in 2014 through the end of sixth grade. Assessments were conducted annually during the first or second week of April for all students in the municipality. While the assessed subjects varied slightly by grade, Japanese and mathematics were tested each year from fourth to sixth grade. Science was introduced in the fifth and sixth grades, and social studies was included in the sixth grade.

2.5. Overview of the Questionnaire-Utilities survey

The Questionnaire-Utilities survey, hereafter referred to as QU, is widely employed in Japanese schools as a diagnostic tool for assessing students' interpersonal relationships, satisfaction with school life, and learning motivation. Originally developed by Kawamura and Tagami (1997), this survey quantitatively captures students' satisfaction with school life, interpersonal relationships within classrooms, motivation towards school activities, and experiences of bullying and social isolation.

The survey included items similar to those found in international assessments such as the TIMSS and Program for International Student Assessment (PISA), covering aspects of bullying experiences, social isolation, self-esteem, and learning motivation. These scales have been adopted in educational and psychological research in Japan (Iida et al., 2021; Nishimura et al., 2022; Saito et al., 2015; Yamasaki et al., 2017).

In the QU, bullying victimization was measured using six questions that assessed whether students had experienced unpleasant remarks, violence, ridicule, social exclusion, or difficulties in

[7] The Act defines bullying as:

> *Acts exerting a psychological or physical influence on a child that are committed by another child who attends the same school or otherwise has a certain personal relationship with the victimized child (including acts committed via the internet), resulting in mental or physical pain for the victim.*

group activities. Noncognitive outcomes were derived from three questions that evaluated students' happiness in achieving goals, enjoyment of participation in lessons, and efforts to improve academically. Friendship formation was assessed using nine questions, including whether students felt that their classmates were kind to them, considered them part of the group, provided encouragement, and offered recognition.

In the municipality analyzed in this study, the QU was administered twice a year, once between late May and early June, and again between late November and early December, targeting all students. However, sixth-grade students participated in the first survey. For the schedule of academic assessments and QU, see Table A1.

3. Econometric Framework

To examine the effect of bullying victimization on educational outcomes, we estimated a value-added model of the education production function by incorporating class-fixed effects as specified below:

$$Y_{ic'st+1} = \beta_0 + \beta_1 Bullied_{icst} + \beta_2 Girl_{icst} + f(Y_{icst}) + \lambda_c + \varepsilon_{ic'st} \quad (1)$$

where $Y_{ic'st+1}$ represents the outcomes of student i in class c' at school s at the beginning of academic year t+1. $Bullied_{icst}$ indicates the extent of bullying victimization during academic year t, when the student was in class c at school s. $Girl_{icst}$ denotes the gender of the student, and $f(Y_{icst})$ is a fifth-order polynomial of the prior outcomes. λ_c represents the class-fixed effect, and $\varepsilon_{ic'st}$ is the error term.

The coefficient of interest is β_1, captures the effect of bullying victimization in academic year t on the outcomes at the beginning of academic year t+1. To address potential correlations between bullying victimization within the same class, we used cluster-robust standard errors at the class level.

The class-fixed effect λ_c controls for fixed characteristics associated with the academic year, grade level, teacher, and school. This approach can mitigate the bias arising from classroom-specific factors that may simultaneously influence both bullying victimization and student outcomes, such as the nonrandom assignment of teachers, variations in teacher quality, and the presence of bullies. Including the polynomial function of the initial educational outcomes, $f(Y_{icst})$, as a covariate helps control for unobserved educational and family inputs accumulated over time. By accounting for $f(Y_{icst})$, we estimated the effect of bullying victimization on overall educational growth over one year.

We used the value-added specification without student-fixed effects. Prior literature emphasizes the persistent nature of bullying victimization due to self-reinforcing mechanisms (Sarzosa,

2024), indicating that controlling for prior outcome variables is necessary. In addition, it generated a high autocorrelation in bullying victimization and other outcome variables within students, leaving little variation in within-student outcome variables after controlling for student-fixed effects. By adopting a value-added modeling approach, we explicitly incorporated prior educational outcomes. This mitigates the endogeneity arising from the feedback mechanism inherent in bullying victimization by controlling for unobserved, time-invariant individual characteristics (such as innate ability and family background) and preserves sufficient variability in our key explanatory variable, bullying victimization.

4. Data

This study utilized panel data that combine individual student records from a city-specific academic assessment and the QU conducted in a Japanese city with a population of approximately 120,000. The dataset follows students who were in fourth grade at public elementary schools from 2014 through their sixth grade in 2016.

As shown in Table A2, municipal statistics indicate that there were slightly more than 1,000 fourth-grade students in 2014. Students with missing data for the variables used in the analysis were excluded. Nevertheless, the final sample covered more than 95% of the students in each grade. Table 1 defines the variables used in the analysis, and Table 2 presents the summary statistics.

The outcome variables included combined test scores for Japanese and mathematics; individual test scores for Japanese, mathematics, and science; and noncognitive and friendship outcomes. All test scores were standardized to have a mean of 0 and SD of 1 for each subject and grade level. Because science tests were not administered in fourth grade, the number of observations for science was limited to students who took the tests in fifth and sixth grades. An analysis of the test score distributions indicated that they generally followed a normal distribution (Figure 1).

The noncognitive outcome was derived from the students' responses to three specific questions in the first QU conducted in May or June (see Table A1 for details). The responses were summed to create a composite score ranging from 3 to 12. For the analysis, this score was standardized to have a mean of 0 and a SD of 1, with higher values indicating stronger noncognitive outcomes. As shown in Figure 2, the raw distribution of noncognitive scores revealed that scores between 10 and 11 were most frequently observed across all grades, suggesting that many students responded positively to these questions.

The friendship outcome measure was also derived from the first QU, based on students' responses to nine specific items (see Table A1 for details).[8] Students responded to these items using

[8] The nine items used here combine two separate subscales originally distinguished in the QU: the Peer Acceptance scale (six items) and the Friendship Relations scale (three items). Since both subscales measure aspects of peer relationships, we aggregated them into a single composite score for this analysis. Robustness checks confirm that using the two subscales separately produces qualitatively similar results.

the same 4-point Likert scale, and their responses were summed to create a composite score ranging from 9 to 36. For the analysis, this composite score was standardized to have a mean of 0 and a SD of 1, with higher values indicating stronger friendship outcomes. As shown in Figure 3, the raw distribution of friendship outcome scores was left-skewed, with the mode across all grades clustering at approximately 30 points. This suggests that many students had strong friendships with each other.

The key explanatory variable in this study was the extent of bullying victimization. This measure was constructed by summing students' responses to six survey questions related to bullying and social isolation (see Table A1 for details). The scores ranged from 6 to 24 per survey round. Since the QU was conducted twice a year, scores from both rounds were aggregated to capture annual bullying victimization, yielding a variable ranging from 12 to 48. To ensure robustness, the models were estimated separately using the first- and second-round scores. The bullying victimization measure was constructed at two time points: first in fourth grade, to estimate its effect on outcomes at the beginning of fifth grade, and again in fifth grade, to estimate its effect on outcomes at the beginning of sixth grade. In all estimations, the bullying victimization score was standardized to have a mean of 0 and a SD of 1 for each year, with higher scores indicating more severe bullying experiences. An analysis of the raw, unstandardized distribution of the annual bullying victimization scores revealed that the most common value was a minimum score of 12, with progressively fewer students reporting higher levels of bullying (see Figure 4).

Prior research indicates that children who experience bullying are likely to experience declines in educational outcomes, subsequently increasing their vulnerability to further victimization (Sarzosa, 2024). In this study, we calculated the autocorrelation coefficient of bullying victimization between fourth and fifth grades in our dataset and found it to be 0.642, indicating a substantial degree of persistence. Additionally, we examined the changes in raw bullying victimization scores (ranging from 6 to 24 points) between the two grades. Specifically, 16% of the students exhibited no change at all, 33% changed by one point or less, 46% by two points or less, and 56% by 3 points or less. More than half of the students experienced minimal or no variation in their bullying victimization scores. These results suggest a feedback mechanism in bullying victimization, implying that the severity of bullying remains relatively stable over time and leads to limited within-individual temporal variation.

In addition to individual-level data, class-level information, including class size and the proportion of female students, was incorporated to analyze the determinants of bullying victimization and the heterogeneity of its impacts.

Furthermore, the dataset used in this study did not include individual item-level responses for noncognitive and friendship outcomes or bullying victimization; instead, only the aggregated results for each measure were provided. Consequently, as a limitation of this dataset, a detailed analysis of each specific aspect of bullying victimization or its related outcomes was not possible.

5. Determinants of Bullying Victimization

This section examines the potential determinants of bullying victimization by analyzing both individual- and class-level characteristics. To identify individual-level factors, we regressed the bullying victimization scores from the second round of the QU on students' initial academic performance, noncognitive and friendship outcomes, and gender. Using the second-round bullying victimization score mitigated simultaneity bias, as bullying victimization, noncognitive outcomes, and friendship outcomes were measured at the same time. Since the second round of the QU was not administered to sixth-grade students, this analysis was limited to fourth- and fifth-grade students. To account for class-level heterogeneity, we included class-fixed effects in the regressions.

Table 3 presents the results of the study. The findings indicated that students with higher academic performance were less likely to experience bullying (Table 3, Columns [1] and [4]). Similarly, students with higher noncognitive outcomes in the first round of the QU were less likely to experience bullying in subsequent periods (Table 3, Column [2]). However, after controlling for academic performance and friendship outcomes, the relationship between noncognitive outcomes and bullying victimization became positive. This result is likely driven by an omitted variable bias, as noncognitive outcomes are correlated with both academic performance and friendship outcomes, which are associated with bullying victimization.[9] Friendship outcomes were associated with a lower likelihood of experiencing bullying (Table 3, Column [3]), and this result remained robust even after accounting for academic performance and noncognitive outcomes (Table 3, Column [4]). Furthermore, as shown in Column (4) of Table 3, after controlling for academic performance, nonccognitive, and friendship outcomes, girls were more likely to experience bullying than boys.

Next, we examined class-level characteristics potentially associated with bullying victimization. Specifically, we regressed second-round bullying victimization scores on class-level characteristics, including class size and the proportion of female students. To identify these class-level associations, class- fixed effects were excluded from the regression. The results presented in Column (5) of Table 3 indicate that larger class sizes were associated with higher levels of bullying victimization, while a higher proportion of female students was associated with lower levels of bullying victimization. However, this relationship was not statistically significant.

In summary, bullying victimization was significantly and negatively associated with students' baseline academic performance and friendship outcomes, whereas it was positively associated with noncognitive outcomes and female gender. Since these factors potentially influence both bullying victimization and subsequent academic achievement, this study estimated the impact of bullying victimization on educational outcome growth by controlling for these determinants and incorporating

[9] The correlation between noncognitive outcomes and friendship outcomes is notably strong: while the correlation coefficient between academic performance and noncognitive outcomes is 0.18, the correlation between noncognitive outcomes and friendship outcomes is substantially higher at 0.55.

class-fixed effects.

6. Results

6.1. The Effect of Bullying on Academic Performance

We estimated the model specified in Equation (1), and the results are summarized in Table 4. Column (1) presents the results for the combined test scores for Japanese and mathematics, Column (2) for the Japanese language test scores, Column (3) for mathematics, and Column (4) for science. All models include fifth-order polynomials of initial test scores in year t and class-fixed effects. Standard errors are clustered at the class level.

These results consistently indicate that bullying victimization significantly hinders academic progress. Specifically, a 1 SD increase in bullying victimization is associated with a 0.03 to 0.05 SD decline in test score growth across all subjects. Notably, when examining individual participants, the negative impact of bullying victimization on academic performance was most pronounced among Japanese students.

6.2. The Effect of Bullying on Noncognitive Outcomes

Next, we examined the effect of bullying victimization on noncognitive outcomes. Table 5 presents the estimation results, which indicate that bullying victimization negatively affects noncognitive outcomes. Specifically, a 1 SD increase in bullying victimization was associated with a 0.10 SD decline in the growth of noncognitive outcomes.

6.3. The Effect of Bullying on Friendship Outcomes

Finally, we investigated the influence of bullying victimization on friendship outcomes. Table 6 presents the results of this analysis. Consistent with earlier findings, bullying victimization negatively affected friendship outcomes. Specifically, a 1 SD increase in bullying victimization was associated with a 0.23 SD reduction in friendship outcome growth.

6.4. Robustness

Controlling for Subsequent Classroom Environments and Teacher Quality

We conducted robustness checks to examine the stability of our main findings under alternative model specifications.

The outcomes measured at the beginning of academic year *t+1* may have been influenced by the classroom environment in year *t+1*. If bullying victimization experienced in year *t* correlated with subsequent classroom environments, our estimates could potentially be biased. While academic assessments are administered within the first two weeks of the new academic year (early April), thereby minimizing this potential bias, the QU is conducted later, from late May to June, and may

therefore reflect influences from the year *t+1* classroom environment. To address this concern, we estimate additional models that control for class-fixed effects in year *t+1*.

Teacher quality may also simultaneously affect bullying victimization and subsequent educational outcomes. To account for this possibility, we estimate models that incorporate teacher-fixed effects. However, since only a small number of teachers in our dataset taught classes in both fourth and fifth grades (five out of 71 teachers), most teacher-fixed effects were effectively absorbed by the class-fixed effects.

Table A3 reports the results of robustness checks. The estimates indicate that controlling for year *t+1* class-fixed effects (Columns [2], [5], and [8]) and teacher-fixed effects (Columns [3], [6], and [9]) does not substantively alter the bullying victimization coefficients across all outcome measures—cognitive, noncognitive, and friendship outcomes—compared with our main results (Columns [1], [4], and [7]).

Thus, these findings confirm the robustness of our key results to potential confounding influences arising from classroom environments and teacher quality.

Robustness to Bullying Victimization Measured in Early and Late Academic Year

In our main analysis, we used an aggregated measure of bullying victimization, combining scores from both the first and second rounds of the QU to capture annual bullying exposure. Here, we further examined the robustness of these results by separately analyzing the effects of bullying victimization measured in the early (first round) and late (second round) portions of the academic year.

As shown in Table A4, our main findings remained robust under these separate measures. However, one exception arises when the bullying victimization measure from the later year survey is used: the coefficients for mathematics and science scores in the following year decrease in magnitude and lose statistical significance (see Table A4, Columns [9] and [10]). Nevertheless, the direction of the coefficients remained unchanged.

In summary, bullying victimization consistently and significantly impaired academic performance and noncognitive and friendship outcomes.

7. Heterogeneous Effects

Next, we examined how the effects of bullying victimization varied according to class characteristics.

Specifically, we estimated models that include interaction terms between the bullying victimization variable and dummy variables for class-level characteristics, namely, class size and the proportion of female students. The class-level dummy variables take the value of 1 if they are above the median, and 0 otherwise.

Table 7 presents the estimation results. First, regarding heterogeneity by class size, the

negative effects of bullying victimization on mathematics and science performance appeared to be offset for students in larger classes compared to those in smaller classes (Table 7, Columns [5] and [7]). Next, when examining the heterogeneity of bullying victimization effects by proportion of female students, the negative effects of bullying victimization on friendship outcomes were mitigated for students in classes with a higher proportion of female students (Table 7, Column [12]).[10]

8. Discussion

The Effects of Peer-Bullying Victimization on Student Outcomes

Thus far, we have examined how direct experiences of bullying victimization affect subsequent cognitive, noncognitive, and friendship outcomes. Prior research suggests that the presence of disruptive classmates negatively affects other students' outcomes (Ahn & Trogdon, 2017; Carrell et al., 2018; Figlio, 2007; Kristoffersen et al., 2015; Neidell & Waldfogel, 2010; Zhao & Zhao, 2021).

Building on these findings, we investigated how the extent of bullying victimization among classmates influenced an individual student's outcomes in the following year. Specifically, in Section 3, we estimate an alternative specification of the model. In this model, we added the class-average bullying victimization measure among classmates, excluding the individual's own score denoted by $PeerBullied_{-icst}$ and removing class-fixed effects. We retained the individual-level bullying measure $Bullied_{icst}$ to separately identify the effects of an individual student's own bullying victimization and the average bullying victimization experienced by their classmates. The estimated model is as follows:

$$Y_{ic'st+1} = \beta_0 + \beta_1 Bullied_{icst} + \beta_2 PeerBullied_{-icst} + \beta_3 Girl_{icst} + \gamma X_{-icst} + f(Y_{icst}) + \varepsilon_{ic'st} \quad (2)$$

where X_{-icst} represents a vector of class-level peer attributes, including prior cognitive, noncognitive, and friendship outcomes, the proportion of girls, and class size. We estimated the model without school-fixed effects because bullying victimization primarily varies between schools rather than within schools.[11] Given that school-level variation constitutes a more significant portion of the total

[10] Additionally, we included interaction terms between bullying victimization and individual student characteristics (e.g., gender, prior academic performance, and noncognitive and friendship outcomes). However, none of these interactions yielded statistically significant results.

[11] To examine whether bullying victimization varies more substantially between schools or across classes within schools, we conducted the following analysis. First, we calculated the deviation of each class's mean bullying score from its respective school mean, measuring within-school, across-class variation. Second, we calculated the deviation of each school's mean bullying score from the overall mean, measuring between-school variation. The SD of bullying victimization was 0.224 for the within-school, across-class component, compared to 0.269 for the between-school component, indicating greater variation between schools.

variance in peer-bullying exposure, incorporating school-fixed effects eliminates most of the variation necessary for identifying meaningful effects. By controlling for a comprehensive set of class-level peer attributes, we effectively accounted for potential confounding factors while preserving sufficient variation to reliably estimate the impact of peer-bullying victimization on individual student outcomes.

Table 8 presents the estimation results. We found that a higher incidence of bullying victimization among classmates was significantly associated with lower cognitive outcomes, specifically the combined Japanese and mathematics scores, as well as science scores in the following year (Table 8, Columns [2] and [4]). Although the effects were not statistically significant for the other outcomes, the results generally suggest that greater exposure to bullying victimization among classmates tends to be negatively associated with students' own outcomes in the subsequent year.

These findings suggest that not only does one's own bullying victimization matter, but also that being surrounded by peers who have experienced bullying can deteriorate students' future educational outcomes.

Comparing the Impact of Bullying Victimization to Class Size Reduction

Our results indicate that a 1 SD increase in bullying victimization is associated with declines of approximately 0.03 to 0.05 SDs in academic growth, 0.11 SD in noncognitive outcomes, and 0.23 SD in friendship outcomes. To contextualize these effect sizes, we compared them with the impact of class-size reduction on academic achievement, drawing on previous studies using Japanese data.

Among studies reporting statistically significant effects from class-size reduction in Japanese elementary and junior high schools, reducing class size by one student is associated with academic improvements of approximately 0.006 to 0.018 SD, depending on subject and grade level (Akabayashi & Nakamura, 2014; Hojo, 2013; Hojo & Senoh, 2019; Tanaka, 2020). Given these estimates, preventing a 1 SD increase in bullying victimization corresponds to the educational benefit of reducing the class size by approximately two to five students.[12]

Considering that bullying victimization substantially impairs noncognitive outcomes and friendship formation, the overall benefits of effective bullying prevention may be even greater. These findings underscore the importance and potential cost effectiveness of targeted anti-bullying measures as valuable components of educational policies.

[12] To interpret what a 1 SD increase in bullying victimization represents, we refer back to the original measurement scale. Our bullying-victimization measure consists of responses to 12 items (measured twice per year), each rated on a 4-point Likert scale, resulting in total scores ranging from 12 to 48 points. The mean bullying score among fourth and fifth graders is approximately 19.2 points, with an SD of 6.85 points. Thus, a 1 SD increase (6.85 points) represents a shift from around the mean (19 points) up to about 26 points. Concretely, a student initially responding "strongly disagree" to five items and "disagree" to seven items would, after this increase, respond "disagree" to 10 items and "slightly agree" to two items.

9. Conclusion

This study used panel data from elementary school students in a Japanese municipality to examine the effects of bullying victimization on academic performance and noncognitive and friendship outcomes. Although previous research has extensively explored the effects of bullying on academic and noncognitive outcomes, few studies have specifically investigated its impact on friendships. By incorporating this dimension, our study provided a more comprehensive understanding of the overall consequences of bullying. Additionally, to our knowledge, no prior empirical research in Japan has directly estimated the effects of bullying victimization on educational outcomes. Thus, our findings complement the existing literature.

First, our analysis of the potential determinants of bullying victimization revealed that students with lower academic performance and weaker friendship outcomes are more likely to experience bullying. Next, to estimate the effects of bullying victimization, we employed a value-added model that controlled for prior outcomes given the high autocorrelation of bullying victimization. The results indicate that greater exposure to bullying is associated with significant negative effects on academic performance and noncognitive and friendship outcomes. Moreover, high levels of bullying victimization in the classroom worsened cognitive outcomes in the following year.

One potential mechanism by which bullying victimization negatively affects academic performance is the disruption of friendships. Previous studies have shown that positive peer networks contribute to improved academic performance (Fletcher, Ross, & Zhang, 2020; Hill, 2015; Lavy & Sand, 2019). At the same time, it is important to acknowledge that academic performance, noncognitive skills, and friendship outcomes are likely to be interconnected and mutually reinforced. For example, noncognitive skills may support both the formation of positive peer relationships and the development of academic competencies. Academic success can enhance students' self-confidence and social integration, thereby fostering strong friendships. Given these complex interlinks, we refrained from asserting a single definitive causal pathway. Rather, our findings highlight that bullying victimization can disrupt the dynamic interplay among the cognitive, noncognitive, and social domains, thereby impairing students' overall educational outcomes.

Finally, our results align with findings from the economics literature, highlighting the negative effects of bullying victimization on human capital accumulation. Reducing bullying not only alleviates distress for victimized students, but also likely promotes both the human and social capital of school-aged children.

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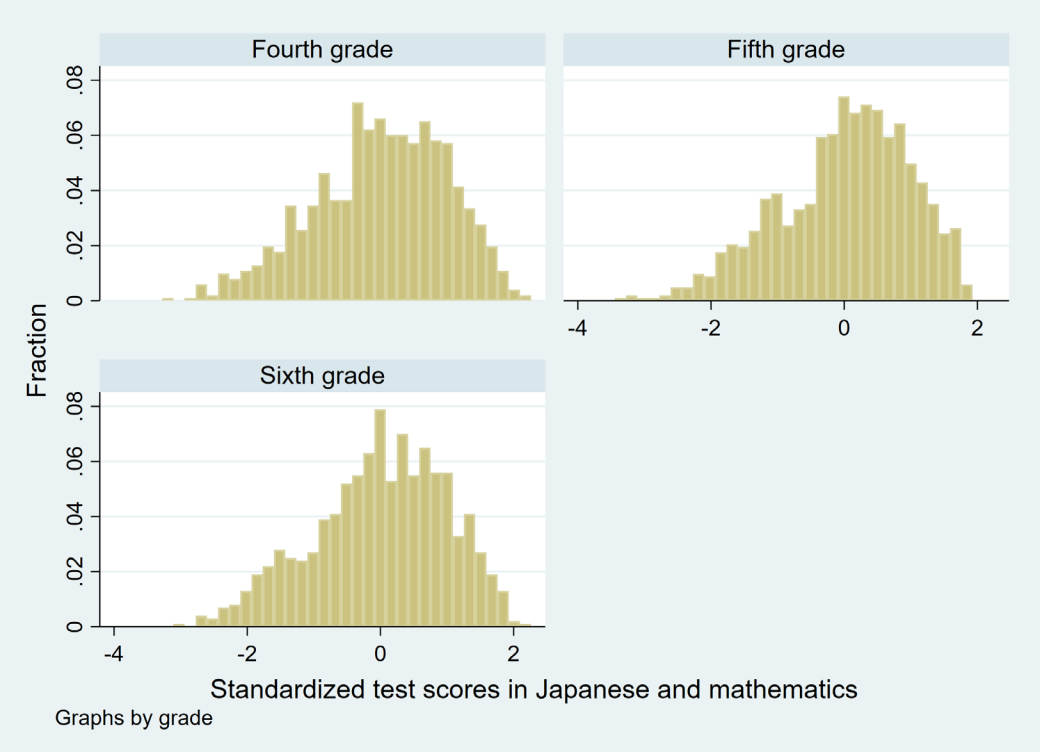
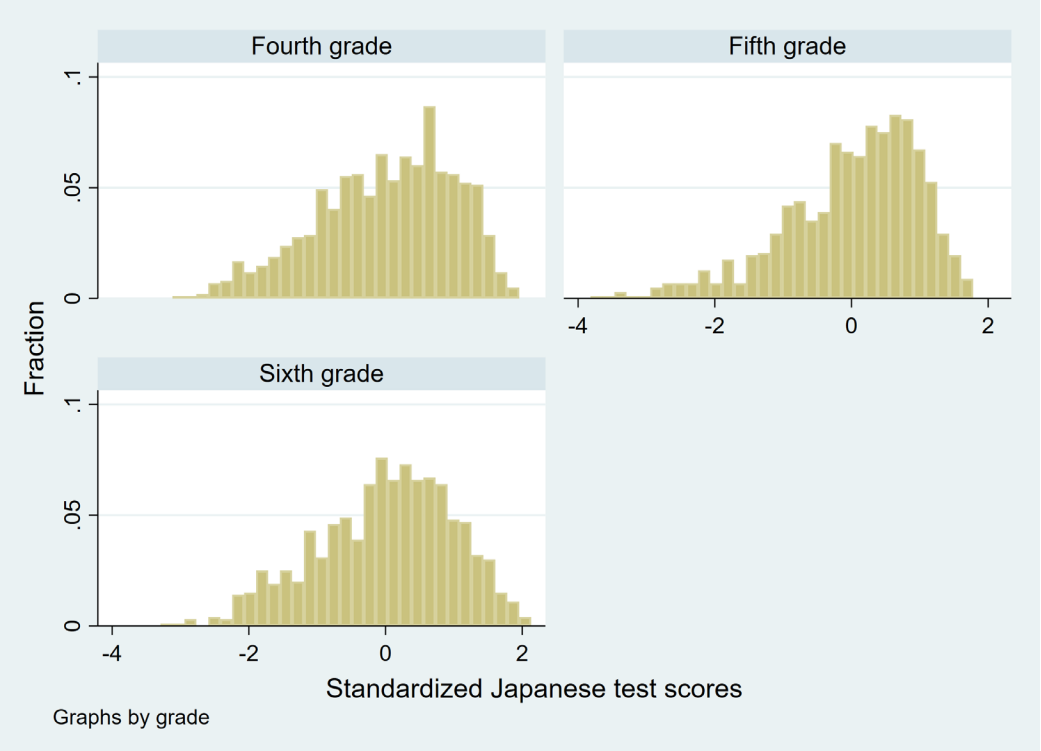
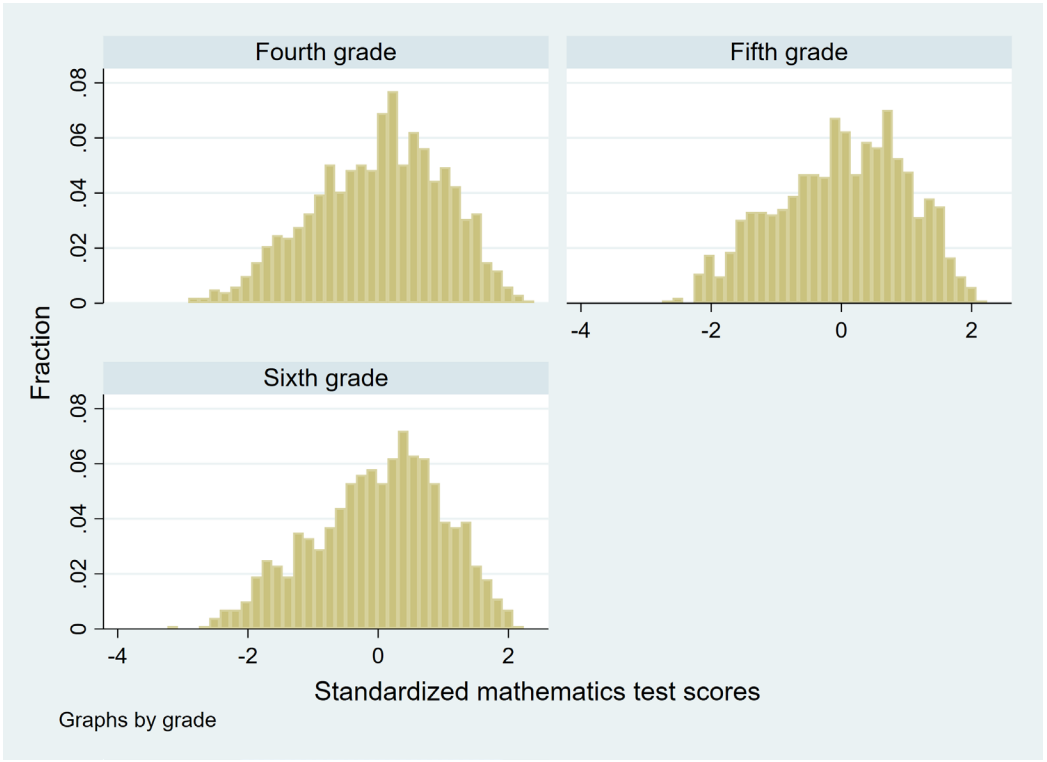
Figure 1. Distribution of Test Scores.






Fourth grade
Fifth grade
Sixth grade
Fraction
0
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-2
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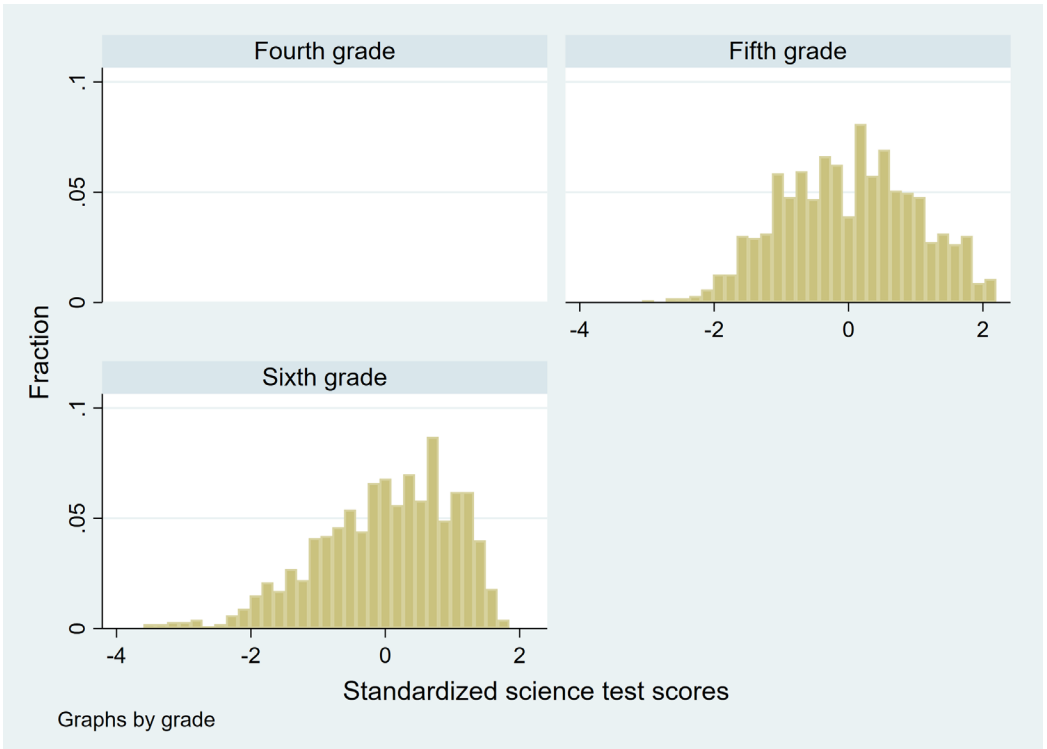
2
Standardized mathematics test scores
Graphs by grade


Fourth grade
Fifth grade
Sixth grade
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Standardized science test scores
Graphs by grade

Figure 2. Distribution of Noncognitive Outcome Scores.

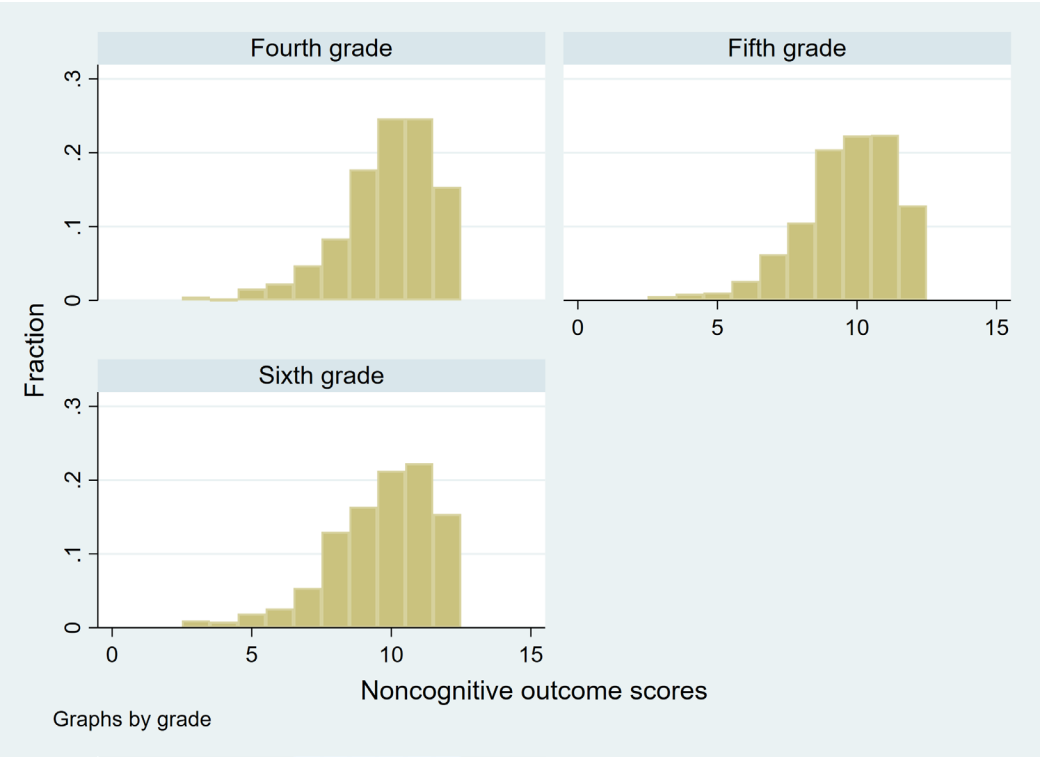

Figure 3. Distribution of Friendship Outcome Scores.

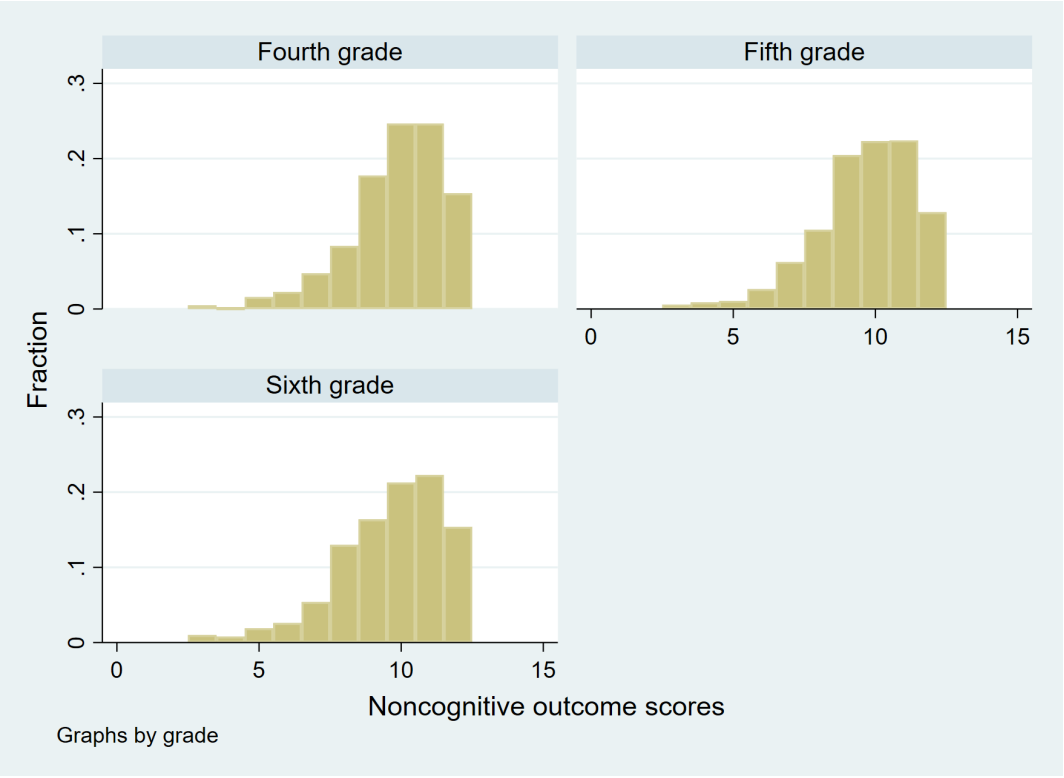

Figure 4. Distribution of Annual Bullying Victimization Scores.

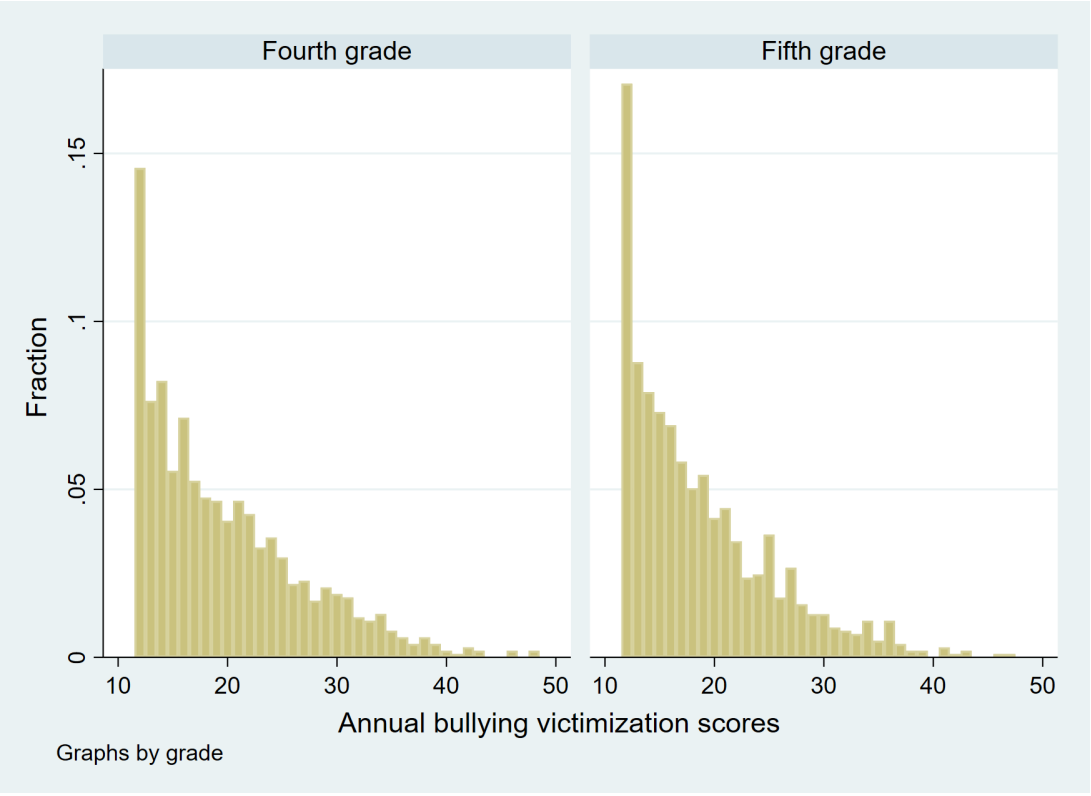

Table 1. Definition of Variables.

Variable	Explanation of Variables
Outcome variables:	
Japanese & Math	The sum of Japanese and mathematics test scores, standardized to have a mean of 0 and a standard deviation of 1 for each grade (administered from fourth grade to sixth grade).
Japanese	Japanese test scores standardized to have a mean of 0 and a standard deviation of 1 for each grade (administered from fourth grade to sixth grade).
Math	Mathematics test scores standardized to have a mean of 0 and a standard deviation of 1 for each grade (administered from fourth grade to sixth grade).
Sci	Science test scores standardized to have a mean of 0 and a standard deviation of 1 for each grade (administered from fifth grade to sixth grade).
Noncognitive	The sum of the responses to the following three questions from the 1st QU. Each response is rated on a 4-point Likert scale: 1 “strongly disagree”, 2 “disagree”, 3 “somewhat agree”, and 4 “strongly agree”. The total score is standardized to have a mean of 0 and a standard deviation of 1. 1. Do you feel happy when you can accomplish something at school that you previously could not? 2. Do you enjoy answering the teacher's questions or expressing your opinions during class? 3. Do you strive to achieve good grades and improve your academic abilities?
Friendship	The sum of the responses to the following nine questions from the 1st QU. Each response is rated on a 4-point Likert scale: 1 “strongly disagree”, 2 “disagree”, 3 “somewhat agree”, and 4 “strongly agree”. The total score is standardized to have a mean of 0 and a standard deviation of 1. 1. Do your classmates talk to you and treat you kindly? 2. Are there friends in your class whom you think are kind or admirable? 3. Do you feel that your classmates like you and consider you part of the group? 4. Do your classmates recognize or admire your abilities in areas such as sports, academics, or extracurricular activities? 5. Do your classmates encourage you when you fail? 6. Do you think there is someone in your class who understands your feelings? 7. Do you believe your classmates cooperate with or support you when you try to do something? 8. Do you think there are many people in your class who actively participate in various activities? 9. When you share your thoughts or ideas, do your classmates listen attentively without mocking you?
Regressors of interest:	
Bullied	The sum of responses to the following six questions from both the 1st and 2nd rounds of the QU Survey. Each response is rated on a four-point Likert scale: 1 (Strongly Disagree), 2 (Disagree), 3 (Somewhat Agree), 4 (Strongly Agree). The total score is standardized to have a mean of 0 and a standard deviation of 1. 1. Do you experience distress when someone in your class says unpleasant things to you or makes fun of you? 2. Do you experience distress when someone in your class acts violently toward you? 3. Do you ever feel like you don't want to be in your class because you are mocked or belittled by your classmates? 4. Do you find yourself alone during recess or other breaks? 5. Do you end up being the last one left out when groups are formed in class? 6. Do you ever feel ignored or excluded by your classmates?

Bullied_1st	The sum of responses to the six questions above from the first round of the QU.
Bullied_2nd	The sum of responses to the six questions above from the second round of the QU.
Other explanatory variables	
Girl	A dummy variable that takes the value 1 if the individual is female, and 0 otherwise.
Class size	The number of students observed in each class.
Girl ratio	The proportion of female students in the class.

Table 2. Descriptive statistics.

	Obs.	Mean	SD	Min.	Max.
Outcome variables:					
Japanese & Math	3,041	0.00	0.99	-3.45	2.26
Japanese	3,041	0.00	0.99	-3.82	2.13
Math	3,041	0.01	0.99	-3.24	2.24
Sci	2,027	0.00	0.99	-3.60	2.20
Noncognitive	3,041	0.00	1.00	-4.09	1.35
Friendship	3,041	0.00	1.00	-4.12	1.44
Regressors of interest:					
Bullied	2,022	0.00	1.00	-1.08	4.28
Bullied_1st	2,040	0.00	1.00	-0.98	3.84
Bullied_2nd	2,022	-0.01	1.00	-0.97	4.13
Other explanatory variables:					
Girl	3,041	0.51	0.50	0.00	1.00
Class Size	3,041	29.7	4.6	12.0	40.0
Girl Ratio	3,041	0.51	0.06	0.30	0.64

Table 3. Determinants of Bullying Victimization.

	Bullied_2nd				
	(1)	(2)	(3)	(4)	(5)
Japanese & Math	-0.1040***			-0.0538**	-0.0479**
	(0.0272)			(0.0250)	(0.0240)
Noncognitive		-0.2098***		0.0480*	0.0459*
		(0.0249)		(0.0283)	(0.0273)
Friendship			-0.4617***	-0.4806***	-0.4705***
			(0.0274)	(0.0326)	(0.0322)
Girl	-0.0254	0.0113	0.0602	0.0618*	0.0624*
	(0.0418)	(0.0425)	(0.0368)	(0.0369)	(0.0367)
Class size					0.0087
					(0.0057)
Girl Ratio					-0.6709
					(0.4543)
Clas-fixed effects	Yes	Yes	Yes	Yes	No
Obs.	2,022	2,022	2,022	2,022	2,022

Note: Standard errors are clustered at the class level and are reported in parentheses.
Significance levels are denoted as ***1% level, **5% level, *10% level.

Table 4. The Effect of Bullying on Academic Performance.

	Japanese & Math (t+1)	Japanese (t+1)	Math (t+1)	Sci (t+1)
	(1)	(2)	(3)	(4)
Bullied	-0.0333**	-0.0520***	-0.0294*	-0.0419*
	(0.0149)	(0.0180)	(0.0165)	(0.0231)
Girl	0.0547**	0.1345***	0.0199	0.0858**
	(0.0242)	(0.0286)	(0.0296)	(0.0404)
Outcome poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes
Class-fixed effects	Yes	Yes	Yes	Yes
Obs.	1,988	1,988	1,988	988

Note: Standard errors are clustered at the class level and are reported in parentheses.
Significance levels are denoted as ***1% level, **5% level, *10% level.

Table 5. The Effect of Bullying on Noncognitive Outcomes.

	Noncognitive (t+1)
Bullied	-0.1066***
	(0.0276)
Girl	0.0298
	(0.0390)
Outcome poly. (fifth order, start of year t)	Yes
Class-fixed effects	Yes
Obs.	1,992

Note: Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.

Table 6. The Effect of Bullying on Friendship Outcomes.

	Friendship (t+1)
Bullied	-0.2290***
	(0.0274)
Girl	0.0889**
	(0.0359)
Outcome poly. (fifth order, start of year t)	Yes
Class-fixed effects	Yes
Obs.	1,992

Note: Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.

Table 7. Heterogenous effects.

	Japanese & Math (t+1)		Japanese (t+1)		Math (t+1)		Sci (t+1)		Noncognitive (t+1)		Friendship (t+1)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bullied	-0.0466**	-0.0276	-0.0384*	-0.0369*	-0.0637***	-0.0348*	-0.0981***	-0.0365	-0.0677*	-0.1173***	-0.2054***	-0.2631***
	(0.0180)	(0.0178)	(0.0222)	(0.0196)	(0.0207)	(0.0199)	(0.0305)	(0.0309)	(0.0342)	(0.0351)	(0.0353)	(0.0310)
×Class size_large	0.0252		-0.0257		0.0653**		0.1024**		-0.0727		-0.0462	
	(0.0290)		(0.0345)		(0.0324)		(0.0424)		(0.0516)		(0.0400)	
×Girl ratio_high		-0.0137		-0.0360		0.0130		-0.0127		0.0255		0.0842**
		(0.0300)		(0.0360)		(0.0340)		(0.0467)		(0.0525)		(0.0395)
Girl	0.0555**	0.0547**	0.1337***	0.1345***	0.0219	0.0197	0.0864**	0.0855**	0.0272	0.0299	0.0879**	0.0884**
	(0.0242)	(0.0242)	(0.0285)	(0.0285)	(0.0295)	(0.0296)	(0.0402)	(0.0402)	(0.0390)	(0.0390)	(0.0357)	(0.0355)
Outcomes poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Class-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,988	1,988	1,988	1,988	1,988	1,988	988	988	1,992	1,992	1,992	1,992

Note: Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.

Table 8. The Effects of Peer-Bullying Victimization on Student Outcomes.

	Japanese & Math (t+1)	Japanese (t+1)	Math (t+1)	Science (t+1)	Noncognitive (t+1)	Friendship (t+1)
	(1)	(2)	(3)	(4)	(5)	(6)
Peer Bullied	-0.1467*	-0.1209	-0.1489	-0.1955*	-0.1524	-0.0836
	(0.0853)	(0.0842)	(0.1042)	(0.0989)	(0.0991)	(0.0967)
Bullied	-0.0377**	-0.0385**	-0.0317*	0.0008	-0.1073***	-0.2334***
	(0.0149)	(0.0167)	(0.0160)	(0.0119)	(0.0268)	(0.0268)
Girl	0.0394	0.1182***	0.0100	0.0100	0.0068	0.0522
	(0.0258)	(0.0302)	(0.0303)	(0.0303)	(0.0397)	(0.0421)
Class-level peer attributes	Yes	Yes	Yes	Yes	Yes	Yes
Outcomes poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,988	1,988	1,988	1,988	1,992	1,992

Note: Class-level peer attributes include peers' prior cognitive, noncognitive and friendship outcomes, the proportion of female students, and class size. Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.

Appendices

Table A1. Implementation Schedule of Academic Assessments and QU.

	April	May or June	November or December
2014 (fourth grade)	Academic Assessment	QU 1st Round	QU 2nd Round
2015 (fifth grade)	Academic Assessment	QU 1st Round	QU 2nd Round
2016 (sixth grade)	Academic Assessment	QU 1st Round	

Table A2. Data Structure.

Academic year	Grade	Student count from city statistics	Our data		
			Student count after dropping those with missing values	Number of schools	Number of classes
2014	4	1,062	1,014	16	38
2015	5	1,054	1,026	16	37
2016	6	1,049	1,001	16	35

Table A3. Robustness Checks: Effects of Bullying on Educational Outcomes with Additional Controls.

	Japanese & Math (t+1)			Noncognitive (t+1)			Friendship (t+1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bullied	-0.0333**	-0.0317**	-0.0316**	-0.1066***	-0.1054***	-0.1054***	-0.2290***	-0.2299***	-0.2302***
	(0.0149)	(0.0149)	(0.0149)	(0.0276)	(0.0268)	(0.0268)	(0.0274)	(0.0260)	(0.0261)
Girl	0.0547**	0.0538**	0.0542**	0.0298	0.0280	0.0279	0.0889**	0.0878**	0.0877**
	(0.0242)	(0.0244)	(0.0244)	(0.0390)	(0.0400)	(0.0401)	(0.0359)	(0.0359)	(0.0359)
Outcomes poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Class-fixed effects (t)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Class-fixed effects (t+1)	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Teacher-fixed effects	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	1,988	1,988	1,988	1,992	1,992	1,992	1,992	1,992	1,992

Note: Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.

Table A4. Robustness Checks: Effects of Early- and Late-Year Bullying Victimization on Academic Performance.

	Japanese & Math (t+1)	Japanese (t+1)	Math (t+1)	Sci (t+1)	Noncognitive (t+1)	Friendship (t+1)
	(1)	(2)	(3)	(4)	(5)	(6)
Bullied_1st	-0.0302**	-0.0421**	-0.0309**	-0.0423*	-0.0900***	-0.1519***
	(0.0146)	(0.0180)	(0.0150)	(0.0246)	(0.0260)	(0.0309)
Girl	0.0556**	0.1381***	0.0182	0.0817*	0.0313	0.0794**
	(0.0245)	(0.0290)	(0.0295)	(0.0406)	(0.0386)	(0.0359)
Outcomes poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes	Yes	Yes
Class-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,997	1,997	1,997	993	2,002	2,002
	Japanese & Math (t+1)	Japanese (t+1)	Math (t+1)	Sci (t+1)	Noncognitive (t+1)	Friendship (t+1)
	(7)	(8)	(9)	(10)	(11)	(12)
Bullied_2nd	-0.0292*	-0.0503***	-0.0217	-0.0348	-0.1048***	-0.2291***
	(0.0150)	(0.0173)	(0.0179)	(0.0214)	(0.0273)	(0.0272)
Girl	0.0539**	0.1333***	0.0195	0.0865**	0.0266	0.0803**
	(0.0243)	(0.0286)	(0.0297)	(0.0400)	(0.0392)	(0.0364)
Outcomes poly. (fifth order, start of year t)	Yes	Yes	Yes	Yes	Yes	Yes
Class-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,988	1,988	1,988	988	1,992	1,992

Note: Standard errors are clustered at the class level and are reported in parentheses. Significance levels are denoted as ***1% level, **5% level, *10% level.